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Workbook Preview

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Name: _____ 6

What is Energy?

What is Energy?

Energy is the ability to do work as it allows things to move, grow, or change. Energy can make things move. When we run or jump, we are using energy from the food we eat to move. When we put gasoline in a vehicle, it will give the vehicle energy to move.

Energy can also make things change. When we bake a cake using different ingredients, the heat energy from the oven changes the liquid batter into a fluffy cake.

Preview of 55 pages from this product that contains 134 pages total.

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Pot

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or

the energy is not being used yet, but has the ability to be used.



Kinetic energy is energy in motion. When you ride your bike and are at the top of a hill, you possess kinetic energy as you have the potential to move if you let go of the break or take one pedal forwards. Once you start moving, you are producing kinetic energy.

Picture a pendulum swinging side to side. When it is in motion, it has kinetic energy, but when it stops for that brief time, it has potential energy. **Fuel** is an example of potential energy as it is stored energy that has not been used yet. Wood, gas, batteries, and even food are examples of fuel and potential energy.

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Name: _____ 7

What is Energy?

Questions

Answer the questions below using evidence from the text

1) You're on a rollercoaster and you stop at the top of a hill before coming rushing down. When are you showing kinetic and potential energy? Explain.

2) Does your body have potential energy right now? Explain.

PREVIEW

Definitions

Explain what the following terms mean.

Energy	
Kinetic	
Potential	

True or False

Is the statement true or false?

1. Fuel is an example of kinetic energy.	True	False
2. Kinetic energy is energy that is in motion or being used.	True	False
3. Potential energy is energy that is stored.	True	False
4. A ball resting at the top of a hill represents kinetic energy.	True	False
5. A puck sliding across the ice is displaying kinetic energy.	True	False

Name: _____ III

What is Thermal Energy?

Matter and Energy

Matter is made up of particles we call atoms. These atoms are moving constantly. In a solid, the atoms are packed tight. In a gas, they are more spread out. The atoms in all matter are constantly moving or vibrating. When we raise the temperature of matter, the atoms will vibrate faster. The heat we apply to matter is called thermal energy.



Thermal Ener

When you put your hand ov[illegible] you are feeling thermal energy. **Thermal energy** is created when [illegible] causes the atoms to move faster and collide with [illegible] that comes from the temperature of the [illegible] and thermal energy. For example, when you light a candle, the [illegible] the candle are moving faster and faster, [illegible]



All matter contains thermal energy. Even we [illegible] thermal energy. You may have more thermal energy than the person beside you, [illegible] in the sun and they aren't. After you exercise, you have more [illegible] as the atoms and molecules in your body are moving faster and colliding with each other. When someone stands next to you, you will likely send heat their way.

Even ice contains thermal energy, but it doesn't have much! You would never try to get any heat from an ice cube as it only has small amounts of thermal energy. The atoms in an ice cube do not move as much as the atoms in boiling water. Some households use boiling water in what are called radiators to heat their homes. The water heats up and the atoms move faster and faster, which creates a rise in temperature. This creates heat (thermal energy) that is sent into the air.

PREVIEW

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Thermal Energy - Questions

True or False

Circle whether the statement is true or false

1. Only warm things have thermal energy	True	False
2. All matter has thermal energy	True	False
3. Thermal energy is released when atoms in matter rise in temperature	True	False
4. When matter heats up, the atoms move slower	True	False
5. Humans lose thermal energy	True	False

PREVIEW

Questioning

...do you have after reading the information?

1)	
2)	

Questions

Use information from the text to support your answer.

1. What is thermal energy? What things have a lot of thermal energy?

2. Does everything have thermal energy? Explain.

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Thermal Energy From Chemical Reactions

Chemical Reactions

For many years, humans have been using chemical reactions to create thermal energy. We have always needed thermal energy for heat to keep us warm.

A **chemical reaction** is when substances are combined and a new substance is formed. When we combine wood with oxygen and heat, we get flames that release carbon dioxide, water vapour, and ash.



Hand Warmers

A hand warmer is a little pouch that you can put in your pocket to create heat for your hands. The reason the hand warmers heat is because they make a chemical reaction.

When you open your hand warmer, the oxygen in the air reacts with the iron, salt, and carbon in the pouch. When these four substances are combined, the result is thermal energy. The thermal energy creates heat that your hands will keep it warm.

These pouches will not work forever. When the oxygen has reacted with the other substances for long enough, the chemical reaction ends. This means no more thermal energy is made, and no more heat.



Candles

When we burn a candle, wax near the flame is burned and it turns into carbon dioxide. This is a chemical change transforming the potential energy into thermal energy, as the candle wax is changed into a new substance – carbon dioxide. That is why a candle will shrink when we burn it.

PREVIEW

Name: _____ 13

Thermal Energy From Chemical Reactions

Making Connections

What does this remind you of in your life?

Questions

...ions below using evidence from the text

1) What is a chemi...

2) How can we use a chemical reaction to cre...

PREVIEW

Word Scramble

Unscramble the words below using the word bank

Chemical	Reaction	Thermal	Energy	New	Substance

EGEYRN		WEN	
BSETSUNCA		CHLCEMAI	
CNEGARTI		LRHATEM	

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Thermal Energy From The Sun

The Sun – The Best Thermal Energy Source



Every second, the sun releases more thermal energy than all humans consume in an entire year! We need the thermal energy from the sun in order to survive.

Look around, you need sunlight and heat, your friends do too, and so do the plants and animals outside. The thermal energy provided by the sun is just the right amount for things to grow and survive.

PREVIEW

How the Sun Releases Thermal Energy

The sun is a massive ball of hydrogen gas that creates an enormous amount of heat. The sun is not just massive, it's huge. You could fit 109 Earths inside of the sun.

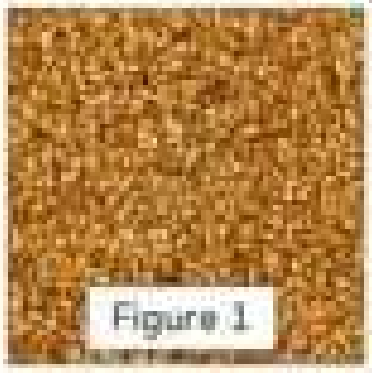


Figure 1

The sun is so big and it has a lot of pressure inside of it. The pressure is so great that all of the hydrogen atoms are constantly moving and colliding. When the atoms collide, they create thermal energy.

Thermal energy is released through nuclear fusion in the sun's core. This happens when hydrogen atoms change into helium atoms. It takes four hydrogen atoms to fuse into one helium atom. This process creates thermal energy. The thermal energy is radiated in the form of sunlight to the Earth, where it keeps us warm.

Figure 1 is a real closeup picture of the sun. You can see all the tiny hydrogen atoms bouncing off each other.



Solar Energy

The sun is constantly providing the Earth with a tremendous amount of energy. Scientists have created solar panels that can convert the sun's thermal and light energy into electricity. Electricity is very useful for humans because it is used to give energy to our machines.

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Name: _____ 16

Nuclear Power



Nuclear Power

Nuclear energy is produced by splitting a uranium atom into two smaller atoms. This process releases heat from the nucleus of the atom that is used to create steam.

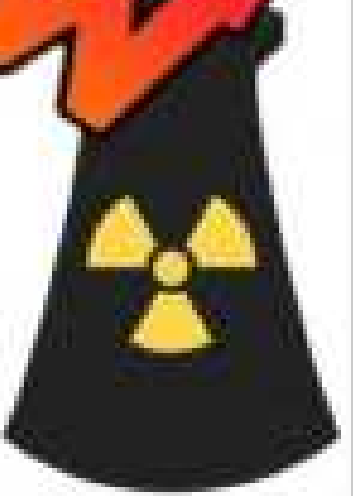
PREVIEW

Nuclear [illegible] Canada and Worldwide

In Ca[illegible] nuclear reactors. Ontario has 18 and there is 1 in New Brunswick. N[illegible] p[illegible]es 15% of Canada's energy needs. Nuclear energy creates 10% of [illegible]gy u[illegible]ide. Nuclear energy is non-renewable energy because it use[illegible] source we could run out of.

Advantages of Nuclear Energy

- It does not use large amounts of [illegible] gen[illegible]. In fact, it uses 450 times less land than solar energy to gen[illegible] same amount of power.
- It is a stable consistent source of energy. It [illegible] the clock while solar and wind only produce energy 10-30 [illegible] depending on weather conditions and whether it is day or night.
- Nuclear energy does not emit greenhouse gases.



Disadvantages of Nuclear Energy

- The same raw materials used to create nuclear power could also be used to create nuclear weapons.
- The risks of an accident at a generating station could cause damage to people and the environment.
- The used uranium is radioactive waste for thousands of years and must be disposed of carefully to avoid contamination.

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Nuclear Power - Questions

True or False Circle whether the statement is true or false

1. Nuclear energy is renewable energy.	True	False
2. Nuclear energy uses fission to generate heat.	True	False
3. Nuclear energy generates no greenhouse gases.	True	False
4. Fear of r[illegible] accidents is why people are against using nuclear energy.	True	False
5. Nuclea[illegible] used much around the world.	True	False

Summ[illegible]ze [illegible]ize the reading by writing the important information

Questions Use information from the text t[illegible]

1) Do you think we should build more nuclear power generating sta[illegible] Why or why not?

2) What are the benefits of nuclear power?

PREVIEW

Name: _____ 18

Nuclear Power Accidents

Nuclear Power Accidents - Overview

There have been three major accidents involving nuclear generating stations.



1) In 1979 - Three Mile Island in the United States had an accident with no loss of life or significant health effects however it did cause a slowdown in nuclear power plants being built.

PREVIEW

2) In 1986 - Chernobyl [illegible] had an accident resulting in two [illegible] 28 people died from radiation poisoning and 15 people died years later from Thyroid cancer. 335,000 people, who lived within a 30 km radius from the accident had to leave their homes.



3) In 2011 - Fukushima Daiichi in Japan had an accident caused by the Tohoku earthquake and tsunami. There were no deaths attributed to the nuclear accident although 18,500 people died as a result of the earthquake and tsunami. One cancer death of a nuclear station employee has since been blamed on the accident. 154,000 people were evacuated from a 20-kilometer radius of the generating station.



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Nuclear Power Accidents - Questions

Questions Use information from the text to support your answer

1) Which accident was the worst?

2) Does [illegible]ion have long lasting effects? Explain.

PREVIEW

Visualizing Draw what [illegible] head while you were reading

What words from the text made you picture that in your [illegible]?

Questioning Write two questions you have after reading the text

1)

2)

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Name: _____ 20

Law of Conservation of Energy

Energy on the Move



In 1907, Albert Einstein created the first law of energy – that it cannot be created nor destroyed, but only transformed. Since energy is either potential or kinetic, it is always there and cannot be created or destroyed, it can only change from one type of energy to another. This concept is the **law of conservation of energy** because it explains how energy is always conserved or lost.

An example of this is when gas is burned in a car. The chemical energy in the gas is not gone, it is transformed into energy through the exhaust pipe. When we are cold, we can move around to create heat energy in the food we eat. That energy doesn't disappear as it rests, it is released.

PREVIEW

Law of Conservation of Energy – More Examples

- A ball at the top of a hill has potential energy because of its position. When it begins to move, the potential energy is gone, but now it has kinetic energy because it is moving. The energy transformed from potential to kinetic.
- When we turn on a lightbulb, electrical energy from the wire connected to it is transformed to light energy and heat energy.
- Wood has potential energy in it. When we burn the wood, the potential energy is transformed into heat and light energy. The potential energy in the wood is not gone, it has just been transformed into heat and light.



- When a musician strikes a drum, the drum stick provides mechanical energy into the drum. The energy is not gone, it is transformed into sound energy.
- When you rub your hands together, you are using mechanical energy. The energy does not disappear, it transforms into thermal energy, making our hands feel warm!

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Transforming Energy

Questions

Use information from the text to support your answer

1) What does Einstein mean by energy cannot be created nor destroyed?

2) Wh[illegible]rical energy go when you turn on a lightbulb?

PREVIEW

Transforming Energy

[illegible] transforming in the picture below



Multiple Choice

Circle the correct answer

1) Who thought of the first law of energy?	Einstein	Edison
2) Food energy is often transformed into _____ energy	Light	Mechanical
3) Wood's chemical energy is transformed into light and _____	Heat	Electrical
4) When a drummer strikes a drum, they are using _____ energy	Sound	Mechanical
5) Energy cannot be created nor...	Destroyed	Transformed

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Name: _____ 22

Chemical Energy

What is Chemical Energy?

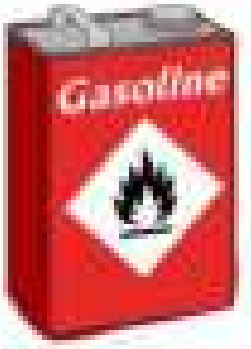
Chemical energy is the energy stored in matter that is used when a chemical reaction happens. Therefore, chemical energy is potential energy, not kinetic energy. It is stored energy in matter that has the potential to be used if a chemical reaction happens. If the chemical [illegible] is used, it is transformed to kinetic energy.

Matter [illegible]ical Energy

- Fo[illegible]
- Batteries
- Candles
- Fireworks
- Gas







PREVIEW

Transforming Chemical Energy

When chemical energy is used, it is not only t[illegible]ned [illegible]ergy, but also other forms of energy. Below are some examples [illegible] is transformed to other forms of energy.

- When you eat food, your digestive systems uses acids to br[illegible]les in the food. This chemical reaction transforms the chemical ener[illegible]ergy your body can use, like mechanical energy.
- A battery in a toy has chemicals inside that have chemical energy. When the chemicals undergo a chemical reaction inside the toy, it will often make sound energy, light energy, or mechanical energy.
- When we pour gas into a car's gas tank, the gas has chemical/potential energy. When we turn the car on, the gas is burned in the engine, causing a chemical reaction that transforms the chemical energy into thermal energy, sound energy, and mechanical energy.

Name: _____ 23

Chemical Energy

True or False Circle whether the statement is true or false

1) Chemical energy is kinetic energy	True	False
2) Chemical energy is great for portable energy you can use in other places	True	False
3) Food is an example of chemical energy	True	False
4) A rock has chemical energy	True	False
5) Gasoline is often transformed into thermal energy	True	False

Making Con ...have you used chemical energy today?

Questions Use information from the text to support

1) Why is food considered chemical energy? What is the energy transformed into?

2) What is the chemical energy in a firework transformed into?

PREVIEW

Name: _____ 2A

Electricity

How Does Electrical Energy Work?

Power plants are responsible for taking different forms of energy, like solar and fossil fuels and transforming them into electrical energy. **Electrical energy (electricity)** is the most common form of energy used as it can be delivered from place to place easily.

Wires are excellent energy conductors that carry energy away from a power plant to houses and buildings. When we plug a cord into an outlet, we are connecting to the wires that connect to the power plants. The power plants charge us money for using their energy. They measure how much energy we are tapping in to.

Power Plants

Electricity is made in power plants using different energy sources. The most popular forms of power plants are nuclear power, fossil fuel power plants (oil, coal, natural gas), and renewable resource power plants.

Nuclear power is one form of power plant that uses machines called nuclear reactors. Heat is produced by these reactors when atoms are split apart. The heat is then used to boil water and create steam. The steam is then used to produce electricity.

Fossil fuels are another form of power plant that burn materials to heat water and create steam to turn turbines. Solar, wind, and water are also **renewable resources** that are also used to produce electricity. The power plants are responsible for transforming the natural energy sources into electricity.



Electricity Transforming

When we plug machines into these outlets, the electrical energy often changes form to provide us with heat, light, or sound.

Think of how a television uses electrical energy to provide light and sound energy to the viewer. It also provides heat energy as I'm sure you have noticed when a TV gets warm after being on for an extended period of time. The energy begins as electrical energy, but transforms into thermal, light, and sound energy.

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Electricity - Questions

Questions Use information from the text to support your answer

1. How does electricity work and how do we get access to it at home?

2. What [illegible]? What types of power are used?

PREVIEW

Summarize [illegible] from the reading passage

Matching Draw a line from the term to the description

Term	Description
Nuclear Energy	Burned to provide energy that is converted to electricity
Fossil Fuels	Used to turn turbines and generate electricity
Renewable Energy	Nuclear reactors split atoms to heat water and produce steam
Outlet	Energy that will come back after it is used
Steam	A device that allows people to have access to electricity

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Name: _____ 29

How My Family Uses Electricity

Survey How does your family use electricity? Answer yes or no.

1) My family has a car we charge with electricity	☑	☒
2) We have a lot of electronics that use electricity	☑	☒
3) We leave TV on a lot which wastes electricity	☑	☒
4) We like to leave lights on in rooms we are not in	☑	☒
5) I use a lot of electronics plugging into the wall	☑	☒
6) My siblings waste electricity leaving them on	☑	☒
7) I always turn off my electronics when not using them	☑	☒
8) We run the dishwasher even if it is not full	☑	☒
9) We don't use a lot of electronics as we play outdoors more	☑	☒
10) My parents have tools that they plug in using electricity	☑	☒

PREVIEW

Write Do you think your family ever wastes electricity? Explain.

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Name: _____ 30

Renewable vs Non-Renewable Energy

Non-Renewable Resources

Non-renewable resources are resources that will not replenish themselves in a lifetime. Once we use all of a non-renewable resource, it could take billions of years to form again.

Nuclear power uses uranium that is a non-renewable resource.

Fossil Fuels coal, oil and natural gas are non-renewable resources. Digging deep into the ground to access these materials are expensive. Once they are used they cannot be used again. These resources are easy to use and provide an efficient form of energy. However, they are dangerous to our environment.



Using these non-renewable resources involves heating up the material which produces a by-product that pollutes the environment. Scientists are searching for more effective ways to use renewable resources. Non-renewable energy sources are expected to run out very soon. They are the way we live.

PREVIEW

Renewable Resources

A **Renewable resource** can be used over and over again without any harm to the environment. The sun produces enough **solar energy** for the entire world. If we could setup enough solar panels to collect the energy, we could solve the non-renewable energy crisis. The problem is that the sun is not always shining where these solar panels are located, which makes it an inefficient means of energy.

Wind energy is also a renewable resource as the wind will always come and go, but that is the problem. The inconsistent flow of the wind makes it another inefficient source of energy.

Water or **hydro energy** uses the flow of water through a dam to generate energy. Water power is efficient but costly to build the dams necessary.

Geothermal energy uses the heat from below the Earth's surface to produce steam that spins turbines and generates power. These setups are efficient but also costly.

The last renewable resource that is commonly used is biomass. **Biomass** energy comes from burning plants, crops, and animal waste to create heat and steam that spins turbines.

Name: _____ 31

Renewable vs Non-Renewable Energy

Questions Answer the questions below using evidence from the text

1) Which type of energy do you think is the best?

2) W[illegible]ng to find more efficient sources of renewable energy?

True or False I[illegible]or false?

1. Coal and natural gas are examples of renew[illegible]sour[illegible]	True	False
2. Biomass is when animal poop is burned to cre[illegible]	True	False
3. Geothermal energy is efficient but costly.	T[illegible]	False
4. Wind and solar energy are efficient sources of energy.	[illegible]	alse
5. Non-renewable energy sources create harmful by-products when burn[illegible]ue		False

Visualizing Draw what you were picturing while you were reading. Explain the picture

PREVIEW

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Name: _____ 35

How My Family Uses Gasoline

Survey How does your family use gasoline? Answer yes or no

1) We drive a vehicle that uses gas for energy	☑	☒
2) We h[illegible] more than 1 car	☑	☒
3) We [illegible] en just to get out of the house	☑	☒
4) Ou[illegible] uses a lot of gas	☑	☒
5) Our vehicl[illegible] and [illegible] of gas	☑	☒
6) We have a lot of [illegible] gas	☑	☒
7) My parents drive a long dista[illegible]	☑	☒
8) My dad sometimes bikes to work so [illegible]	☑	☒
9) We carpool with other families to use les[illegible]	☑	☒
10) We take the bus sometimes to use less gas	☑	☒

PREVIEW

Write Do you think your family ever wastes gasoline? Explain

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Air Pollution Infographic

Analyze Analyze the infographic and answer the questions



1) Which organization made the infographic?

2) Why do you think they made it?

3) Where does air pollution come from?

4) Why does it say that air pollution is a global challenge? Why does every community need to tackle it together?

PREVIEW

Name: _____ 38

Solar Energy



What is Solar Energy?

Solar energy is energy given off by the sun's rays. The sun has been providing humans with solar energy for thousands of years. The sun has given us thermal energy to keep us warm and dry our clothes, and light energy to allow us to see.

As technologies advance, humans are now using solar energy to create electricity. Using solar energy for electricity means the sun is powering our electronics, machines, electric [illegible].

Solar energy is a renewable energy source because we cannot use it up. It is an inexhaustible resource because the supply is endless.



How Solar Energy Works

Solar energy is harnessed by [illegible] and store the sun's energy. The stored energy is [illegible] used on demand. Solar panels are made of many solar cells that are all connected.

The solar cells have two sides. One side [illegible] positively charged and the other side has a negative charge. When the [illegible] cell, the energy knocks the electrons loose and they begin to flow [illegible] creating an electrical circuit. We can plug our electronics into a [illegible] flowing electrons can give them power.

PREVIEW

Benefits and Drawbacks to Solar Energy

Benefits	Drawbacks
Renewable energy we won't run out of	Solar energy can only be collected when it is sunny. Cloudy, rainy days will slow down energy storage
No greenhouse gases (no air pollution)	Batteries store the solar energy. Batteries don't decompose, meaning they will end up in landfills when they no longer work
Once setup in homes, the cost is free to use electricity	It costs a lot to install solar panels

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Wind Energy

What is Wind Energy?

Wind is the movement of air from areas of high-pressure to areas of low pressure. When the gases that make up our air are warmed, they spread out and have higher pressure. When the air is cooled, the pressure is lower as the gas particles get closer together.



Wind energy is the energy we harness from the movement of the air. We can fly a kite, move a sailboat, and spin a turbine. To use a wind turbine, we can use wind energy to produce electricity.

What is a Wind Turbine?

A wind turbine is like a windmill. When a turbine is spun by wind energy, the turbine connects to a generator that changes the energy into electrical energy by forcing the electrons through an electromagnet.



Use of Wind Energy in Canada

Wind energy is the second most used renewable energy source in Canada. It creates 3.5% of Canada's electricity. Moving water is number one, with 59% of Canada's electricity generation.

Benefits and Drawbacks of Wind Energy

Benefits	✓ Clean energy that doesn't produce greenhouse gases and won't run out ✓ Free energy once you have setup the wind turbine ✓ Wind turbines don't take up much space on the ground
Drawbacks	✓ Dangerous to birds and bats who can fly into the blades ✓ They are noisy so they are usually built in rural areas ✓ Are expensive to setup ✓ They only work when the wind is blowing. This causes unpredictable amounts of energy. If it isn't windy for a long period of time, the stored wind energy will run out

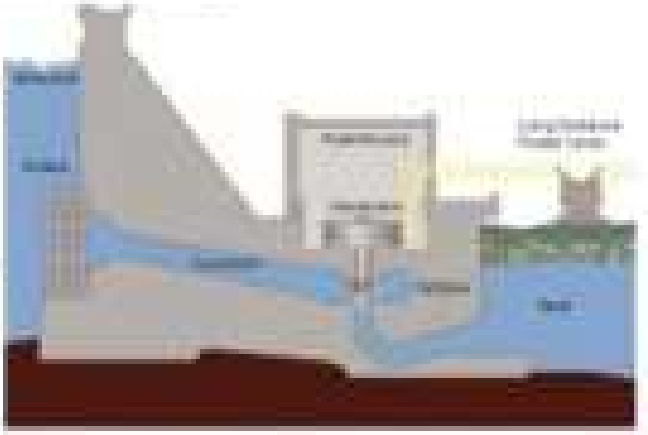
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Name: _____ 42

Hydro Energy

What is Hydro Energy?



Hydro energy is energy that is harnessed from the flow and movement of falling water. You have likely noticed in a stream or river that there is a current that sends water downhill. This movement of water can be harnessed to create energy for humans to use, like electricity.

Hydro energy is one of the oldest forms of energy. Watermills were first used in the 3rd century by the Greeks. The movement of water would spin a watermill that would spin a pipe. The pipe would connect to a machine that could do work.

How Hydro Energy Works

A hydroelectric dam is built across a river. The water is built up in a reservoir that acts like a lake. The water stored at higher altitudes is potential energy. At the bottom of the concrete wall, there is an intake that allows water to travel down the penstock. The water flow must push on and spin the turbine and generating electricity.



Hydroelectric Dams in Canada

The Canadian government is serious about using less fossil fuels for energy and more renewable forms of energy. This is why there are over 15,000 dams in Canada. Hydro creates 59% of all electricity used by Canadians! Canada makes the second most hydroelectricity, behind only China.

Benefits and Drawbacks

Benefits	✓ Renewable source of energy that we won't run out of ✓ The energy is clean because it doesn't emit greenhouse gases ✓ It's the most reliable form of renewable energy as water always flows
Drawbacks	✓ It has an impact on fish because the dam stops the natural flow of water ✓ Can only be built in certain areas where water flows already. It can be difficult to get the electrical energy to big cities from remote locations ✓ High cost to build dams

PREVIEW

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Name: _____ 43

Hydro Energy

Questions Answer the questions below using evidence from the text

1) What is hydro energy?

2) Does [illegible] hydroelectricity? Why do you think they do?

Benefits and Drawbacks [illegible] and drawbacks of hydro energy

Benefits	
Drawbacks	

Reaction Do you think we should use more hydro energy? Explain.

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Climate Change

Overview

Scientific evidence has shown that our climate has warmed over the last 100 years due to human activity. The everyday actions of our society are creating greenhouse gases that are wrapping a thick blanket around our planet. These actions have major effects that need a global response. Everyone needs to conserve the use of energy and resources.



Climate Change – Science

The burning of fossil fuels to generate energy is the primary reason for climate change. When fossil fuels are burned, the result is carbon dioxide emissions that are called greenhouse gases. These emissions rise into the atmosphere and disrupt the carbon cycle.

A normal blanket of carbon dioxide is created as plants and animals decay and this blanket keeps some heat within the atmosphere. The problem is the extra carbon dioxide we are producing from factories, and powerplants is thickening the blanket and keeping more heat on the earth's surface.

Global Effects

As the planet warms, the glaciers are melting, causing flooding. The environment is unable to adapt to the unpredictable changes in temperature and this causes extreme weather such as hurricanes, tsunamis, droughts, floods and more!



Global Response – Paris Agreement

In 2015, all 195 countries in the world realized that climate change needs to be corrected. They agreed to meet in Paris to discuss ways to fix the climate change issue.

Each country has agreed that the climate cannot rise above a 2° increase from the normal temperature by the year 2100. Countries submitted carbon dioxide emissions targets that they would strive to achieve. If all countries can hit their targets, the amount of carbon dioxide would be significantly reduced.

Countries also needed to submit their action plan for how they will achieve their targets. Some plans included implementing a carbon tax on gasoline to deter people from using too much fuel.

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Climate Change

Questions Answer the questions below using evidence from the text

1) What is climate change?

2) W… of climate change?

PREVIEW

Definitions Explain what the … for …

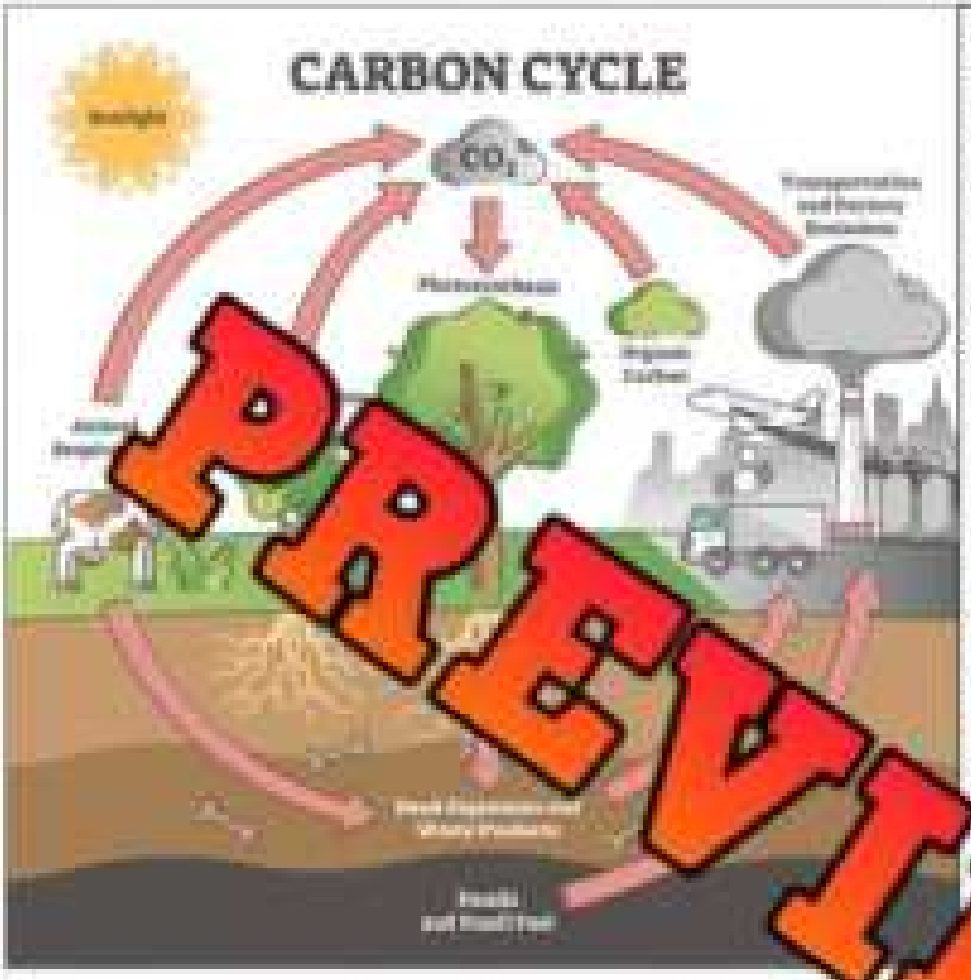
Greenhouse Gases	
Climate Change	
Paris Agreement	

True or False Is the statement true or false?

1. A carbon tax will deter people from buying fuel.	True	False
2. Countries met in 2015 to sign the Paris Agreement to lower CO2 emissions.	True	False
3. Zero carbon emissions would be better for the environment.	True	False
4. Climate change is a result of people burning too many fossil fuels.	True	False
5. The planet warming will make it more enjoyable for people in cold places.	True	False

Name: _____ 48

Greenhouse Gases - Carbon Dioxide



Greenhouse Gases
There are three main greenhouse gases that are released into our atmosphere when we burn fossil fuels.

1) Carbon Dioxide – 82%
2) Methane – 9%
3) Nitrous Oxide – 6%

Carbon Cycle
Carbon dioxide is released into the atmosphere in natural ways, like when animals exhale. This natural release of carbon keeps our planet healthy as it blankets our Earth keeping it the right temperature. But, when we add unnatural amounts of carbon from factories and ...les, we make the blanket ... This is called the ...ffect.

PREVIEW

Questions Answer the questions below usi... ...e ...

1) What is the greenhouse effect? What do you think a thickening bl...

2) What human activities are causing the greenhouse effect? What can we do to stop it from getting worse?

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Conserving Energy

Where Energy in Canada Comes From

When we use energy, we are using either renewable energy or non-renewable energy. Below is a breakdown of where electricity is generated in Canada.

1) Hydroelectricity – 59% from falling water
2) Fossil fuels – 20% from coal (9.5%), natural gas (8.5%), and petroleum (2%)
3) Wind – [illegible]om wind turbines



Con[illegible]

When [illegible] turn on a light, you will be using electricity mo[illegible] and fossil fuels.

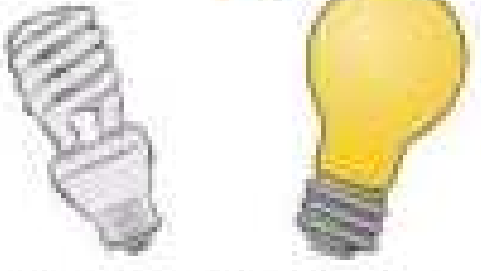
The electricity [illegible] cost. If it came from burning fossil fuels, [illegible] uting to more greenhouse gases in the atmosphere. [illegible]roelectricity, you are contri[illegible] to th[illegible] for wildlife that live around hydro dams.



Using energy allow[illegible] provides us with light to see, heat to stay w[illegible] us entertained. Using energy wisely needs to

Conserving energy means energy is not wasted. Below are some [illegible] you can do to conserve energy.

- Turn off the lights when you leave a room
- Use natural light instead of lightbulbs
- Unplug appliances when they are not being used
- Use energy efficient appliances and light bulbs
- Insulate your home so it stays warm so that you don't need to run your furnace
- Play outside instead of inside on electronics
- Run full loads in the laundry machine and dishwasher



PREVIEW

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Dissipating Energy

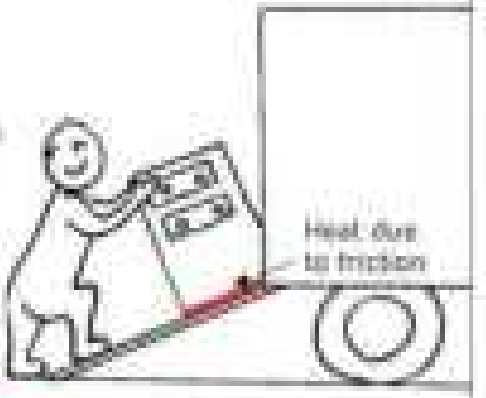
What is Dissipation of Energy?

The term **dissipation** is used to describe ways in which energy is wasted. When energy is transformed from one form into another, not all of the energy is used for the intended purpose. Some of the energy transformed is wasted.

For example, when we turn on a light, electricity is transformed into light energy. The problem is that some of the electricity is dissipated into heat and even sound energy.

Dissipation by Friction

Many machines have friction causing a dissipation when you push a box, an incline makes the work might be easier than picking it up. Friction is the external force resisting the movement of



If the two surfaces – the box and the ramp – are made out of materials that increase friction, heat will be produced. There will be wasted heat energy created. Examples of these surfaces are sandpaper and rubber.

Vehicles – Dissipated Heat Energy

A vehicle uses fuel as energy to allow it to move. Its main purpose is to move, but engines also create heat and sound energy. **Lubricants** reduce friction between moving parts by adding a slippery substance so they can slide past each other. Under the hood of a vehicle, lubricants allow engines and gearboxes to run smoothly.

If you've ever touched a vehicle's engine, you've likely felt the grease get on your hands. Engines have a lot of moving parts, which means they need to be lubricated so they can run efficiently, so they do not create dissipated heat and sound energy.

The most fuel-efficient vehicles are the quietest. This is because the energy used to move the car is not being dissipated into noise energy. Electric vehicles dissipate less noise energy, but their batteries do dissipate heat energy as they get hot.



PREVIEW

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Energy Efficiency

Insulation

Insulation is used to prevent the flow of heat energy into or out of a certain area. Your lunchbox is likely insulated so that heat outside of your lunchbox cannot easily pass through the insulated materials. This keeps the cold items in your lunch cold.

You have probably seen pink insulation before in your house between the walls. It is used to keep the heat inside your house in the winter, and the heat o[illegible] of your house in the summer.



Ins[illegible] important in conserving energy because if we didn[illegible] we would require more energy to heat [illegible] wrong many other things.

Lightbulbs

Lights use a lo[illegible] city. [illegible] using a new lightbulb, it is important to choose the most efficient [illegible] that produce light with less energy.

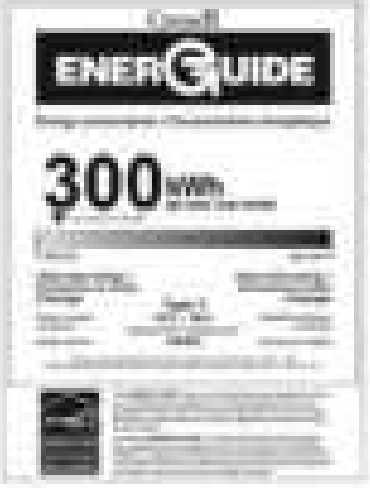
There are 4 typ[illegible] choose from. The most basic and older style is an incandescent li[illegible] lot of heat when they're turned on. Since a light is not [illegible] for, that energy is wasted, meaning its not energy efficie[illegible]

A compact fluorescent bulb is v[illegible] ficient [illegible] bad for the environment. They do not get hot, but they [illegible] m[illegible] which is a dangerous element that needs to b[illegible] ed [illegible]

Halogen lights are another type, but these [illegible] incandescent lights. They produce a lot of heat, whic[illegible] ene[illegible] They last a long time but are not efficient.

Light emitting diodes (LED) bulbs are very energy efficient [illegible] even longer than compact fluorescent bulbs and they do not con[illegible] The only problem is that they are more expensive.

PREVIEW



Household appliances

Some appliances in our homes are energy hogs. They require a lot of electricity to operate. Older appliances were made with poor technology that need a lot of energy to run. Replacing old refrigerators or furnaces with newer high efficiency appliances can save a lot of money on energy bills in the long run.

In Canada, the government requires companies to put an EnerGuide label on appliances that displays how much energy the appliance uses. The label even shows how efficient the appliance is compared with other similar appliances. Choosing an energy efficient appliance is important for conservation!

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Energy Efficiency - Questions

Questions Answer the questions below using evidence from the text

1. What is insulation and how does it help conserve energy?

2. What i[illegible]nd how does it help people choose the right appliance?

Inferencing [illegible]ion[illegible]text to support your inference

Who do you think uses more energy [illegible] or developing countries? Why do you think that is and is it fai[illegible] othe[illegible]

Definitions Explain what the following terms mean

LED Lightbulb	
Incandescent Lightbulb	
Energy Efficient	

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Measuring Electricity In Our Homes

Measuring Electricity in our Homes



We measure the amount of electricity we have used in our homes by kilowatt hours. A **kilowatt-hour** (symbol: kW h) is a unit for measuring energy over a period of one hour. It is how many hours one kilowatt has been used in a house. One kW h is the electricity needed to burn ten 100-watt light bulbs for one hour. An LED 60 inch TV would use approximately 100 watts per hour. This would mean it would take 10 hours for [illegible] to reach one kilowatt-hour.

Reading a [illegible] Hour Metre

Many [illegible] use 4 or 5 dials to provide the number of hours a house has used [illegible] like the one above. To read the dials, you start from left to right, [illegible] covered counter-clockwise. If the pointer is between two numbers, read [illegible] has just passed. If the pointer is between 9 and 0, always read 9.

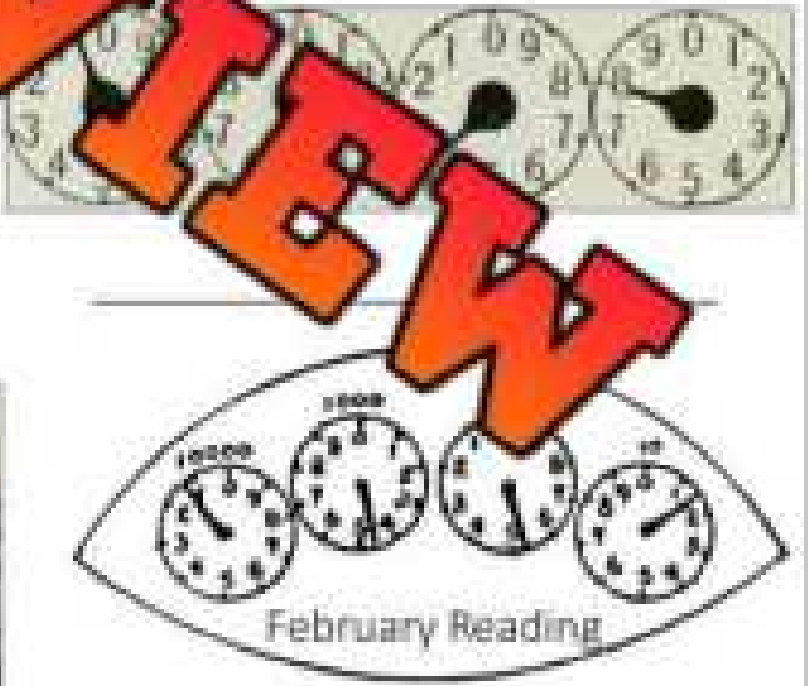
PREVIEW

Read the Metre [illegible] below on the line



_____





January Reading: 12380 kW h

February Reading: _____

How many hours were used in January?

_____ _____

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Reading Efficiency Labels

Household appliances

Some appliances in our homes are energy hogs. They require a lot of electricity to operate. Older appliances were made with poor technology that need a lot of energy to run. Replacing old refrigerators or furnaces with newer high efficiency appliances can save a lot of money on energy bills in the long run.

In Canada, the government requires companies to put an energy efficiency label on appliances that displays how much electricity the appliance uses. The label is called the **EnerGuide**. It shows how many kilowatt-hours an appliance will use for a year. The EnerGuide also shows how efficient the appliance is compared with other similar appliances.

Activity: Write down everything you learned about the appliance from the EnerGuide.



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Energy Audit - Classroom

An **audit** is when a system is looked at very closely to find errors or problems in the system. Your classroom and school are systems of building materials, heating and cooling components, and structures. Perform an audit of your classroom or school by answering the questions below.

Audit | Answer the questions below

1) Put your ... near the windows in your class. When the windows are closed, do you feel a dr... coming in? Write about the windows in your classroom/school. Are they energy ... they be replaced? Why would that help?

2) What types of lightbulbs are used? A... ligh... efficient? You might have to research the lights online to learn more about ... ould the lightbulbs be replaced?

3) What type of heating and cooling does your school use? You may need to consult the custodian to learn more about the system. Is it energy efficient?

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Anishinabek/Ontario Resource Management Council

Anishinabek/Ontario Resource Management Council (AORMC)

The Anishinabek Nation are a political group of 42 First Nations in Ontario. Some of these First Nations include the Chippewas, Mississauga, and Nipissing First Nation. The Anishinabek Nation represent 55,000 people in Ontario.

In 20[illegible] Ontario government partnered with the Anishinabek Nation to improve communi[illegible]ons between the 42 First Nations and the Ministry of Natural Reso[illegible]tural Resources is run by the Ontario government with the goal of using O[illegible]e[illegible]ssibly so they can be enjoyed by future generations.

The Resou[illegible]geme[illegible]as 12 members. Six of the members are from the Anishinabek Nation a[illegible] Ministry of Natural Resources. Together the 12 council members ma[illegible]s r[illegible]aging resources in Ontario.

The partnership means the [illegible]Ontario government new ways to conserve natural resources.

Goal of the Partnership

When issues related to natural resources in Ontario a[illegible]nci[illegible]s will discuss the issue and come up with a resolution. Common issues th[illegible]es[illegible]d to:

- Forestry
- Hunting/Fishing/Trapping
- Pipelines – natural gas and oil rigs

Ministry of Natural Resources

Working Groups

There are too many natural resources to manage for only 12 council members. For this reason, working groups were created to focus on certain natural resources. Below is a list of the different working groups:

1) Water Working Group – 8 members (4 First Nation, 4 Ministry of Natural Resources)
2) Lands Working Group – 5 members (3 First Nations, 2 Ministry of Natural Resources)
3) Fisheries Working Group – 7 members (4 First Nations, 3 Ministry of Natural Resources)

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STEM INVESTIGATION AND COMMUNITICATION SKILLS

Conservation of Energy and Resources

PREVIEW





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Grade 5 Science Unit

Strand A – STEM Investigation and Communication Skills

	Curriculum Expectations	Pages That Cover the Expectations
A1.1	use a scientific research process and associated skills to conduct investigations	79 – 80
A1.2	use a scientific experimentation process and associated skills to conduct investigations	71 – 72, 83 – 84
A1.3	use the engineering design process and associated skills to build, and test devices, models, and/or systems	73 – 82, 85 – 88
A1.4	follow procedures and safety procedures during science and technology investigations, including wearing appropriate equipment and clothing and safely using instruments and materials	71 – 88
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	71 – 88
A2.1	write and execute code in investigations and with modelling concepts, with a focus on using methods to store and process data for a variety of purposes	90 – 94
A2.2	identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades	94
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	89, 91 – 94
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	89, 91 – 94
A3.3	analyse contributions to science and technology from various communities	91 – 94

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Experiment - Basketball Potential Energy

Hypothesis Does a basketball have more potential energy the higher it is held?

If we drop a basketball from higher up, will it bounce higher or lower?	
Higher	Lower



Materials What do we need?

- ✓ Basketball
- ✓ Recording sheet

Method How do we complete the experiment?

1) Drop a basketball from your knees
2) Count how many times it bounces and write it on your sheet
3) Drop a basketball from your waist
4) Count how many times it bounces and write it on your sheet
5) Drop a basketball from shoulder level
6) Count how many times it bounces and write it on your sheet
7) Drop a basketball from over your head
8) Count how many times it bounces and write it on your sheet

PREVIEW

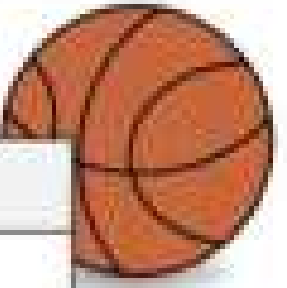
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Name: _____ 72

Basketball - Elastic Energy

Observations	What happened?





How many times did the ball bounce?	
Knees	
Waist	
Head	
Overhead	



Results	Answer the questions

1) Does the ball have more potential energy [illegible] lower?

2) What energy was used to move the ball higher in the air?

3) What gives the ball energy?

Its Materials	Its Shape	Its Texture	Its Position

4) When did the ball have kinetic energy?

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Potential Energy Lab Report

Information | What is this Lab about?

Potential energy is often impacted by gravity as we see in the example of a ball sitting at the top of a hill. It only has potential energy because of its positioning on the hill. If it is at the bottom of the hill, it has no potential energy.

Research Question

1. How do[es] potential energy in a toy car change based on how steep the hill is?

Materials

1. To[y car]
2. Car[dboard]
3. Books
4. Meter stick
5. Tape



Method

1. Stack three books on top of [each] [edge] of the cardboard to the edge of the top book. Tape the bottom edg[e] [to] the floor. This should resemble a slide.
2. Place the car at the top of the "hill" and let go.
3. Measure how far the car travels using the m[eter] [stick]. R[ecord] measurements on this paper.
4. Change the height of the hill by adding a 4th, 5th, and
5. Measure each height and record the distances the car t[ravels]

Hypothesis – What do you predict will happen?

_____

_____

_____

Height in Books	Distance in Meters	Distance in CM
3 Books		
4 Books		
5 Books		
6 Books		

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Name: _____ 7A

Potential Energy Lab Report

Results

1. How does the height of a hill affect the potential energy in an object like a car?

2. Was y[illegible]orrect or incorrect? Why?

3. If you used a larger car, [illegible]urther or less far? Explain.

4. If you were recruiting members for a bobsled team, would [illegible] the tryouts? Why or why not?

5. Why do you think it is important to have a hypothesis before doing a science experiment?

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Activity - Balloon Car

Research Question — What are we learning about?

We will be creating a car that is able to move without us pushing it. To do this, we will use the force of moving air. Our car's wheels will attach to a rotating axle.

Materials — What you will need for the experiment

- ❑ Plas[tic]
- ❑ F[our] with holes [in] that are large [enough] for [the axles] through
- ❑ 2 wooden [skewers] [cut] [in half] over the wid[th] [of the] bottle
- ❑ Balloon
- ❑ Two straws
- ❑ Tape
- ❑ Scissors







PREVIEW

Method — How you will [complete] the [experiment]

1) Cut one of the straws in half
2) Tape both pieces of the straw to one side of the [car]
3) Put the wooden skewers through the straws
4) Press each bottle cap onto the ends of the wooden skewers. [These] are your wheels and axles
5) Give your car a push to see if it will roll properly. If it gets stuck or if the wheels don't roll, make sure your axles are parallel to each other
6) Tape the neck of the balloon around one end of the other straw. Wrap the tape very tightly so the connection is airtight.
7) Cut a small hole in the top of the water bottle so that it is just big enough to push a straw through. Ask your teacher for help on this step!
8) Push the free end of the straw through the hole and out the mouth of the bottle
9) Tape the straw to the bottle so it is secured to the bottle
10) Blow up the balloon by blowing air into the straw. Keep your finger over the end of the straw until you are ready for the car to move!

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Diagram Draw a picture of your balloon car. Label the wheels, axles, and power source. Use arrows to show which way the wind is blowing.

Results ...ed with your car? Answer the questions below.

1) How did your ca... ?

2) How could you improve the design of your car s... ...r? Think about the following in your answer: weight, straw diam... ...alloon.

3) Newton's third law of motion states that for every action, there is an equal and opposite reaction. Why is this experiment an example of this law?

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Activity - Balloon Car #2

Research Question — What are we learning about?

In this experiment, we will be making a balloon car again, but this time with different materials. We will use wind power to propel our cars forward.

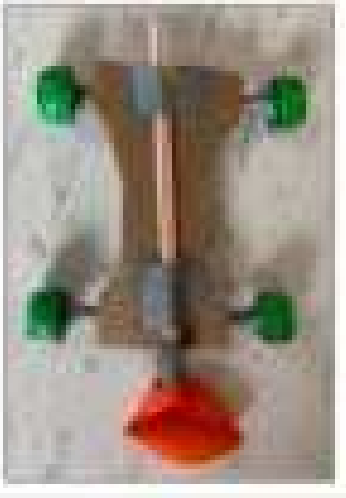
Materials — What you will need for the experiment

- ❑ Body (cardboard, foam, plastic. Make it a streamlined shape that uses as little material as possible, so it is lighter
- ❑ [illegible]. Should be large enough to keep the body of the car off the ground)
- ❑ 2 wooden skewers (long enough to span over the width of the car's body)
- ❑ Balloon
- ❑ Two straws
- ❑ Tape
- ❑ Scissors

Method — How to complete the experiment

1) Cut one of the straws in half
2) Tape both pieces of the straw to one side of the body of the car
3) Put the wooden skewers through the straws
4) Press each bottle cap onto the ends of the wooden skewers. These will be the wheels and axles
5) Tape the neck of the balloon around one end of the other straw. Wrap the tape very tightly so the connection is airtight
6) Tape the straw to the top of the body of the car. This should give the balloon enough room to fill up
7) Blow up the balloon by blowing air into the straw. Keep your finger over the end of the straw until you are ready for the car to move!





PREVIEW

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Name: _____ 80

Results What happened with your car? Answer the questions below.

1) How far did your car travel?

2) Did this car drive better than the other versions you made? Explain why or why not.

Compare Compare your car to another car in the class (best car)

		Other Car
Distance travelled		
Strengths - What was good about the car?		
Weaknesses - What could have been better?		

PREVIEW

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Name: _____ #1

Experiment - Wind Powered Turbine

Research Question — What are we learning about?

In this experiment, we will make a wind-powered turbine that moves a load. Our turbine will do work by using wind energy.

Materials — What you will need for the experiment

- ❑ Cards[illegible] construction paper
- ❑ Strip[illegible]
- ❑ [illegible]
- ❑ [illegible]
- ❑ Tape
- ❑ Large disp[illegible]
- ❑ Small disposable cup
- ❑ Large straw
- ❑ Small straw
- ❑ Some small weights (marbles)
- ❑ Ruler
- ❑ Pencil

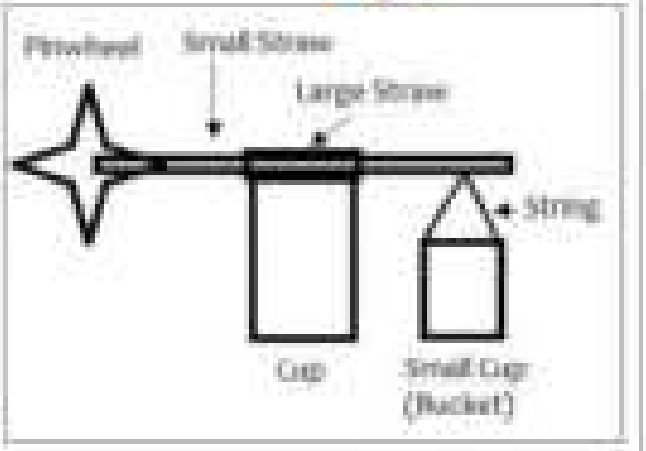
PREVIEW

Method — [illegible] complete the experiment

1) Cut out a square that is 17 [illegible] by 17
2) Put a dot in the centre of the squa[illegible]
3) Cut a slit diagonally from each cor[illegible] towards the [illegible]. Leave 4 cm between where you stop cuttin[illegible] the dot.
4) Make 5 holes using the end of your scissors. Be [illegible] Make one hole in the centre, and four holes at each [illegible] of your paper (as shown on the diagram).
5) Push the small straw through the centre of the hole
6) Bend each corner over the small straw



7) Use tape to secure the pinwheel to the straw
8) Cut your large straw to the length of the base of the large cup. Tape it to the top of the cup.
9) Put the pinwheel straw through the larger straw
10) Take your small disposable cup and cut two holes on opposite sides of the cup. Then tie a string through it, making it a bucket.
11) Tape the string to the straw.
12) Blow on the windmill and see if it will lift the cup. Add weights to the cup to see how strong the wind energy can be.



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Name: _____ #2

Observations | What happened?

1) Were you able to move the load using wind? Explain

2) Was this model able to move heavy or light loads? Explain why

Results | Answer the questions below

1) How is this model similar to a wind turbine?

2) If you don't blow on the pinwheel, does it move? How is this similar to a wind turbine is reliant on the movement of air?

3) Why do you think wind farms are built near large bodies of water? Why aren't they built behind buildings?

PREVIEW

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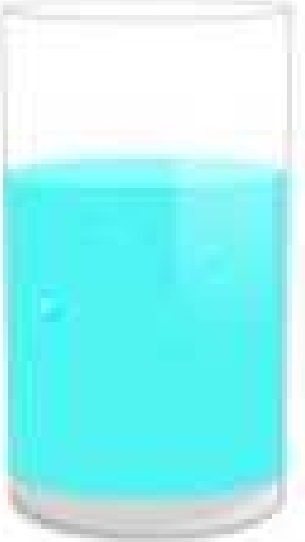
Thermal Energy Experiment

Research Question — What are we learning about?

Atoms and molecules act differently when they are warm, cold, or room temperature. But how do we know? Complete this lab to find out!

Materials — What you will need for the experiment

1. 3 cups (clear cups are the best, or you can
2. Hot water
3. Cold water
4. Room temperature
5. Masking tape
6. Food colouring (any colour)



PREVIEW

Method — How you will

1) Fill the three cups with the cold, warm, and room temperature water
2) Label each cup with the appropriate label (warm, cold, room temperature)
3) When you are ready to observe, put 5 drops of food colouring into each cup of water.
4) Watch closely what happens to the food colouring. Does the food colouring travel faster in warm, cold, or room temperature?
5) Record your results and check your hypothesis. Fill in your answers below.





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Name: _____ 8A

Thermal Energy Experiment

Hypothesis Which cup of water will the colouring move the fastest?

Observa What happened?

What h ened? D colouring move faster in any of the cups?

Results What happened with yo Ans questions below.

1) Why do you think the food colouring moved faster wat lowest in the cold water?

2) If you mixed chocolate syrup in hot and cold water, which would the syrup mix better in?

PREVIEW

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Insulation Lab Report

Information | What is this lab about?

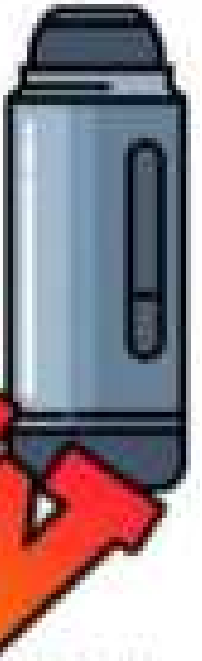
Heating and cooling are two of the main uses of energy in the world. We heat and cool our homes and our food all the time. Insulation is important in limiting the amount of heating and cooling we need to do as it allows objects to retain their temperatu

Som ials are better at insulating than others. Today we will test some different ility to insulate.

Rese uestion

Which of the fol rials is the best insulator: sand, shredded paper/newspaper, c Wool d tin foil?

PREVIEW



Materials

1. Sand
2. Paper/Newspaper
3. Cotton Sock
4. Wool Sock
5. Tin Foil
6. Cups full of warm water
7. Thermometer

Method

1. Wrap the insulating materials around each cup. One materia
2. Fill the cups with warm water.
3. Use the thermometer to measure the temperature of each cup. Record it below.
4. Wait 1 hour and test the temperatures again. Record the temperatures below.
5. Fill in the table to figure out which water stayed the warmest.

Hypothesis – Which insulating material will keep the water the warmest? Why?

_____

_____

_____

Name: _____ 86

Insulation Lab Report - Questions

Results What happened during the experiment?

Insulating Material	Starting Temperature	Temperature After 1 Hour	Difference in Temperature
Sand			
Shredded paper			
Cotton S			
Wool			
Tin Foil			

PREVIEW

Questions

1. Which material is the w[illegible]? H[illegible] know based on this experiment?

2. Was your hypothesis correct or incorrect? Why?

3. If you were a pizza delivery person, what material might you use to [illegible]za warm?

4. What do you think would happen if you did the same experiment with an ice cube in the cups instead of warm water? Which insulator would keep the ice frozen the longest?

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Name: _____ 90

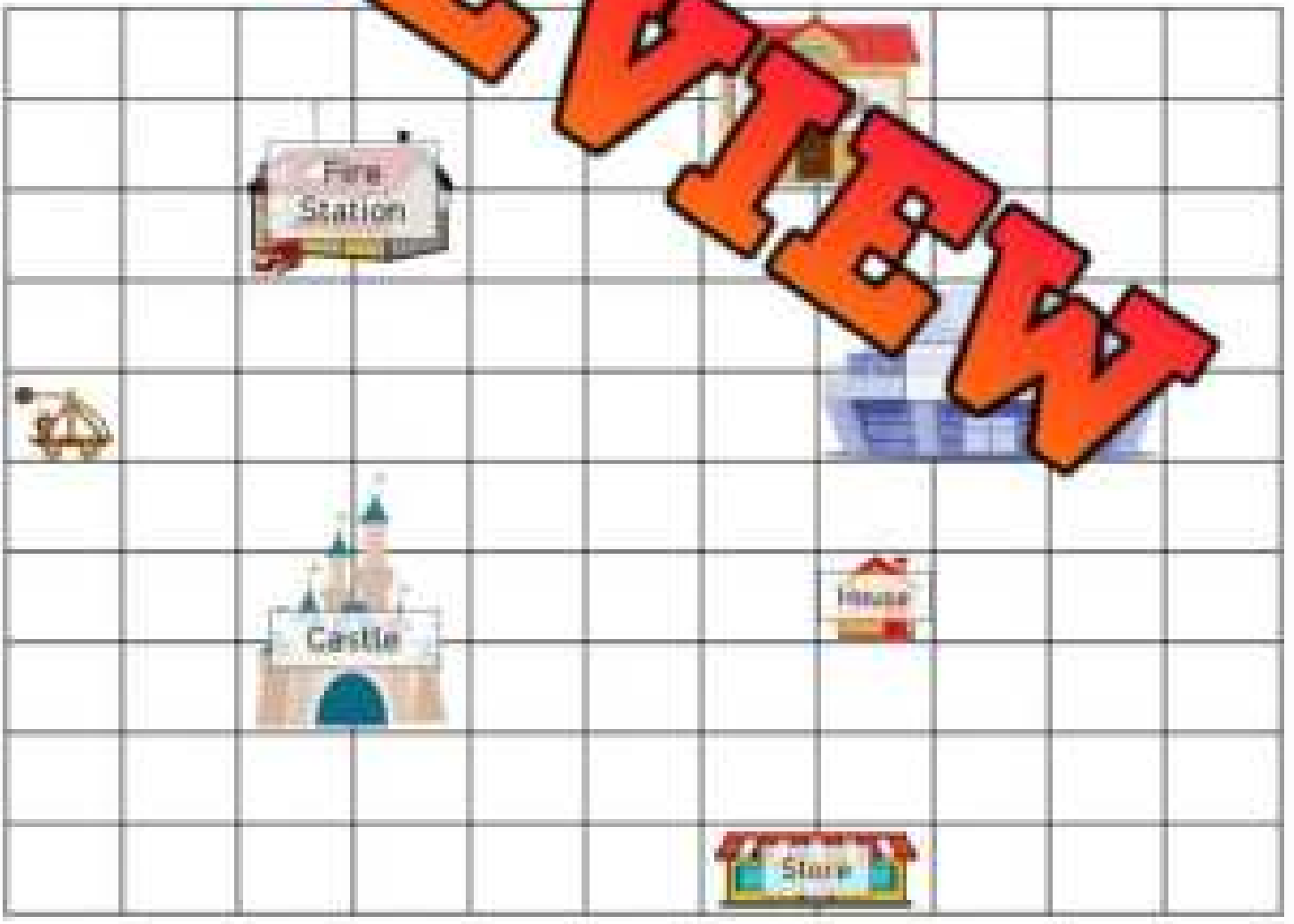
Catapult Coding Activity

Directions Follow the code to find out which buildings the catapult smashed down

1)	Throw rock up 3 and forwards 7
2)	Throw rock down 1 and forwards 3
3)	Throw rock up 4 and forwards 6
4)	Throw rock up 1 and forwards 7
5)	Throw rock down 2 and forwards 2
6)	Throw rock up 3 and forwards 6
7)	Throw rock down 1 and forwards 7

9)	Throw rock down 2 and forwards 2
10)	Throw rock down 3 and forwards 3
11)	Throw rock down 2 and forwards 7
12)	Throw rock up 4 and forwards 7
13)	Throw rock down 5 and forwards 6
14)	Throw rock down 3 and forwards 3

PREVIEW



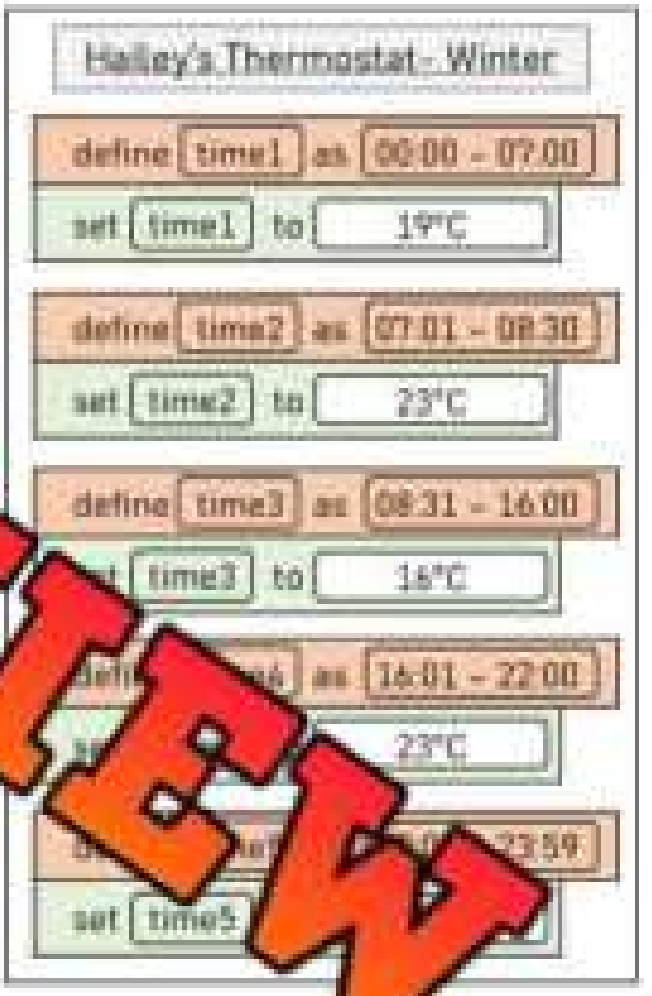
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Name: _____ 92

Reading Code - Hailey's Thermostat

Directions Read Hailey's thermostat program and write what temperature it is based on the time

	Time	Temperature
1)	00 am	
2)		
3)	5:00	
4)	10:	
5)	1:00 am	
6)	6:00 pm	
7)	2:30 pm	
8)	4:00 am	
9)	12:00 pm	
10)	8:31 am	



PREVIEW

Results What do you think of Hailey's thermostat program? What would you change?

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Workbook Preview

Grade 5 Science Unit
Forces Acting on Structures

	Curriculum Expectations	Pages
D1.1	analyse the effects of forces from natural phenomena on structures in natural and built environments	34–43, 51–53, 61–62, 87–93
D1.2	assess various ways in which humans mitigate impacts of forces from natural phenomena on structures in urban, rural, and remote communities	32–33, 44–45, 48–53, 61–62
D2.1		6, 63–, 78–, 107–
D2.2		2, 24–, 81–86
D2.3	describe forces resulting from natural phenomena that can have severe consequences for human-built structures, and identify structural features and materials that can allow such structures to withstand these forces	8–13, 21–22, 24–28, 31–33, 44–45, 54, 57–60, 81–96
D2.4	describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces	117–125
D2.5	describe ways in which protective equipment helps to protect humans from potentially harmful effects of forces	110–114

Preview of 90 pages from this product that contains 186 pages total.

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Grade 5 Science Unit

Strand A - STEM Investigation and Communication Skills

	Curriculum Expectations	Pages
A1.1	use a scientific research process and associated skills to conduct investigations	104-106
A1.2	use a scientific experimentation process and associated skills to conduct investigations	23, 55-56, 68-69, 76-77
A1.3	use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	46-47, 97-100, 102-106
A1.4	follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials	23, 46-47, 55-56, 68-69, 76-77, 97-100, 102-106
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	23, 46-47, 55-56, 68-69, 76-77, 97-100, 102-106
A2.1	write and execute code in investigations and when modelling concepts, with a focus on using different methods to store and process data for a variety of purposes	29-30, 115-116, 126, 128-130
A2.2	identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades	29-30, 115-116, 126, 129-130
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	29-30, 126-127
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	29-30, 126-127
A3.3	analyse contributions to science and technology from various communities	29-30, 126-127

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NAME: _____

FORCES ACTING ON STRUCTURES



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Name: _____ 1.1

What are Structures?

What is a Structure?

A **structure** is a supporting framework that holds a load and has a shape, size, and a purpose. That means that you, your desk, chair, and pencil are all structures.



Shapes and Sizes of Structures

Structures come in all shapes and sizes. The CN Tower is a ...cture that is 553 m tall. It is one of the tallest structures ...e world. The CN Tower was built tall so it could send ...adio waves across the city without being blocked by other ...gs.

...shoe is a structure. A shoe is built with a shape that fi... shape ... You can buy shoes that are extra wide, ... r s... can even buy shoes that have a ... to fit your toes!

PREVIEW

Purpose of a Structure

All structures are built for a purpose. They are designed to help people. Your shoe's purpose is to protect your foot from sharp objects on the ground and to keep your feet warm.

The CN Tower's purpose is to send radio waves across the city. It is also a tourist attraction that brings people to Toronto to visit.

When engineers design a structure, they have to think of the purpose of the structure. No engineer would design a pillow using barb wire! They think about the purpose of the structure and then design it accordingly.

Name: _____ 12

Questions Answer the questions below using evidence from the text.

1) What is a structure?

2) Name [illegible]re in your class. What is the purpose of it?

PREVIEW

Questioning Write 3 q[illegible]ou[illegible]structures.

1)	
2)	
3)	

True or False Circle whether the statement is true or false.

1) We are structures.	True	False
2) Heat is a structure.	True	False
3) The CN Tower is one of the tallest structures in the world.	True	False
4) A structure must have a purpose.	True	False
5) A dream you had last night about structures is a structure.	True	False

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the blanks using the word bank.

Structure	Purpose	Mark
CN Tower	Shoe	

1) A supporting framework that holds a load is called _____

2) The _____ is designed to protect your foot from sharp objects and keep your feet warm.

3) The _____ was built to send radio waves across the city.

4) Engineers first think about the _____ of a structure before they design it.

Name: _____

Fill in the blanks using the word bank.

Structure	Purpose	Mark
CN Tower	Shoe	

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Structure	Purpose	Mark
CN Tower	Shoe	

1) A supporting framework that holds a load is called _____

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3) The _____ was built to send radio waves across the city.

4) Engineers first think about the _____ of a structure before they design it.

PREVIEW

Name: _____ 14

External Forces – Dead and Live Loads

External Forces – Dead Loads and Live Loads

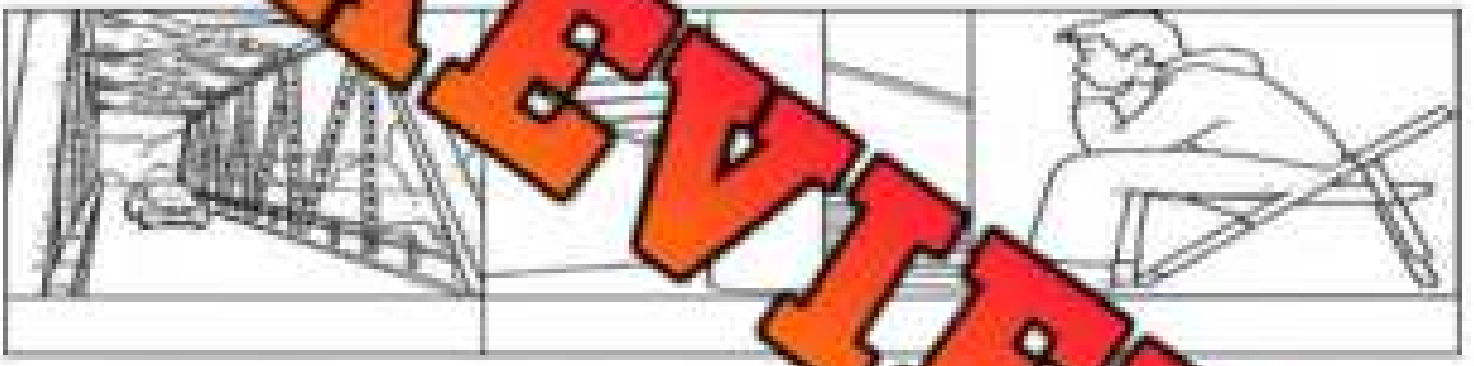
All structures need to support a load. The seat you are sitting in needs to support the load of a person sitting in it. There are two types of loads, dead loads, and live loads. A **Dead load** is the effect of gravity acting on the structure. It is the weight of the structure itself that the structure must be able to support.

A **Live load** is a force that moves or changes while acting on a structure. Wind is a live load because the force of the wind is constantly changing.

The [illegible] is the combination of the dead load and live load that the structure must be [illegible] load.

PREVIEW

Live or Dead Loads – Look at the example of loads below. Label them live or dead loads.



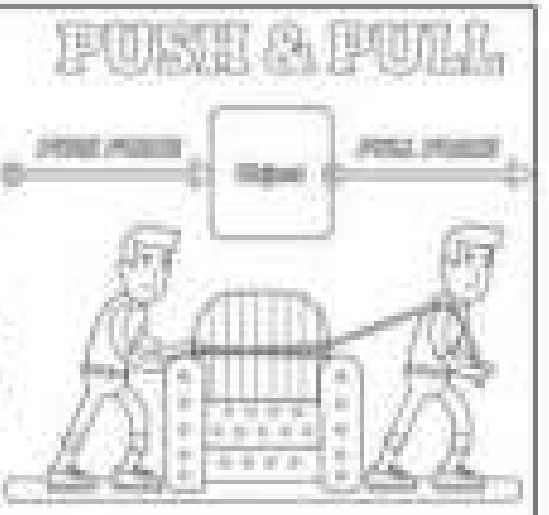




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Name: _____ 15

Forces – Push and Pull



What is a Force

A **force** is any push or pull that causes an object to move. Think about it, if an object moves, a force must have acted on the object.

A friend may have pushed a book across a desk to slide it, or maybe they pulled a pencil out of your

PREVIEW

Pushing Force

A **push force** happens when a force moves an object away. Examples of pushing forces include:

- Kicking a soccer ball
- Pushing a cart in a grocery store
- Plugging something into a wall

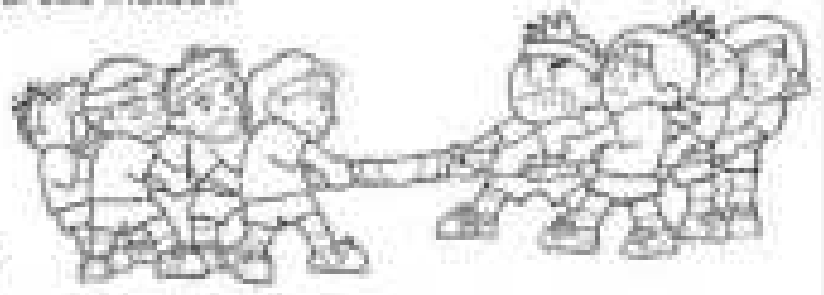


In the picture, the child on this swing is the object pushing from the man. The man is pushing the child away using a pushing force. If he doesn't apply enough pushing force, the child won't have much fun, as they will

Pulling Force

A **pulling force** happens when a force brings an object closer. It is the opposite of a pushing force. Examples of pulling forces include:

- Pulling the curtains closed
- Pulling or dragging your chair
- Opening a door



A fun game of tug of war is an example of two teams using pulling forces. They are each trying to pull the other team closer to them. The team that uses the most pulling force will win.

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Name: _____ 16

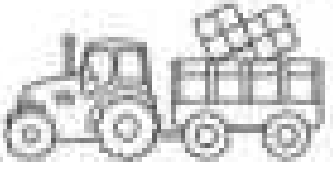
Questions Answer the questions below using evidence from the text.

1) What is a force?

2) What [illegible] working during a game of tug-of-war?

PREVIEW

Push or Pull Does the pi[illegible]ow[illegible] force?

			
Push Pull	Push Pull	Push Pull	Pull

Examples Write 2 examples of each, a push and pull force.

Push Force	
Pull Force	

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Name: _____ L7

Contact and Non-Contact Forces

External Forces

An **external force** acts on structures from the outside. External forces are a result of the environment pushing or pulling the structure. This pushing or pulling force can be from contact forces, or non-contact forces.



Non-Co

A **no** ce fo e an object without touch e non-contact forces are grav for tic force, and magnetic

When an object move ut being touched, a non-contact force has acted on the object.

Gravity is the most common non-contact force that is acting on all of us right now! **Gravity** is the pulling force that keeps on **magnet** can also push or pull an object towards it or away fro se the magnetic field. Lastly, electric forces are non-contact. An example is static electricity that might move your hair on a trampoline without touching it!

Contact Forces

A **contact force** is any force that uses contact to move an object. If you see something move, was it touched by something else? Perhaps it was the wind moving a tree branch, or someone kicking a soccer ball. Either way, these are contact forces as something touched the object to make it move.

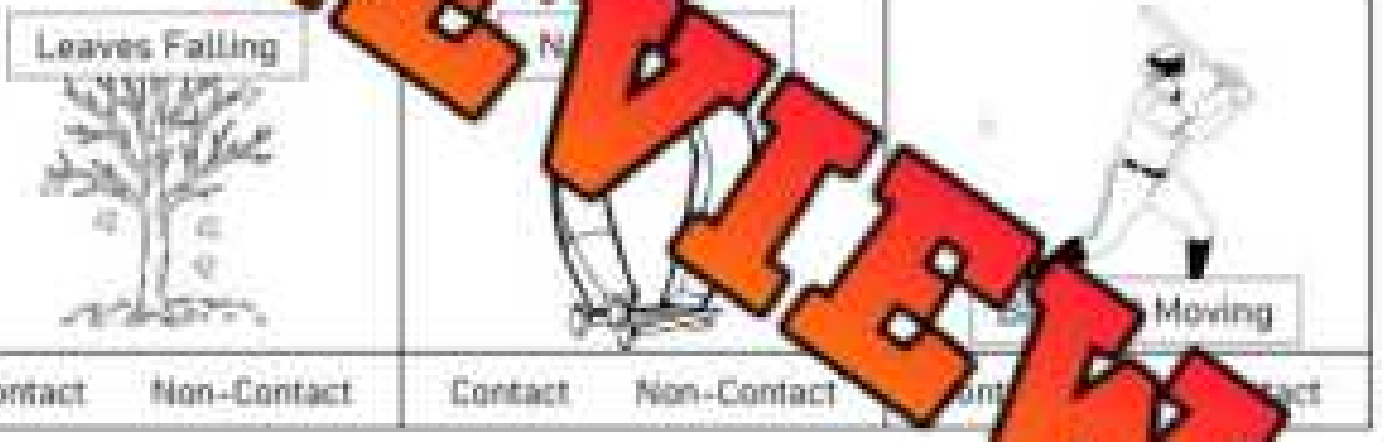
PREVIEW

Name: _____ 18

Definition What do the terms below mean?

Non-Contact Force	
Contact Force	

Contact or Non ... picture show a contact or non-contact force?



Contact Non-Contact Contact Non-Contact ...ct

Making Connections Give an example of when you have seen th... below.

Non-Contact Force	
Contact Force	

PREVIEW

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Name: _____ 19

Experiment – Egg Drop

Research Question

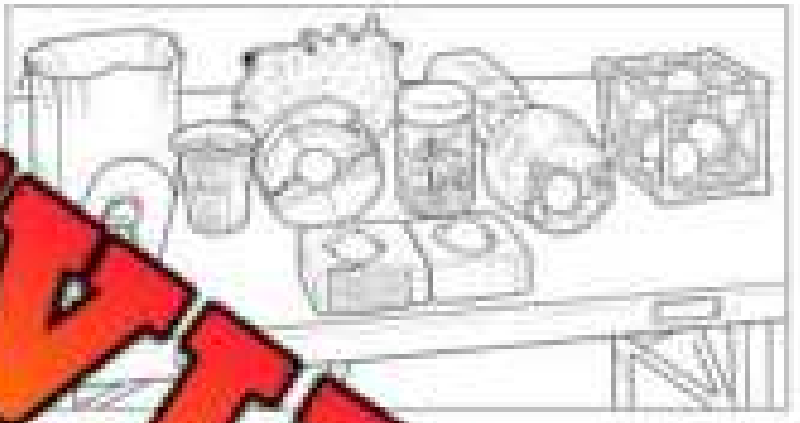
What are we learning about?

The egg drop experiment is a classic science experiment that demonstrates the principles of physics, particularly the concepts of force and gravity. The goal of the experiment is to create a contraption that will protect an egg from breaking when dropped from a certain height.

Materials

What will you need for the experiment?

- ❑ [illegible]
- ❑ A variety of [illegible] straws, paper, paper, cardboard, string, [illegible] glue, etc.
- ❑ A high surface such as a [illegible] a ladder, or bleachers to drop the egg from.



PREVIEW

Method

How will you complete the [illegible]

1) Gather materials: Provide each group with a raw egg and [illegible] materials they can use to create their egg-protecting contraption.

2) Plan and design: Allow each group to plan and design their contraption. They can use any combination of the materials they were provided with. They can [illegible] egg drop experiment online to find ideas for creative contraptions.

3) Build: Once the group has a plan, they can begin to build their contraption. They should be careful to use the materials to protect the egg, not to overbuild or over-weight the egg.

4) The Final Drop: After the group is satisfied that their contraption is successful, each group can take turns dropping their egg from the highest point (stairway, ladder, or bleachers) to test their contraption.

5) Observation and conclusion: Observe the results, and examine how their contraption worked, what materials protected the egg best, and how they could improve their design.

Name: _____ 20

Plan Answer the questions below to plan your egg holder.

1) What materials will you use to support your egg?

2) Draw a diagram of your egg holder. Label the materials.

PREVIEW

Results What happened with your egg? Answer the questions.

1) What was pulling the egg down to the ground? Was the force strong at different heights?

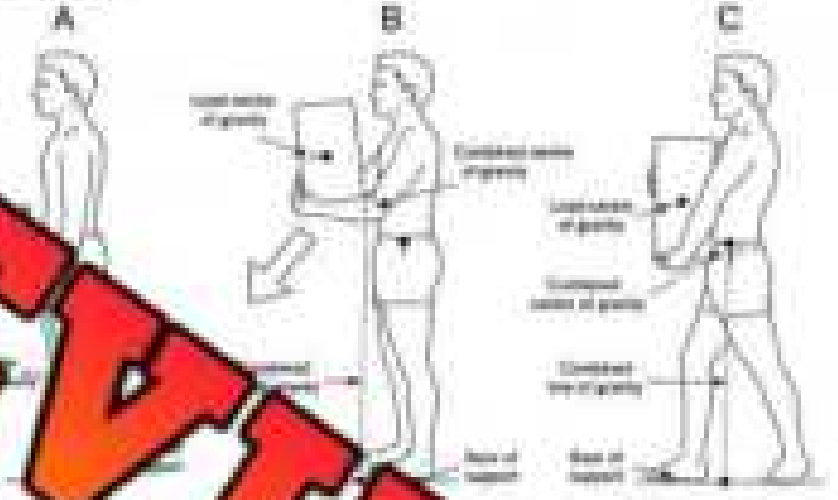
2) If you could make the egg holder again, what would you do differently? Explain.

Name: _____ 21

Centre of Gravity

Gravity

What goes up must come down. That is true because of gravity, the force that pulls everything towards the Earth's centre. Sometimes gravity can make structures turn or topple over. Tall buildings will topple over if they are not stable because gravity is pulling the buildi towards the Earth's centre.



Centr

The tal bui re
difficult it is h d m
it stable and not fa
Builders understand an
scientific principle called cen
gravity. The

Centre of gravity (CG) is an imaginary point on a ob e w weight of the structure is evenly dispersed around it. This mea th ght on all sides – above, below, in front, behind, and on both sides.

A ball has a clear centre of gravity with it being right e . the centre of gravity is a bit more complicated. It is slightly above o s have more weight on the top half of our body than the bottom half.

Tall structures will topple over easier because their centre of gravity is higher. If you build a tower of blocks with a stack of single blocks on top of each other, it will eventually fall. The centre of gravity is in the centre of the tower. As you build the tower higher, the CG becomes higher as well, making it more unstable. But if you make the base wider, the centre of gravity will be lower because there is more weight on the bottom. The tower will be more stable if the bottom half of the tower has more blocks.

When engineers and architects design structures, they must understand the CG of the structure. Keeping the centre of gravity as low as possible will increase its stability.

PREVIEW

Name: _____ 22

Questions Answer the questions below using evidence from the text.

1) What does centre of gravity mean? Why is it important?

2) If you [illegible] designing a structure, how could you use your understanding of CG to ensur[illegible]e?

PREVIEW

Diagram Draw a diag[illegible]ow[illegible] where its centre of gravity is.

[illegible]describ[illegible]the CG is and how you kept [illegible]

True or False Circle whether the statement is true or false.

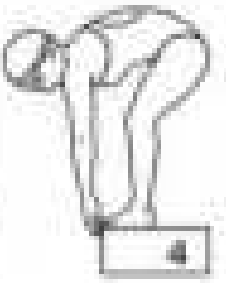
1) A structure's CG is always in the middle of the structure.	True	False
2) A structure's CG is where there is equal weight surrounding it.	True	False
3) The lower the CG, the more stable a structure is.	True	False
4) In football you have more stability/balance when you stand straight up.	True	False
5) A tower with a wider base has a lower CG.	True	False

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Name: _____ 23

Centre of Gravity – Experiments

We can demonstrate the importance of the concept of centre of gravity by performing the activities below. Follow the instructions and answer the questions.



4

Activities Follow the instructions and answer the questions.

1) Stand [illegible] back and feet against a wall. Have someone place a pencil at your feet. Try to [illegible] forward without moving your feet.

What [illegible] forward? Why did that happen?

2) Stand against a wall sideways with your [illegible] the wall, with nothing to hold on to. Try to lift your other leg straight out [illegible]

Were you able to do it? Why not? Why is this impo[illegible]?

3) Get on all fours (knees and hands on the ground). Now try to put your hands behind your back (do not shoot hips back, try to keep them above your knees).

Did you fall down? Explain why or why not. Also, ask around the class as some people (females) might be able to do this easier as males tend to have a higher CG than females.

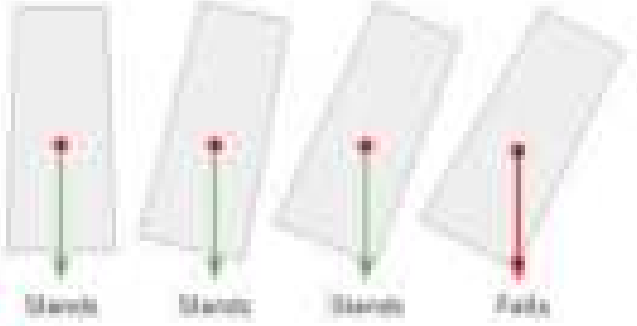
PREVIEW

Name: _____ 24

Gravity Acting on Structures

Gravitational Force

Gravity is a non-contact force that attracts matter towards the centre of the earth. Without gravity pulling us, we would fall right off the Earth's surface and float away! Gravity is an external force that structures have to withstand in order to stay strong and



Gravity and Structures

A structure is stable when the centre of gravity is above its base. If a structure is unstable, then we draw a line from the centre of gravity straight down to the ground, the base of the structure of the building.

A well-built structure will have a strong and wide base because this lowers the centre of gravity. This means that the strongest structures have a wide base and a narrower top part of the structure.



The Great Pyramid of Giza

Engineers have learned a lot from a structure that was built almost 5,000 years ago. The Great Pyramid of Giza is still standing, even though it was built in 2550 B.C. in Egypt. The pyramids have withstood the strongest external forces, including gravity.

The structure is a pyramid, meaning it has a very wide base compared to its top. The low centre of gravity means gravity's external force will not bring it down.

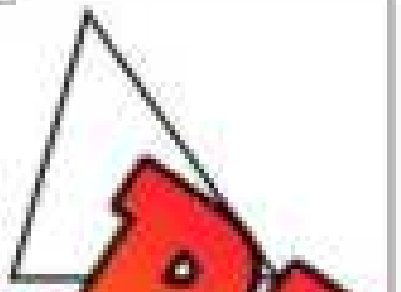
PREVIEW

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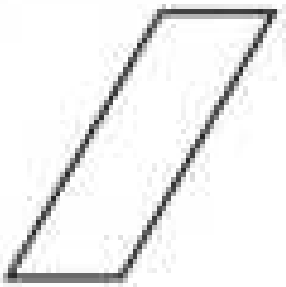
Name: _____ 25

Explain Draw a dot where the centre of gravity is on the shape. Then draw a line straight down. Is this shape stable? Will gravity bring it down?

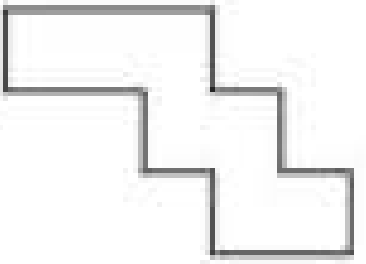
1)



2)



3)



PREVIEW

Questions Use information from the text to support your answer.

1) How can you make sure a structure you build will withstand external force of gravity?

2) Why is the Pyramid of Giza still standing? How long has it withstood external forces for?

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Match each internal force to its correct definition.

Gravity	❑ A structure has a wide base and is less likely to tip over.
Centre of Gravity	❑ The imaginary line that goes straight down from the centre of gravity to the ground.
Wide Base	❑ The point where a structure's weight is balanced.
Line of Gravity	❑ A force that pulls objects toward the centre of the Earth.
Stable Structure	❑ A structure whose line of gravity stays inside its base.

Name: _____ Mark

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Name: _____ Mark

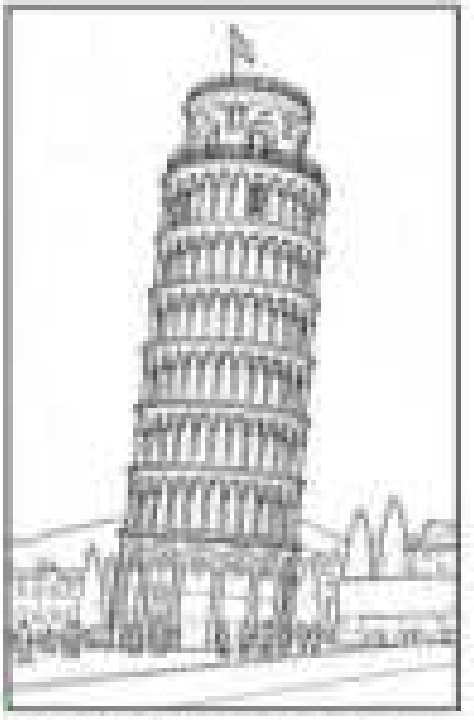
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PREVIEW

Name: _____ 27

Leaning Tower of Pisa – Centre of Gravity



History of the Leaning Tower of Pisa

The Leaning Tower of Pisa has been leaning for over 800 years. It was built in 1173, but because of several interruptions, it wasn't completed until the mid-1300s. It was built as a belltower for the church nearby.

Why Does the Tower of Pisa Lean?

The soft [illegible] filled the soil, which destabilized the to[illegible] the soil underneath is mad[illegible] shells, which creates too soft [illegible] a heavy structure. The settling o[illegible] wa[illegible], causing the one side of the b[illegible] to c[illegible] the soil more than the other[illegible].

For the last 800 y[illegible] tower[illegible] not only leaning, but the lean ha[illegible] as[illegible] two millimetres per year. Today, the Lean[illegible] more than five metres off perpendicular (straight up).

While making the tower, the architect a[illegible] the lean after they built the 3rd story out of 8 stories total. They [illegible] slightly taller on the short side of the tower in an attempt to co[illegible] air plan backfired, as the weight of the extra floors caused [illegible] further and lean more.

Leaning Tower of Pisa – Centre of Gravity

In 1990, the Tower reached an inclination of 5 degrees, which becam[illegible] to the dangerous limit of the CG falling outside of the outer edge of the bu[illegible].

A massive engineering project was performed to return the Tower to a 4-degree inclination. They held up the Tower using cables while they dug under the Tower's north side – the opposite side it was leaning. As they dug, the tower began shifting into the hole they dug. This brought the tower back one degree, so that its centre of gravity stayed inside its base.

Future of the Tower

The Tower needs constant monitoring, to ensure it doesn't fall. It will likely need more corrections, like the one described above. Also, if a massive storm, earthquake or other natural disaster strikes, it could send the Tower to the ground. Luckily, Tuscany hasn't experienced any major natural disasters in the last 800 years.

PREVIEW

Name: _____ 28

Questions Answer the questions below using evidence from the text.

1) Why is the Leaning Tower of Pisa leaning?

2) Will th[illegible]ver fall? Explain how they fixed the lean.

PREVIEW

Questioning Write 3 ques[illegible]u [illegible]e Leaning Tower of Pisa.

1)	
2)	
3)	

True or False Circle whether the statement is true or false.

1) The Leaning Tower of Pisa has not fallen in 800 years.	True	False
2) The Tower is just leaning, not falling.	True	False
3) The CG on the Tower was close to being outside of its edge in the 1990s.	True	False
4) The lean was not noticed until after the Tower was built.	True	False
5) The soft soil of clay, sand, and shells led to the Tower leaning.	True	False

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Name: _____ 29

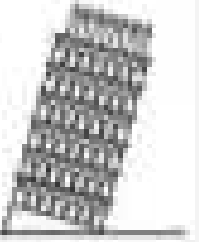
Coding – Leaning Tower of Pisa

Horizontal Displacement Sensors

Displacement is how far something has moved from its original position. Horizontal means side-to-side. So, **horizontal displacement sensors** measure how far something has moved side-to-side.

The Leaning Tower of Pisa has a horizontal displacement of 4.5 metres. The sensors in the Tower are always monitored because it is a historic building that no one wants to see fall. The Tower's lean increases over 1 mm each year.

The news is that computer code has been written to tell engineers if the lean is too much for the Tower to stay stable. Engineers know if it leans too much it could fall. Check out a sample code below.



Did the building move over 5 m?

IF the building moved over 5 m

THEN Display message, "Danger"

ELSE

Display message, "Safe"

PREVIEW

Directions Answer the questions using information from the text.

1) What do horizontal displacement sensors do?

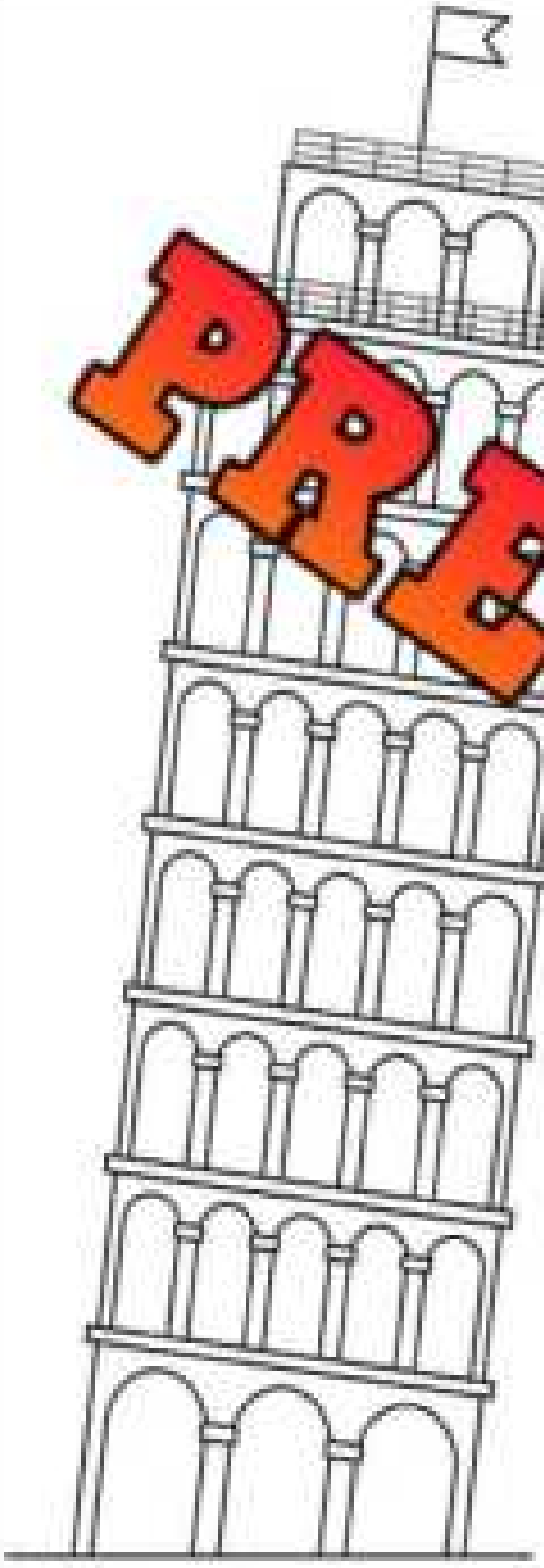
2) How are sensors being used to make sure the Leaning Tower of Pisa doesn't fall down?

3) Why is coding important in keeping structures strong and stable?

Name: _____ 30

Curriculum Connection
AC1, AC2, AC3, AC4, AC5

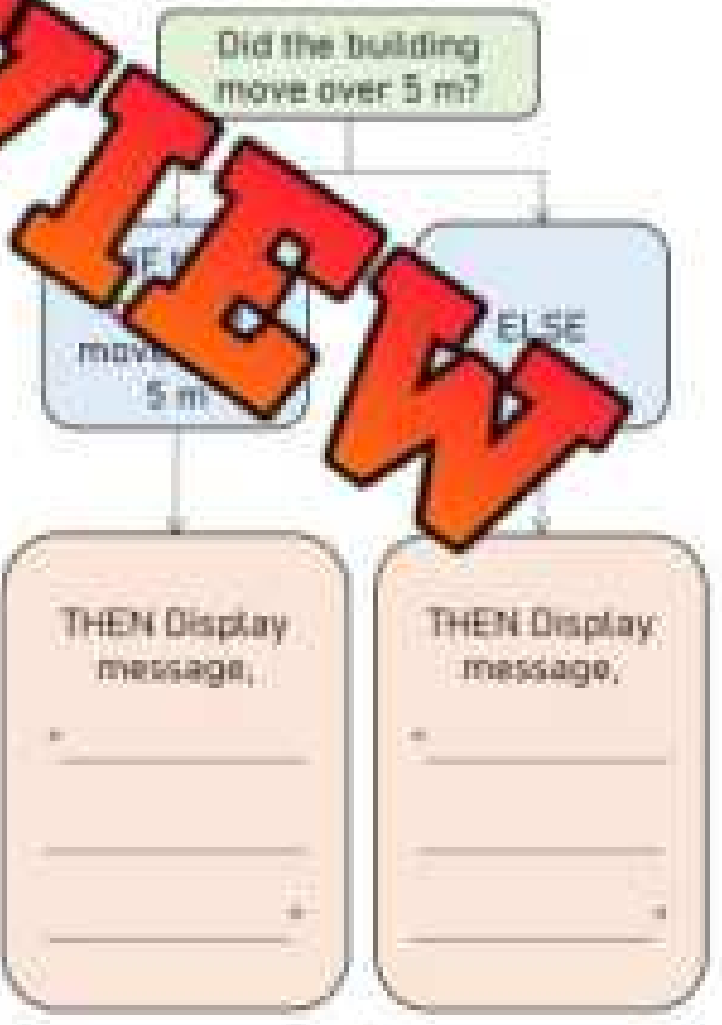
Colour Colour the Leaning Tower of Pisa below.



Part 2 Follow the instructions below

1) Where would you put the horizontal displacement sensors? Draw 4 of them on the Leaning Tower of Pisa.

2) Write your IF/ELSE statements below.



PREVIEW

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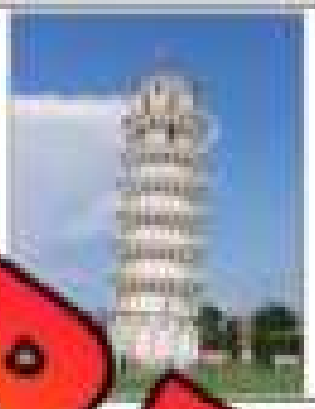
Name: _____ 31

Centre of Gravity – Which is More Stable?

Evaluate Circle the structure that is more stable. Explain why below.

1)



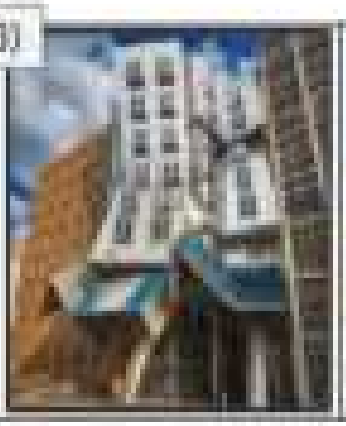


2)





3)





4)





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External Forces – Tropical Storms

What is a Tropical Storm

A **tropical storm** is a change in atmospheric conditions that create strong winds, heavy rain or snow and sometimes thunder and lightning. Tropical storms form in the large oceans and then move towards land, often causing massive destruction.

Tropical storms often bring massive external forces that destroy structures.

Types of Tropical Storms

There are [illegible] main types of coastal or tropical storms – hurricanes, cyclones, and typhoons. [illegible]storms are all the same, as they all form over warm ocean waters, rotate [illegible] air pressure, and have wind speeds of over 119 km per hour. [illegible] based on where the storm happens.

Hurricane

A hurricane [illegible] the [illegible]lantic Ocean and Northeast Pacific.

Cyclone

A cyclone will form over [illegible] Pac[illegible]dian Ocean.

Typhoon

A typhoon is formed over the Northwest Pacific Ocean.



How Coastal Storms Form

A coastal or tropical storm will form in the following steps:

1) The water needs to be warm, at least 26.5 degrees Celsius. This is why tropical storms begin in warmer areas near the equator.
2) When wind blows across the warm ocean water, the warm, moist air rises rapidly
3) As it rises, the moist air cools and the water in it condenses, forming large storm clouds
4) The cooling water also releases a lot of heat. This heat transfer creates enough energy to cause strong winds
5) The strong winds push even more air up from the ocean's surface causing more clouds and even more wind
6) The rapidly moving air creates an area of low air pressure in the centre. This middle part of the storm is called the eye of the storm. It is calm, but around the eye has the strongest, most devastating winds.

PREVIEW

Name: _____ 37

Questions Answer the questions below using evidence from the text.

1) What is a coastal storm? What wind speeds need to be exceeded to be considered a coastal or tropical storm?

2) What is the difference between a hurricane, cyclone, and typhoon?

PREVIEW

Label Fill in the blanks to ... of coastal storms form.



Ordering Order the steps from first to last in the development of a coastal storm.

	The eye of the storm is formed.
	The moist air cools, creating large storm clouds.
	Water is warmed to a minimum of 26.5 degrees Celsius.
	Strong winds are created by warm and cool air moving causing changes in air pressure.
	Wind blows across the warm ocean water causing the moist air to rise.

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Explain how tropical storms form and why they can damage structures.

Name: _____ Mark

Explain how tropical storms form and why they can damage structures.

Name: _____ Mark

Explain how tropical storms form and why they can damage structures.

Name: _____ Mark

Explain how tropical storms form and why they can damage structures.

PREVIEW

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Name: _____ 39

Drawing Contest – Design the Strongest Structure

Objective What are we learning about?

To apply knowledge of internal and external forces by designing a structure that can withstand natural forces while explaining the engineering features used.

Materials What will you need for the activity?

- [illegible] sheet per student)
- [illegible] coloured pencils
- Reference [illegible] posters about structures
- A handout of [illegible] components (to help students choose [illegible] structure)



Instructions How will you complete the activity?

1) Explain to the students that they will be challenged to design a strong structure that can withstand one or more [illegible] strong wind, earthquakes, floods, heavy snow, or storms.
2) Provide each student with a sheet of drawing paper and access to drawing materials.
3) Allow students to select from a handout of structures to draw (e.g., a bridge, school, tower, dam, lighthouse, playground, house, or community centre). They should also choose the natural force their structure is designed to resist.
4) Encourage students to think carefully about the engineering features that would make their structure stronger. They should include details such as strong foundations, support beams, trusses, deep supports, sloped roofs, flexible materials, or other design features that help the structure withstand the chosen natural force.
5) Give students ample time to complete their drawings. They can use reference materials for ideas and accuracy.
6) Once everyone is finished, have a gallery walk where students can view each other's work and discuss the different features they included.

PREVIEW

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Handout Below are design ideas for different structures.

Bridge		Natural Force to Resist
Materials	**Helpful Design Features**	
Steel	Triangular trusses	Strong Wind
Reinfo ncrete	Thick support beams	Flooding
	Deep foundations	Earthquake
Ston	Flexible joints	Heavy Traffic

		Natural Force to Resist
Materials	**el**	
Brick	Sl ed ro	Heavy Snow
Concrete	Reinforced s	g Wind
Wood	Deep foundation	quake
Steel	Strong roof supports	

Tower		Natural Force to Resist
Materials	**Helpful Design Features**	
Steel	Wide base	Strong Wind
Reinforced concrete	Cross-bracing	Earthquake
Concrete	Flexible frame	Lightning
Metal	Deep foundation	Storms

PREVIEW

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Name: _____ 41

Handout Below are design ideas for different structures.

Dam		Natural Force to Resist
Materials	**Helpful Design Features**	
Concrete	Thick walls	Water Pressure
Reinfo ncrete	Wide base	Flooding
	Spillway	Heavy Rain
Steel	Strong supports	Ice Pressure

		Natural Force to Resist
Materials		
Reinforced concrete	Wide ular	Strong Wind
Stone	Thick w	n Waves
Steel	Deep foundatio	
Brick	Reinforced windows	

Playground		Natural Force to Resist
Materials	**Helpful Design Features**	
Pressure-treated wood	Strong support posts	Strong Wind
Steel	Deep footings	Heavy Use
Recycled plastic	Cross-bracing	Rain
Rubber	Shock-absorbing surface	Falls

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Name: _____ 42

Draw Draw your chosen structure.

Structure Name: _____

Which natural force does your structure resist? _____



Name: _____ 43

Reflection Answer the questions below

1) Which natural force did you design your structure to withstand? Why?

2) What [illegible]ture do you think made your structure the strongest?

3) How did what you learned [illegible] design your structure?

4) What idea did you see in another student's drawing that you [illegible]

5) If you could improve your design, what would you change and why?

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Structures Built to Withstand External Forces

Structures Built to Withstand External Forces

Depending on where you live, the structures around you will experience a variety of external forces from weather phenomenon. Strong winds and rain from powerful storms will destroy structures that have not been built to handle these forces.

Rainfall and Flooding

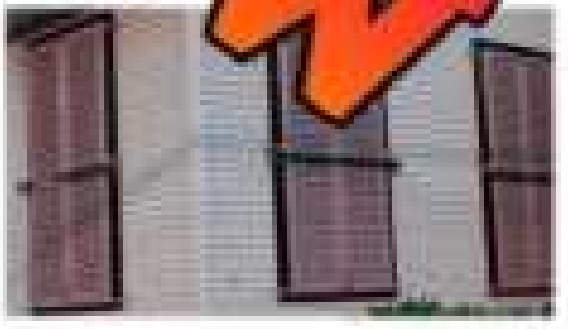
When building a home that needs to handle a lot of rainfall, the home builder will use eaves... to funnel the rainwater away from the house. Eavestroughs are like can... sides of the roof that wrap around the house. When rainwater hits the ro... into the eavestroughs and ... out which sends the wa... away ...us...



Floodi... ...e gets a lot of rainfall, ...ground ... absorb the water anymore ... coastal regions when ... ...rel... and overflow onto the land ... bu... some engineers will build floating ho... sit on top of the water. They will als... hous... elevated on pillars, so the houses aren't affected by the flooding und... ...ch.

Hurricane

A **hurricane** brings strong tornado winds that d... ...t built strong enough. The heavy rains cause flooding that ... ...ts ... Our homes need to be built out of strong materials in order to have ... ...an hurricane.



Concrete is one of the strongest materials that should be used in building a home. Homes built out of concrete have a much better chance at withstanding the forces of a hurricane when compared to those built with wood, brick, or paneling. Steel is another great material that is built to last.

Builders should also use storm windows and hurricane shutters. When a window breaks, the wind and storm can now enter the house and destroy everything inside. Windows are the weakest point because they are made of glass versus the rest of the house being made from a stronger material like wood or steel. A broken window will often allow flooding to enter the home which destroys possessions.

PREVIEW

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Questions Answer the questions below using evidence from the text.

1) How can you build a structure to handle rain and flooding?

2) How should a structure be built in a region that experiences hurricanes?

PREVIEW

Visualizing Draw what you pictured in your mind as you were reading. Explain the picture.

True or False Circle whether the statement is true or false.

1) A hurricane can produce tornados.	True	False
2) Concrete is one of the strongest building materials we can use.	True	False
3) Brick and wood houses can easily withstand a hurricane.	True	False
4) Eavestroughs keep rainfall away from our houses.	True	False
5) Windows are the weakest point on a house.	True	False

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Name: _____ S1

Fact or Fiction – External Forces Acting on Structures

Objective What are we learning about?

To identify external forces that act on structures and determine whether statements about these forces are facts or fiction.

Materials What will you need for the activity?

- Fact or Fiction statement cards
- A 'Fact' sign and a 'Fiction' sign to distinguish the two sides of the room
- Designated areas in the classroom for the 'Fact' and 'Fiction' sides, allowing for students to move to either side



PREVIEW

Instructions How will you complete the activity?

1) Your teacher will read statements. Pay close attention as each statement is shared.
2) Consider carefully whether you think the statement is true or false.
3) If you decide the statement is true, walk to the 'Fact' side of the room.
4) If your guess is that it's not true, move to the 'Fiction' side of the room.
5) Stay on your chosen side and listen attentively for the correct answer to be revealed.
6) When the right answer is announced, return to your seat, ready for the next round.
7) Have fun getting up and moving!

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Name: _____ 52

Fact or Fiction | Read the statements to the class.

#	Statement	Fact or Fiction
1	Strong winds can make a bridge or tall building sway.	Fact
2	Gravity is an external force that pulls structures downward.	Fact
3	Buildings never need to be designed for earthquakes.	Fiction
4	Heavy snow on a roof can increase the force acting on a building.	Fact
5	Flo[illegible]an weaken the ground supporting a structure.	Fact
6	[illegible]ge roads, bridges, or buildings.	Fiction
7	[illegible]ildings to better withstand strong winds.	Fact
8	A torna[illegible] tr[illegible]ever damages buildings.	Fiction
9	Waves crash[illegible] an example of an external force.	Fact
10	Earthquakes can shake [illegible]	Fact
11	A building made of stronger mat[illegible] bet[illegible] external forces.	Fact
12	Wind only affects structures that are mad[illegible]od.	Fiction
13	The weight of people and furniture inside a bui[illegible] extern[illegible] force.	Fiction
14	Strong winds can lift roof shingles from a house.	Fact
15	Engineers study weather and the environment before designing many structures.	Fact
16	Snow always melts before it becomes heavy enough to affect a roof.	Fiction
17	Flood barriers and strong foundations can help protect structures from water damage.	Fact
18	External forces only happen during natural disasters.	Fiction
19	Bridges are designed to carry the weight of vehicles safely.	Fact
20	If engineers ignore external forces, structures may become unsafe or fail.	Fact

PREVIEW

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Properties of Materials

What are Materials

Materials are any substances can be used to make structures. Examples include chalk, paper, clay, water, stone, steel, and wood. All structures are made of materials. Think of a structure in the class and decide what materials it is made of.



Properties of Materials

Strength, flexibility, and durability are **properties of materials** that allow us to describe a material. Strength is how much force a material can resist. **Flexibility** is how much a material [illegible] and **durability** is how long a material will last. We can describe steel as being [illegible] but durable. A rubber band is flexible, weak, and not durable.



Flexible Materials: [illegible] plastic

Durable Materials: [illegible] concrete, and brick

Strong Materials: [illegible] steel, titanium

PREVIEW

Properties of Materials [illegible] describe [illegible] materials.

Material	[illegible] Statement
Strength	
Flexibility	
Durability	

Material	Plastic
Strength	
Flexibility	
Durability	

Order Rank the materials by numbering them 1–5. 1 is the best and 5 the worst.

Strength	Plastic	Rubber	Stone	Wood	Steel
Flexibility	Glass	Stone	Plastic	Rubber	Steel
Durability	Wood	Steel	Plastic	Concrete	Glass

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Name: _____ 55

Can You Poke a Hole in a Balloon?

Hypothesis Can you poke a hole in a balloon without popping it?

Yes	No

Materials What do we need for our experiment?

1) B...
2) ...
3) Wooden ...



Method How ... experiment?

1) Blow up the balloon ...
2) Tie the balloon.
3) Dip the pointy end of the skewer in the vaseline or rub lip chap on the pointy end.
4) Stick the pointy end into the area near the knot that isn't fully stretched. The area will be darker.
5) Pull out the skewer.
6) Try sticking the skewer into the opposite side of the balloon where there is a dark spot.
7) Stick the skewer right through the balloon and into the knot on the other side.





PREVIEW

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Name: _____ 56

Results Answer the questions below.



1) What happened when you poked the balloon?

2) If you [illegible] balloon in another place, what would happen?

3) Why didn't [illegible] n po[illegible]

4) How would you describe rubber as a mat[illegible]hat [illegible]e it for?

5) Draw a picture of the balloon with the stick through it.

PREVIEW

Name: _____ 63

Internal Forces

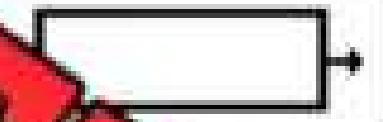
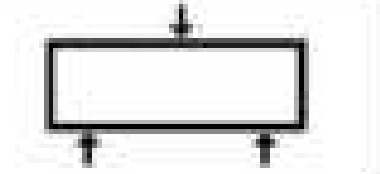
Internal Forces

There are also internal forces that happen inside a structure. An **internal force** resists external forces that act on it from the outside. Therefore, external forces cause motion in an object, while internal forces resist the motion. The two forces work against each other. If the external force is stronger than the internal force of the structure, the structure will move and could fail or break.

Internal vs External Forces

When an external force, like a push, pushes a structure, it might cause the structure to bend, twist, or shear. The external force is causing the structure to move internally, and internal forces.

PREVIEW

Tension	The structure is being pulled	
Compression	The structure is being squeezed or pushed down, making it more compact	
Torsion	The structure is being twisted	
Shear	The structure has forces acting on it in opposite directions	
Bending	Forces that make a straight material curved. One side of the material is squeezed (compression) while the other side stretches (tension)	

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Name: _____ 64

Questions Use information from the text to support your answer.

1) What are internal forces? What causes a structure to have internal forces?

2) How a[illegible]ession and tension opposite internal forces? Explain.

PREVIEW

Matching Match the [illegible]ription.

Answer	Term	
	Compression	a) A piece of steel [illegible]d s[illegible]nd a chair.
	Tension	b) Ashley rips a piece of pa[illegible]g i[illegible]e directions.
	Shear	c) Courtney sits on a chair.
	Torsion	d) A rope is used to tow a boat.
	Bending	e) A bottle cap is turned to get it off the bo[illegible]

Draw Draw a diagram of each type of internal force below.

Compression	Tension	Shear	Torsion	Bending

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Name: _____ 66

Forces on Structures

Forces on Structures

Forces are acting on structures all around us. Structures support our weight, the wind, rain, and the loads of other structures as well.

Compression and tension are common internal forces. They are called axial forces because they push or pull in a straight line.

Compression

Compression is a pushing force. When we sit on our chair, we are compressing it downward. Our weight is applying a pushing downward force.



Another example is when a person and a table are applying a pushing force to the structure.

A structure will break if it cannot withstand the compressive force, which is commonly the force that rests on top of it. A chair needs to withstand the compressive force of the person who rests on it.



Tension

Tension is a pulling force. When we pull both ends of a material or structure, we are applying tension to it. Materials like wood do not break when tension is applied to it, but a rope or string could.

It would be very difficult to break a popsicle stick by pulling both ends of it. On the other hand, we could easily break an elastic by applying tension to it and pulling it apart.



Tension can happen even when one side is being pulled. An awning on the front of a shop is being pulled down towards the ground.

PREVIEW

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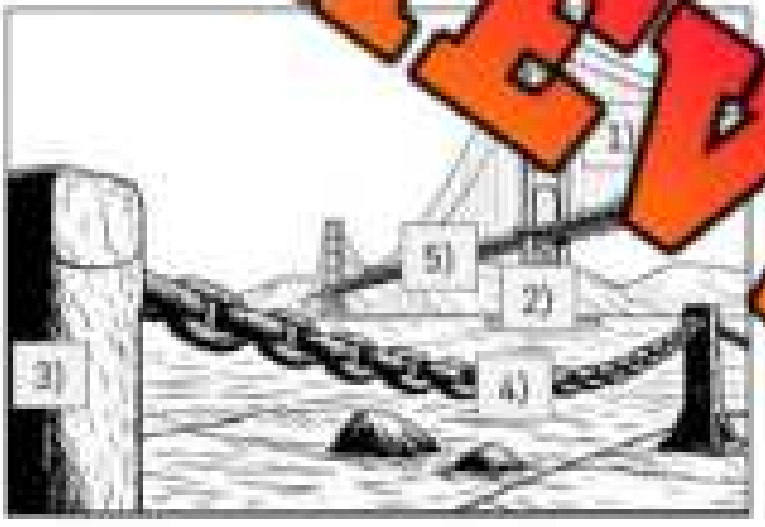
Definitions

Explain what the following terms mean.

Compression	
Tensi	

Examine

Ar[illegible] picture under compression or tension?



1)	
5)	

PREVIEW

Compression or Tension?

Label the examples below

Telephone wires		Punching a punching bag	
Sitting on a chair		Guitar strings	
Standing on a stage		Swinging on a rope	

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Name: _____ 68

Investigate – Compression/Tension

Research Question What are we trying to learn more about?

What is the difference between compression and tension? What do compression and tension do to a bridge when acting on it at the same time?

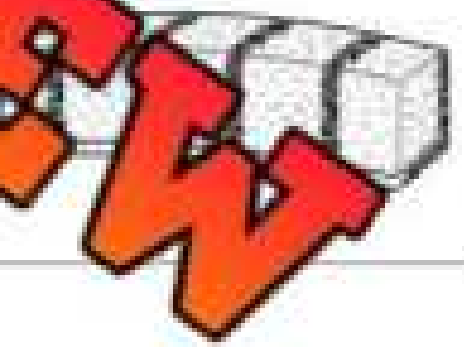
Materials ...will you need for this experiment?

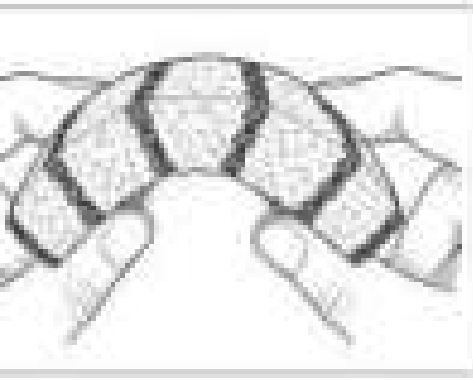
- ...
- A black ...



Method How will ... ...ment?

1) With a dark marker, draw a ser... ...s across the side of the sponge. Do this to ... top and bottom of the sponge.
2) Pass the sponge around and bend it into a U-shape.
3) Observe what happens to the lines on the top and bottom of the sponge. Ask yourself the following questions while investigating.
   - Do some lines get closer together?
   - Do some lines get further apart?
   - Which side of the sponge is under tension?
   - Which side of the sponge is under compression?





PREVIEW

Name: _____ 69

Observations What happened? How much load did your beam hold?

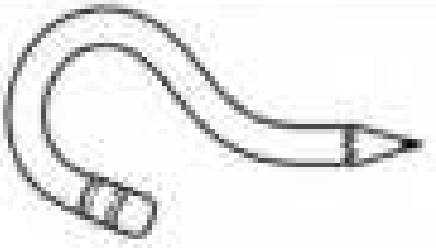
1) Did some lines get closer together?	
2) Did some lines get further apart?	
3) Which side of the sponge is under tension?	
4) Which side of the sponge is under compression?	

Results Answer the questions below.

1) How can a bridge be under tension and compression at the same time?

2) Draw a diagram of the sponge when it was in its U-shape and when it was under tension and compression.

3) Put a circle around the parts of the pencil that are under tension and a rectangle around the parts that are under compression.



PREVIEW

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Name: _____ 70

Shear and Tension

Forces in Motion: Torsion and Shear Forces



Just like compression and tension, torsion and shear forces are constantly at work in the world around us. Understanding these forces is important to comprehend the stability and longevity of different structures.

Torsion

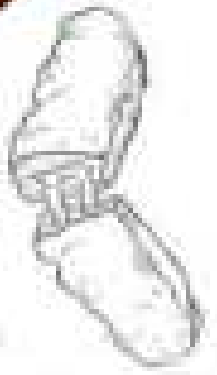
Torsion, or twisting, this force can be seen when you twist the lid of a jar to open it. You apply a torsional force to the lid.

A toy rubber band airplane uses the principle of torsion. When the propeller is wound, the rubber band is twisted. The stored energy in the twisted rubber band is what powers the propeller when released.

Any structure that cannot withstand torsion when applied to it will either twist or break. For example, a twisted metal rod will permanently twist if the torsion force surpasses its limit.

Shear Forces

Shear is a force that causes parts of a material to slide past one another in opposite directions. For instance, when you use a pair of scissors to cut paper, the blades slide past each other and apply a shear force to the paper, making it separate.



Another example is when you try to break a chocolate bar into pieces. The force you apply with your hands makes the layers of chocolate slide past each other and break apart.

Just like with other forces, if a structure or material can't resist the shear force applied to it, it will deform or break. Understanding shear forces is crucial in designing buildings to withstand forces like strong winds that can cause different parts of a structure to move in opposite directions.

PREVIEW

Name: _____ 71

Questions Use information from the text to support your answer.

1) Explain in your own words what torsion forces are and give an example.

2) What is [illegible] force and how does it affect structures like buildings?

PREVIEW

Draw Draw a diagram [illegible] paper and label where the shear force is acting.

True or False Circle whether the statement is true or false.

1) A pair of scissors cutting paper is an example of torsion.	True	False
2) Torsion involves twisting.	True	False
3) Breaking a chocolate bar demonstrates shear force.	True	False
4) Twisting a jar lid open is an example of shear force.	True	False
5) Shear forces move in the same direction.	True	False

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Check the facts about torsion and shear forces.

- ☐ Twisting the lid of a jar is an example of torsion.
- ☐ Shear force happens when two parts of a material slide past each other in opposite directions.
- ☐ Torsion is a pushing force that squeezes an object together.
- ☐ Scissors use shear force to cut paper.
- ☐ A rubber band airplane stores energy when the rubber band is twisted.
- ☐ Torsion only happens in buildings and never in everyday objects.
- ☐ Trying to break a chocolate bar into pieces can involve shear force.

Name: _____ Mark

Check the facts about torsion and shear forces.

- ☐ Twisting the lid of a jar is an example of torsion.
- ☐ Shear force happens when two parts of a material slide past each other in opposite directions.
- ☐ Torsion is a pushing force that squeezes an object together.
- ☐ Scissors use shear force to cut paper.
- ☐ A rubber band airplane stores energy when the rubber band is twisted.
- ☐ Torsion only happens in buildings and never in everyday objects.
- ☐ Trying to break a chocolate bar into pieces can involve shear force.

Name: _____ Mark

Check the facts about torsion and shear forces.

- ☐ Twisting the lid of a jar is an example of torsion.
- ☐ Shear force happens when two parts of a material slide past each other in opposite directions.
- ☐ Torsion is a pushing force that squeezes an object together.
- ☐ Scissors use shear force to cut paper.
- ☐ A rubber band airplane stores energy when the rubber band is twisted.
- ☐ Torsion only happens in buildings and never in everyday objects.
- ☐ Trying to break a chocolate bar into pieces can involve shear force.

PREVIEW

Name: _____ 7h

Experiment – Testing Forces

Objective What are we trying to learn more about?

To investigate and understand the two forces: shear and torsion using common materials.

Materials What do you need for this experiment?

- A rubber band
- A popsicle stick
- A sponge





Method How will you complete the experiment?

1) Rubber Band:

- **Shear:** Hold on both ends and try to bend/snap it.
- **Torsion:** Hold the rubber band at both ends and try to twist.

2) Popsicle Stick

- **Shear:** Try to snap or bend the stick.
- **Torsion:** Hold the stick at both ends and attempt to twist it.

3) Sponge

- **Shear:** Hold the sponge on opposite sides and try to snap or bend it.
- **Torsion:** Hold the sponge at both ends and attempt to twist it.

PREVIEW

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Observations	What happened?

Rubber Band	
1) Did it break or deform under torsion?	
2) Did it break or deform under shear force?	

Popsicle Stick	
1) Did it break or deform under torsion?	
2) Did it break or deform under shear force?	

Sponge	
1) Did it break or deform under torsion?	
2) Did it break or deform under shear force?	

PREVIEW

Results	Which objects are strong under the internal forces? Which didn't deform/break?

Shear	
Torsion	

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Identifying Forces Acting on Structures

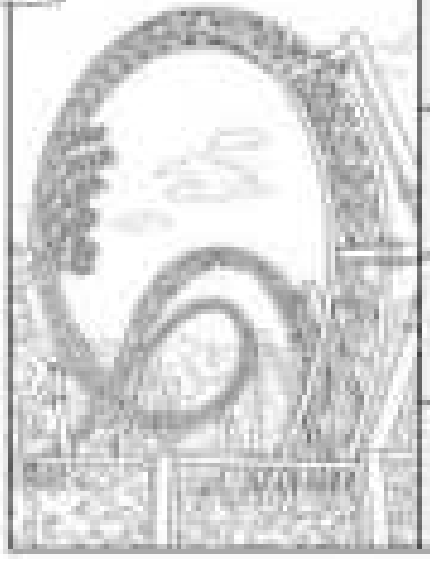
Describe Describe the internal forces happening to the structures.

1)



Tension	
Compression	
Bending	

2)



Bending	
Tension	
Compression	
Torsion	

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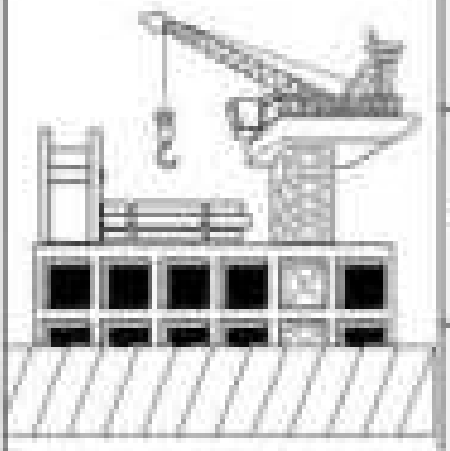
Describe Describe the internal forces happening to the structures.

3)



Tension	
Compression	
Shear	

4)



Tension	
Compression	
Torsion	

PREVIEW

Name: _____ 81

Memory Game: Forces and Structures

Objective What are we learning about?

To help students identify and remember various forces and structures terms through a fun and engaging memory game.

Material What you need for the activity?

- Memory game cards (provided) with the terms on one set and the definitions on another set.
- A flat surface like a table or the floor to lay out the cards.



Instructions How you will complete the activity

1) Divide the class into groups of 3 or 4. Give each group a set of Memory Game cards. (Provided)
2) Have each group lay all the cards face down in a grid on a flat surface.
3) The students take turns flipping over two cards at a time, trying to find a matching term and its definition.
4) If a student finds a match, they remove those cards from the grid and keep them.
5) If the cards do not match, they are turned back over, and the next student takes a turn.
6) The game continues until all the cards have been matched.
7) After the game, review the terms and definitions with the class.
8) Discuss why these terms are important to understand and how they relate to forces and structures.

PREVIEW

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Name: _____ 82

Cards List of terms and definitions related to forces and structures.

Term	Definition
Frame	A type of structure made up of parts that are joined together.
	A type of structure that is strong and hollow, often used to provide support or protection.
Solid	A type of structure that is entirely made of material, offering support and stability.
Centre of Gravity	The point at which the weight of an object is evenly balanced in all directions.
Stability	The ability of a structure to remain steady and not fall over.

PREVIEW

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Name: _____ 83

Cards | List of terms and definitions related to forces and structures

Term	Definition
Compression	A force that squeezes or presses an object.
Tension	A force that stretches or pulls an object.
Shear	[illegible] that causes parts [illegible] to slide [illegible]
Torsion	A force that [illegible] an object.
Live Load	A force that moves or changes while acting on a structure

PREVIEW

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Name: _____ 84

Cards	List of terms and definitions related to forces and structures

Term	Definition
External Forces	Forces that act on a structure from the outside.
S	The internal resistance of a material to deformation.
Dead Load	eff ravity acting ure
Gravitational Force	Is a non-contact e that attracts matter towards the centre of the earth.
Load	The weight or force that is applied to a structure.

PREVIEW

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Name: _____ 85

Cards | List of terms and definitions related to forces and structures

Term	Definition
Natural Force	Is an event that happens in our environment that is due to nature and not human beings
Horizo… …ce… …t …rs	Measure how far something has moved side-to-side.
Lightning	Is … …tatic current that …els … electrically … …nother.
Efficiency	The ability of … …e to use materials and … …sources effectively to achieve its purpose.
Elasticity	The ability of a material to return to its original shape after being stretched or compressed.

PREVIEW

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Name: _____ 87

Forces Destroy Tacoma Narrows Bridge

Background

The Tacoma Narrows Bridge was built in 1940, in Washington State, USA. It cost $6.4 million to build, which is the equivalent of approximately $130 million today. The bridge spanned 853 metres as it connected Tacoma city and the Kitsap Peninsula.

The bridge was a suspension bridge made of steel and cable wire.



Galloping Gertie

Construct[illegible] bridge started in 1938. As soon [illegible] was built, it began to move [illegible] conditions. The construction workers named the structure "Gallo[illegible]".

The mo[illegible] was described even after the bri[illegible] opened. People still trusted [illegible] should be flexible, moving [illegible] snapping due to external forces.

Collapse of the Tacoma Narrows Bri[illegible]

The bridge collapsed the same year it opened. On the morning of November 7th, the deck was hit with strong 64 km/h winds. The [illegible] oved [illegible], but its momentum became too strong.

The torsional force inside the bridge became [illegible] for the bridge to stay stable. A large portion collapsed as the bridge twisted [illegible] strong winds.

The cause of the collapse was due to the strong winds getting [illegible] closed trusses that are usually open to allow wind to pass through. This caused the bridge to twist – "gallop". As it twisted back and forth, it picked up momentum and eventually fell.

Therefore, the external force of the wind became too strong for the internal force acting on the bridge. The torsion force inside the bridge caused it to collapse.

Cost of the Disaster

In 1950, a second bridge was built to replace Galloping Gertie. The new bridge has open trusses, allowing wind to pass. The cost of the new bridge was almost double, at $11.2 million ($206 million today). This cost gets passed on to the taxpayers.

The engineers were blamed for their poor design. A lot of taxpayer money was wasted because the engineers did not predict the external forces that would act on the bridge. They did not use a design that would lessen the internal forces.

PREVIEW

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Questions Answer the questions below using evidence from the text.

1) What external and internal forces caused the bridge to collapse?	
Internal	
External	

2) How [illegible] fail in their first bridge?

True or False Circle whether the [illegible] true or false.

1) Torsion is an external force that made the [illegible] collapse.	True	False
2) The wind is an external force that caused the [illegible]	True	False
3) The bridge began to twist, causing a torsion internal force.	[illegible]	False
4) The open trusses caused the bridge to collapse.	[illegible]	False
5) The new bridge has open trusses, allowing wind to pass through.	[illegible]	False

Draw Draw the bridge with open trusses and closed trusses.

Closed Trusses	Open Trusses

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Name: _____ 91

Role Play: Engineers Against Nature

Objective — What are we learning about?

To understand how engineers design structures that can withstand different natural forces by planning and performing role plays that demonstrate safe and effective engineering solutions.

Materials — What will you need for the activity?

- [illegible], or recycled materials (optional)
- Scenario [illegible] role
- Simple classroom [illegible]
- Safety helmets or [illegible] (optional)



Instructions — How will you [illegible]

1) Divide the students into small groups and [illegible] each [illegible] scenario card that describes a different structure that must [illegible] a
2) Give each group time to discuss how the natural [illegible] affect their assigned structure and brainstorm different engineering ideas [illegible] could help keep the structure safe and strong.
3) Provide each group with simple classroom materials and prop[illegible] use to help demonstrate their engineering ideas. Encourage students to a[illegible] different roles such as engineers, architects, construction workers, community members, weather reporters, emergency workers, or building inspectors.
4) Allow each group time to plan and practise a short role play that first shows the natural force affecting the structure and then demonstrates how the engineers improve the design to better withstand the force.
5) Invite each group to perform their role play for the class while the audience watches carefully and identifies the natural force, the engineering problem, and the design features that helped strengthen the structure.
6) After all groups have presented, discuss the different engineering solutions that were shared and create a class list of building features and materials that help structures resist natural forces.

PREVIEW

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Name: _____ 92

Scenario Cards Cut out the topics below.

Scenarios	Role Play Scenarios
Wind[illegible]e	A new bridge is being built across a river. Weather reports predict very strong winds. Act out a meeting where engineers decide how to make the bridge strong enough to stop it from swaying or collapsing. Explain the building materials or design features you choose and show how the bridge stays safe during the windstorm.
Earthquake School	[illegible]ool is being built in an area where [illegible]quakes happen. Act out engineers [illegible]esign the school to protect students [illegible]achers. [illegible]t happens when the earthquake beg[illegible] how [illegible] design keeps
Flooded Community Centre	Heavy rain has caused the [illegible]dly. Engineers must protect a comm[illegible] flooding. Act out the planning meeting a[illegible]w how the building is changed to reduce flood damage. Explain why your design works.
Snowy Sports Arena	A town is building a sports arena in a region that receives heavy snowfall every winter. Act out engineers deciding how to build the roof so it can safely support the weight of the snow. Show how the arena stays strong after a large snowstorm.

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Name: _____ 93

Scenario Cards Cut out the topics below.

Scenarios	Role Play Scenarios
Tornado [illegible] Home	A family wants to build a home in an area where tornadoes sometimes occur. Act out the engineers explaining how they will strengthen the house. Show the tornado passing through and how the house protects the family.
Coastal Lighthouse	[illegible] being built beside the ocean where [illegible] storms often hit the shoreline. Act out [illegible] materials and a design that will help [illegible] the powerful waves [illegible]
Mountain Highway Tunnel	Engineers are building a [illegible] where falling rocks are common. A[illegible] process and show how the tunnel is [illegible] to protect drivers from rockfalls. Explain the safety features you include.
Playground Upgrade	Your town is replacing an old playground after several strong storms damaged it. Act out engineers discussing how to make the playground stronger and safer. Show children using the new playground after another storm without it being damaged.

PREVIEW

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Name: _____ /6

Beams and Trusses

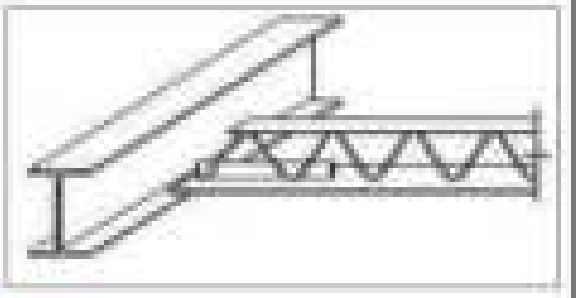
Stable Structures

A structure that does not topple over when forces act on it must be designed and built with certain structural features that give it strength. Engineers need to understand the forces that will act on the structure.

When building bridges, houses and other structures that must withstand live loads, engineers use beams and trusses to create stable structures.

PREVIEW

Steel Beam



The **steel beam** is commonly referred to as an I-beam or H-beam and is the shape of most steel structures. The design of the beam makes it capable of handling great loads.

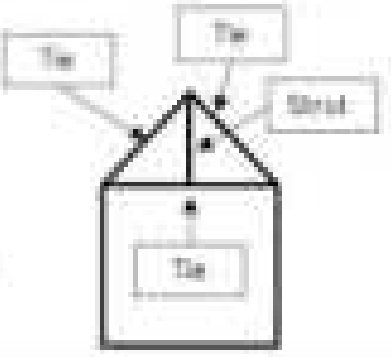
Engineers use the I-beam for horizontal purposes to frame in heavy structures like buildings and bridges. Steel beams can withstand extreme forces, but it will not break or buckle. It is an expensive material which is used in commercial buildings and large bridges. They are not commonly used in residential homes.

Truss



The truss is a frame that is used to make stable structures. A truss takes advantage of triangles as the triangle is the strongest shape. Triangles are the strongest shape because when a force is applied to a triangular shaped structure, it is spread through all three sides.

Houses use trusses for their peaked roofs that provide stability throughout the entire frame of the house. Truss bridges also take advantage of the strength of the triangle.



Trusses have struts and ties. A strut is a beam that is under compression while a tie is a beam under tension.

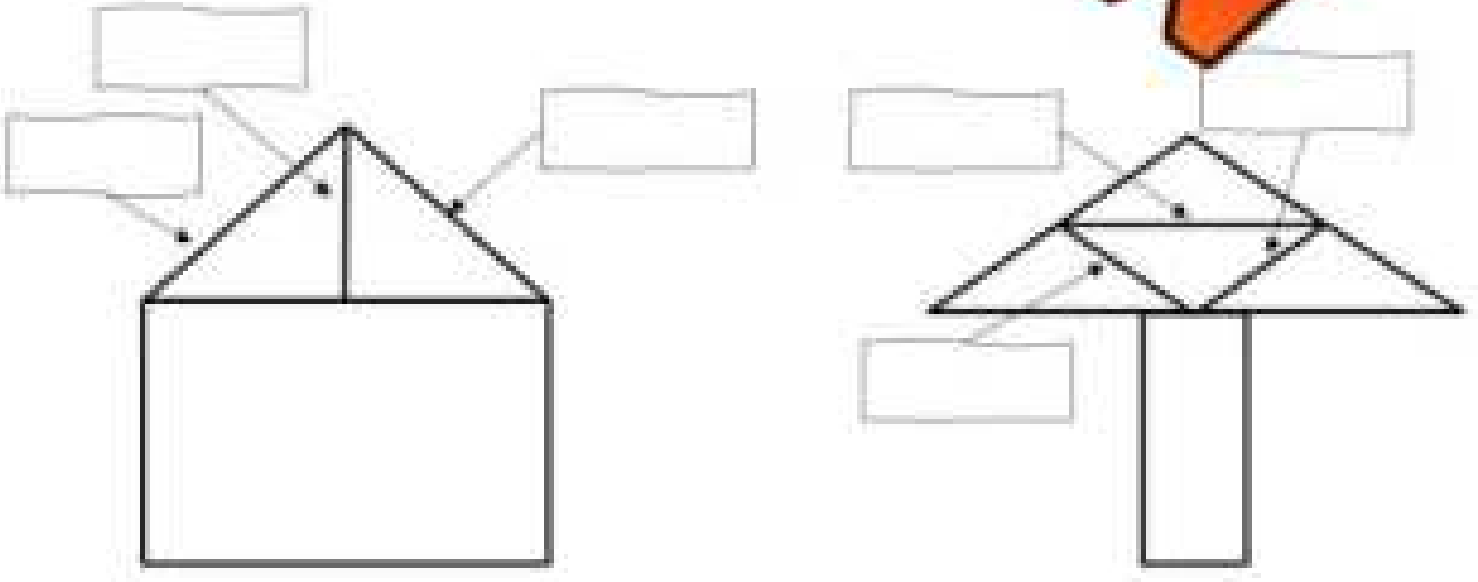
Name: _____ 95

Question Why are steel beams used to build strong structures? Why are they not used in houses?

Draw ... of structures that use I-Beams and Trusses

I-	Truss

Diagram Label the diagram.

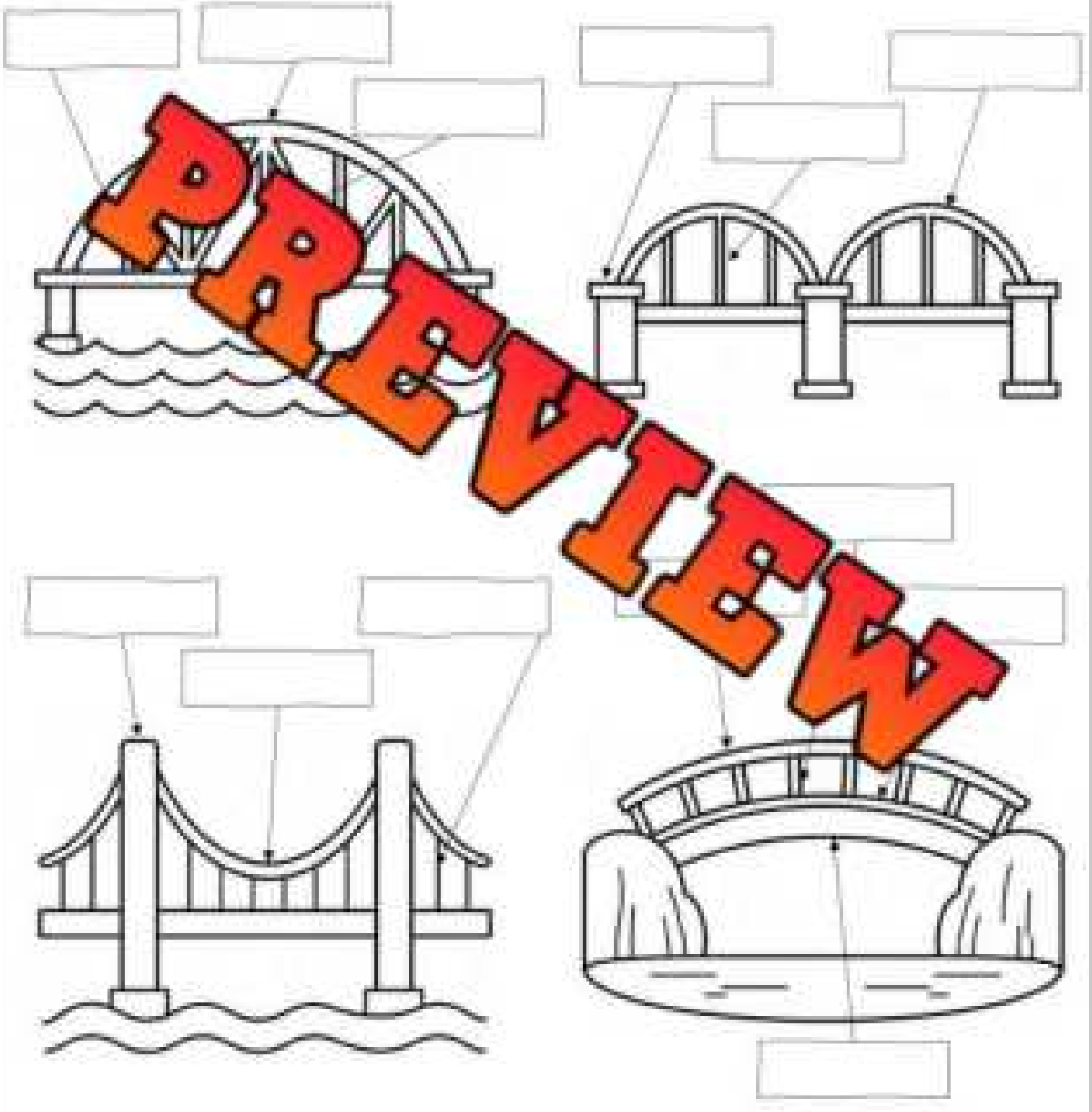


PREVIEW

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Bridges – Tension or Compression?

Question Is the part of the bridge under tension or compression?



PREVIEW

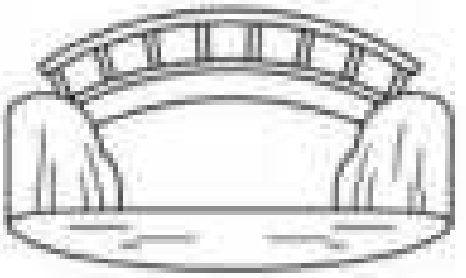
Name: _____ 102

Activity – Building a Bridge #1

Background

What is the activity?

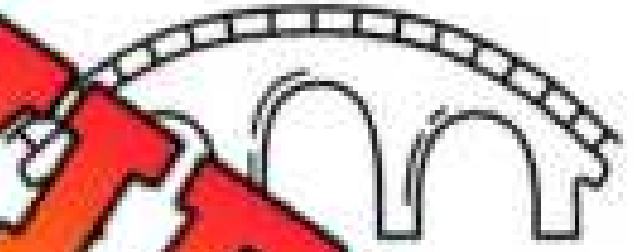
Can you build a bridge using only blocks for pillars and construction paper as the beam? Your bridge will need to s[illegible] the compressive forces of a toy car crossing [illegible]. It will also need to support the dea[illegible]f.



Materials

[illegible] you n[illegible] the experiment?

- 3 blocks
- 3 sheets of construction paper
- A toy car



Method

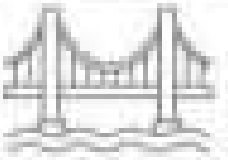
How will you complete the experime[illegible]

1) Spend 5 minutes thinking about how you can best use your [illegible] design a sturdy bridge.
2) Spend 15 minutes building a bridge that a toy car can travel across.
3) The bridge needs to be the length of one piece of construction paper.
4) Experiment with where you could put the pillars and how to use the three sheets of paper.
5) Experiment with the type of bridge you will build.

PREVIEW

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Observations What happened?

1) Draw a picture of your bridge below.

2) Was your [illegible] made it successful or unsuccessful?

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Results Answer the questions below.

1) What type of bridge did you build? Why did you use this type?

2) What would you change about your bridge if you had another chance?

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Activity – Building a Bridge #2

Background — What is the activity?

Can you build a bridge using spaghetti noodles? If you layer the spaghetti noodles, can your bridge support a live load as well as its dead load?

We will test how strong your bridge is by increasing the load on the middle of the bridge with weights. The bridge needs span a gap of 38cm. Remember, your bridge is only as strong as its weakest part!

PREVIEW

Materials — What do you need for the experiment?

- ✓ Spaghetti noodles
- ✓ White glue or hot glue
- ✓ Tape
- ✓ Bucket
- ✓ Belt
- ✓ Weights – we used wooden blocks
- ✓ Marshmallows



Method — How will you complete the experiment?

1) Provide students with time to plan their bridge.
2) Have them begin constructing their bridges. Give each group the same number of materials.
3) To test their bridges, wrap the belt around the middle of their bridge and around the bucket. Add weights to the bucket until the bridge fails.



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Plan How will you make your bridge?



1) Research some spaghetti bridges online. Choose some ideas you want to replicate and write them below.

_____

_____

_____

2) How ... tape, glue, and marshmallows effectively? Explain how you will ... (Hint: ...)

Tape	
Glue	
Marshmallows	

3) Draw a plan for your bridge. Label the ta... and spaghetti.

PREVIEW

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Results | How did it go?



1) How successful was your bridge? Explain what happened.

2) How could you have done better? What would you do differently?

3) Draw the bridge you would like to test.

4) How did your bridge fail? What force(s) were too strong for your bridge to support?

PREVIEW

Name: _____ 1107

4-Corners: Which Structure Would You Build?

Objective What are we learning about?

To evaluate different structural designs and materials by choosing the option students believe would best withstand different forces and explaining their reasoning

Mater need for the activity?

- Prepared o ased related to structures (prep
- Four signs for the corners of the rele "A, B, C and D"



Instructions How will you complete the activity

1) Prepare the classroom by labelling each corner with lett
2) Explain to the students that you will read questions about struc building materials, engineering designs, and natural forces, and each co will represent a different opinion or design choice.
3) When you read a question, students will move to the corner that corresponds to the answer they think is correct. These will be opinion questions. For the questions, have students discuss their opinions in that corner with others who also chose that option. Then discuss as a class.
4) Once all students have chosen their corners, facilitate a whole-class discussion by asking why they made their choice sharing their reasoning and opinions.
5) Repeat with different questions to reinforce their understanding of concepts.

PREVIEW

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Question	A	B	C	D
If you were building a bridge over a wide river, which material would you choose?	Steel	Wood	Plastic	Cardboard
Which structure would you build in an area with frequent earthquakes?	Brick house	Flexible steel building	Glass tower	Tall stone tower
Which roof would help [illegible] handle heavy snow?	Flat roof	Sloped roof	Cloth roof	Slate roof
Which structure would you build best [illegible] ocean?	[illegible]	Concrete lighthouse	Bunker	Bamboo hut
Which playground equipment would you choose for a windy park?	[illegible] plastic slide	[illegible]	Inflatable slide	Tall fabric hammock
Which foundation would you choose for a tall building?	Deep concrete foundation	[illegible] shell	[illegible]	Flat Grass base
Which structure would you build to protect people during a tornado?	Reinforced shelter	Greenhouse	Tall [illegible]	[illegible]low
Which material would you use to build a dam?	Concrete	Bricks	Wood	Plastic
Which tree would you plant in a windy area?	One with deep roots	One with shallow roots	A tree that grows very tall	One that does not bend easily
Which animal adaptation do you think gives the best protection from forces?	Armadillo shell	Long rabbit ears	Butterfly wings	Fish fins

PREVIEW

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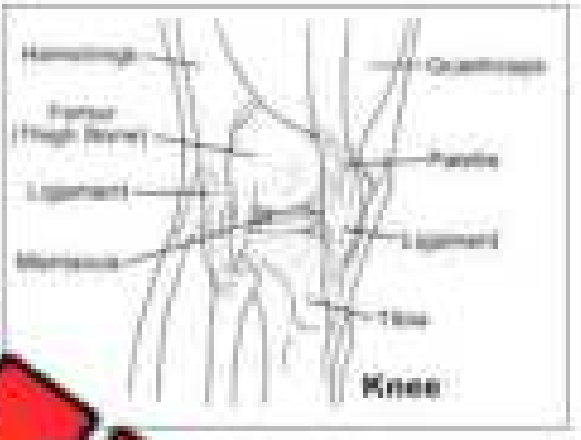
Sports – Protective Equipment

Sports can be Dangerous!

Sports can be dangerous and cause injuries because of the forces that occur between athletes. In football and hockey, compression occurs as a pushing force that happens frequently when athletes body check or tackle each other.

In wrestling, tension occurs as the athletes pull each other onto the mat. In basketball, shear forces cause injuries as athletes are [illegible] pivoting with the ball.

Shear forces cause a lot of injuries. They happen when a force moves one body part in one direction while [illegible] the body in the opposite direction. [illegible] can happen when shear forces act on the knee. If the thigh produces a force moving forward but the shin produces a force going backwards, the shear forces can sometimes cause the ligaments in the knee to tear.



Injuries are a part of playing sports, but many [illegible] can be avoided by using proper protective equipment.



Protective Equipment

Helmets, shin pads, and other protective equipment play a huge roll in reducing the risk of injuries in sports. Most equipment covers a vulnerable area and absorbs the force and distributes the force over a larger area. This reduces the damage of the impact.

In soccer, a shin pad protects the shin bones by absorbing the impact of a kick to the shins and distributing the compressive force throughout the entire shin. Helmets protect the skull from fractures due to compressive forces. They do not stop concussions as a concussion is caused when the brain moves inside the skull.

PREVIEW

Name: _____ 111

Questions Answer the questions below using evidence from the text.

1) How does protective equipment help reduce injuries?

2) What fo[illegible]ppen in sports? (tension, torsion, compression, shear). Give examples.

PREVIEW

Making Connections [illegible] remind you of?

True or False Circle whether the statement is true or false.

1) A helmet protects against shear forces.	True	False
2) A shin pad protects against compressive forces.	True	False
3) Shear forces cause a lot of knee injuries in sports.	True	False
4) Torsion forces happen a lot in basketball.	True	False
5) Helmets stop concussions in sports.	True	False

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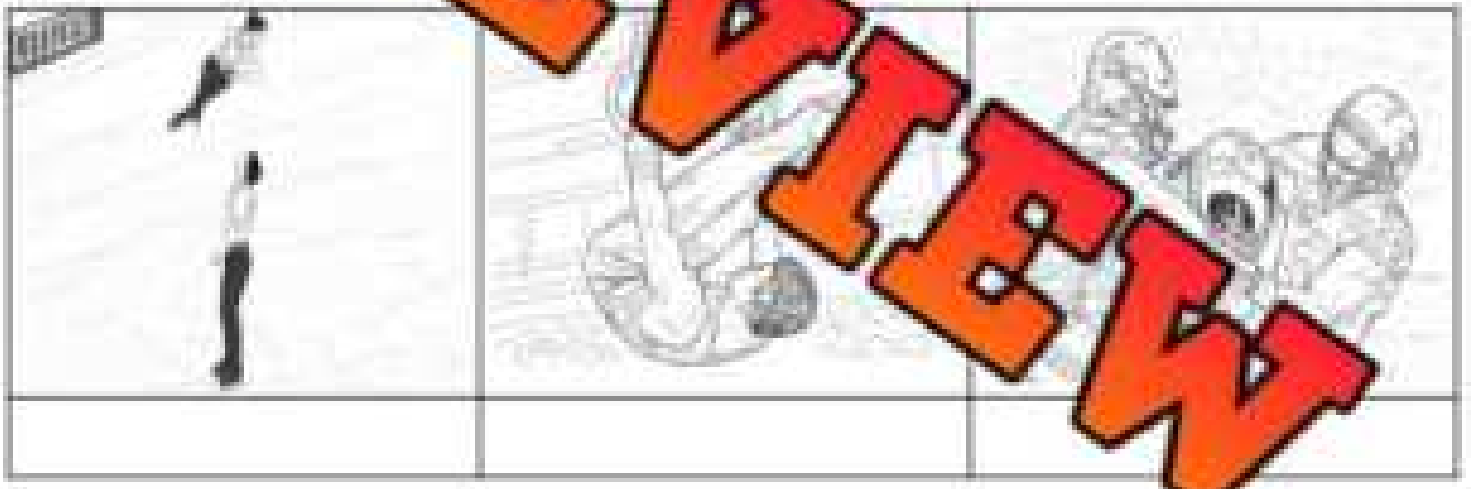
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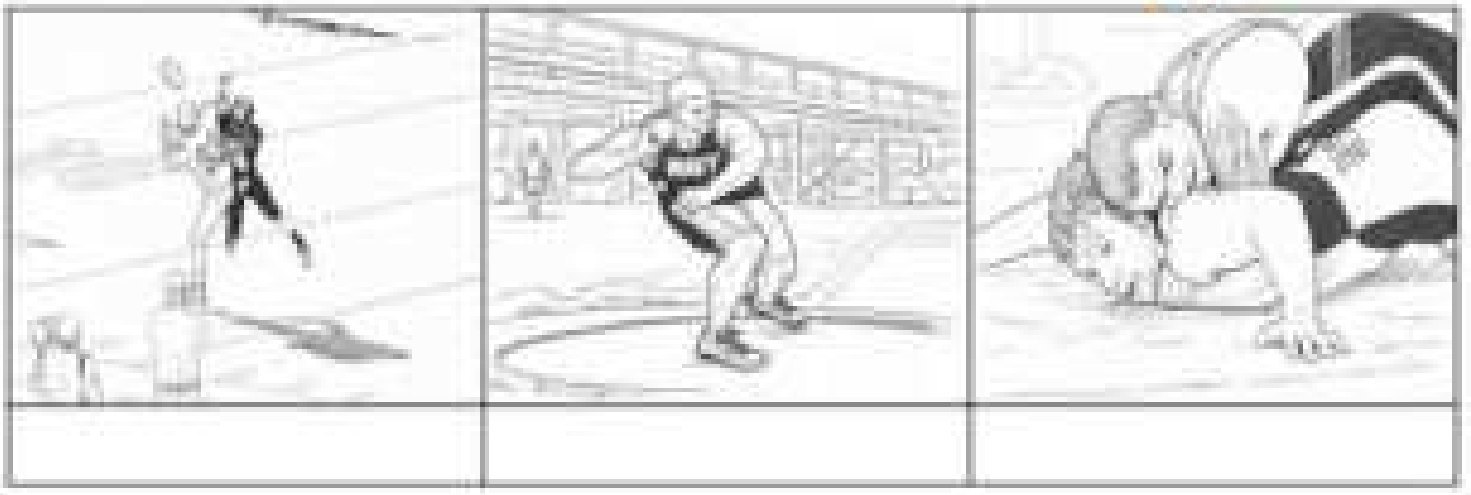
Forces in Sports

Examples of Forces

Look at the pictures below and write which force is acting on the athletes – shear, tension, compression, torsion







PREVIEW

Name: _____ 117

Cats Surviving High Falls

Cats Can Survive High Falls



A cat can walk away from falls around 2 to 3 metres high with no injuries. Since the average cat is about 25 cm tall, this is 8 to 12 times their height. Picture you falling from a roof that was 8 to 12 times taller than you. You wouldn't walk away the way a cat would.

Why [illegible] Falls?

There are [illegible] that can survive falls from high heights.

1) **Cats fall slowly** – Cats have [illegible] bodies compared to their weight. This means when they fall, their [illegible] as fast. In addition, their larger bodies slow them down because they have [illegible] wind resistance. Cats fall at a speed of 97 km/h while humans fall at a [illegible]

2) **Evolution** – Cats fall because when they are [illegible] they tend to live in trees. When a branch snaps, or when they [illegible] cats [illegible] they fall. If they don't survive, they can't have babies. The cats [illegible] have babies that will also survive high falls. Over time, cats have [illegible] falls.

3) **Strong and long legs** – Cats have strong legs used to climb [illegible] their strong, muscular legs act like shock absorbers. Their legs are also [illegible] compared to their bodies. The long, strong legs are like springs, which allow them to absorb the impact with the ground.



Supercat

A cat was treated at the New York Vet Clinic after falling 32-stories from a high-rise apartment building. The owner had left the window open. The cat survived the 105 metre fall with only a chipped tooth and collapsed lung. It was released from the clinic after two days and made a full recovery.

PREVIEW

Name: _____ 118

Questions Answer the questions below using evidence from the text.

1) Why can cats survive falls better than humans?

2) Do cats [illegible]rong legs? Explain how their legs help them survive high falls.

PREVIEW

Summarize What is th[illegible] details of the reading?

True or False Circle whether the statement is true or false.

1) When a cat falls, the impact of hitting the ground is a tension force.	True	False
2) Cats have a light weight compared to the size of their bodies.	True	False
3) Cats fall faster than humans.	True	False
4) A cat survived a fall of 105 metres.	True	False
5) Cats that don't live in homes prefer to live in caves.	True	False

Name: _____ 120

Tall Plants – Sunflowers and the Hyperion Tree

Hyperion Tree

The **Hyperion tree** is the tallest tree in the world. It is a sequoia redwood tree, found in California. The tree is 379 feet, or 115 metres and it weights over 1.6 million pounds.

Why Doesn't it Fall?

The wood [illegible] Hyperion tree is made of is very strong. It has the strongest [illegible] weight ratio than any other type of wood. This mean[illegible] heavy, but very strong. The heavier the wood, the stronger [illegible] gravity pulling the tree to the ground.

The Hyp[illegible] a d[illegible] of 4.8 metres. This means from one side of the [illegible] the [illegible] 4.8 metres. Picture this distance and you will [illegible] how [illegible]ion tree uses its huge base to grow tall.



Hyperion Tree

Sunflowers

A sunflower plant has adapted to grow tall, so it [illegible] it needs. Shorter plants are often shaded by larger plants, which gi[illegible]. On average, a sunflower will grow to a height of 2 to 4 metres. The t[illegible]ever [illegible] was 9.17 metres!

Why Don't They Fall?



The taller a structure is, the stronger the base needs to be. Sunflowers have deep roots that are almost the same height of the plant above the surface. These roots are like the foundation of a building. With external forces like the wind and rain, sunflowers can remain standing because of their deep foundation.

Moreover, as the plant grows taller, the stalk grows thicker. Sunflower stalks are fibrous and tough, unlike other shorter plants. These stalks can even be used as building materials for a fence or plant stake.

PREVIEW

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Name: _____ 121

Questions Answer the questions below using evidence from the text.

1) Why is the Hyperion tree still standing?

2) Why are sunflowers able to grow so tall?

Visualizing Draw what you pictured in your mind as you were reading. Explain the picture.

True or False Circle whether the statement is true or false.

1) The Hyperion tree is taller than 100 metres.	True	False
2) The tallest sunflower ever was 60 metres.	True	False
3) Sunflower stalks are thick and fibrous.	True	False
4) Sunflower roots are much shorter than the height of the plant.	True	False
5) Hyperion is made of wood that has a high strength to weight ratio.	True	False

PREVIEW

Name: _____ L23

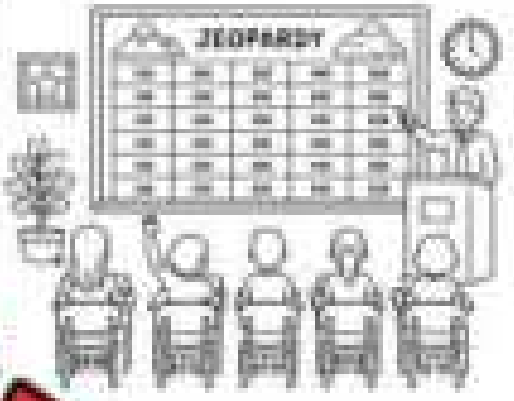
Jeopardy – Forces Acting on Structures Review

Objective What are we learning about?

To review key concepts about forces acting on structures and explain how the physical characteristics of plants and animals help protect them from harmful forces.

Mat you need for the activity?

- Jeopardy
- Buzzer or bell



Instructions How will you comp

1) Print the Jeopardy board on the next p
2) Divide the class into two teams.
3) Ask one team to go first by selecting a point value.
4) Read the question aloud from the point value.
5) The first team to ring the bell or buzzer gets to answer.
6) If they answer correctly, award them the points. If not, another team can answer.
7) Continue the game until all questions have been answered.
8) Tally the points to determine the winning team.
9) Conclude by discussing what they learned about the topics in the questions.

PREVIEW

Name: _____ L24

Jeopardy Question | Ask students the questions below

1 Points	2 Points	3 Points	4 Points	5 Points
Which internal force is a pushing force? **Compre**	What internal force pulls on a material? **Tension**	Which force helped the Tacoma Narrows Bridge collapse? **Torsion**	What physical feature gives sunflowers support? **Roots**	What slows a falling cat? **Air resistance**
What force pu… everything toward Earth? **Gravity**		Which famous bridge was nicknamed …alloping …?	Which natural force can shake buildings without warning? **Earthquake**	What structure feature lets wind pass through a bridge? **Trusses**
What protects an armadillo's soft underside? **Shell**	Which weather event shakes the ground? **Earthquake**	…at type of …natur… force can … away soil… a structu… **Flooding**	…e? …al	What movement caused Galloping Gertie to twist back and forth? **…scillation**
Which structure carries people across a river? **Bridge**	What structure supports a roof? **Beam**	Which structure stores water behind a wall? **Dam**	What is t… broad bottom part of a structure called? **Foundation**	…e type of …ridge was Galloping Gertie? **Suspension**
What animal can survive very high falls? **Cat**	What animal has a protective shell? **Armadillo**	Which plant grows deep roots to resist wind? **Sunflower**	What is the name of the world's tallest tree? **Hyperion**	What type of tree is the Hyperion Tree? **Redwood**

PREVIEW

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Name: _____ 126

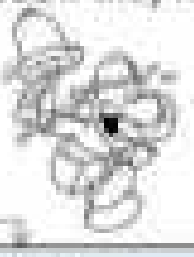
Coding – Sensors in Tall Buildings

Sensors in Tall Buildings

As buildings are built taller and taller, engineers are using sensors to make sure they stay strong and safe. When sky scraping buildings are being built, sensors are put on columns to monitor their movement. A **column** is a vertical (up and down) beam that acts like a wall.

Coding is used with the sensors to tell the building manager how safe the structure is. Walls can move up to 1 metre on a tall skyscraper. This is because tall buildings need to be flexible, so they don't snap and fall down. But, if they move too much they become unstable and fall down.

Sens... Code E...



...ding move over 1 m?

IF the building ...

ELSE

THEN sound the ala...

Display message, "Safe"

PREVIEW

Directions If you were writing the code, wha... hap... situations below?

The Wall Moved Over 1 Metre	
The Wall Did Not Move Over 1 Metre	

Directions Fill in the blanks showing what would happen if the wall moved

	Sensor – Movement Amount	IF or ELSE?	What Happened
1)	1.5 metres		
2)	0.5 metres		
3)	125 centimetres		
4)	75 centimetres		
5)	0.99 metres		

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Name: _____ 127

RADAR – Predicting Natural Forces



Radar

The term **RADAR** is an acronym formed from the term Radio Detection and Ranging. RADAR systems use an antenna to focus a pulsed radio-frequency beam out into the atmosphere. When the beam of energy strikes particles of precipitation, that energy is reflected back to the radar. The intensity of this energy is related to the number, size, and type of precipitation particles. This allows meteorologists to determine what weather systems are in the area.

Doppler R

The D… traditional radar, but it also reports the wind direction, wind spee… warm fronts and cold fronts. Having one tool to determine all thes… portan… …her systems gives the best information for meteorologist…

PREVIEW

True or False

Is … …lse?

1) Radar takes images of the … …ecast centres.	True	False
2) Radar is used to measure precipitat…	True	False
3) Radar gets its name from the term Radio De… …ind	True	False
4) Doppler radar is a simpler version of radar.	True	False
5) Doppler radar gives information on the wind as we… …tati… …rue	True	False

Questions

Answer the questions below.

1) How does radar work? Explain.

2) Without radar, it would be difficult to predict the weather. What would life be like if we had no idea what the weather would be like day-to-day?

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Name _____ 128

RADAR Coding

RADAR works by sending a signal out and then measuring the signal being sent back. By sensing the strength of the return signal, RADAR devices can make a map of precipitation in an area.

Radar Follow the codes below to put raindrops on the map using the coordinate plane.



❑ (10, 7)	❑ (12, 4)	❑ (10, 6)	❑ (3, 4)	❑ (10, 5)
❑ (11, 5)	❑ (13, 4)	❑ (11, 7)	❑ (4, 3)	❑ (11, 6)
❑ (11, 4)	❑ (12, 5)	❑ (5, 2)	❑ (6, 4)	❑ (6, 2)
❑ (7, 2)	❑ (14, 5)	❑ (8, 2)	❑ (3, 3)	❑ (6, 3)
❑ (5, 3)	❑ (14, 4)	❑ (7, 3)	❑ (2, 3)	❑ (8, 3)
❑ (9, 3)	❑ (13, 5)	❑ (8, 4)	❑ (2, 4)	❑ (7, 4)

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Name: _____ 129

Reading Code – Tsunami Buoys

A **tsunami buoy** is a floating sensor that is put along coastal regions that experience tsunamis. The buoy measures the wave height of the waves around it. It collects data that is sent to the mainland where scientists can read the data.

Most tsunamis are under 3 metres tall. These tsunamis do not cause much damage on land. When tsunamis [illegible] 3 metres, a tsunami warning is issued.



Coding [illegible] provided about the shoreline height and the tsunami height, [illegible] you send to people living on shore?

Shoreline Height	[illegible]	[illegible] – Then display, "_____"
2 m	2 m	
1.5 m	2.5 m	
2.2 m	5 m	
1 m	20 m	
3 m	1.5 m	
1.8 m	50 m	

PREVIEW

If/Then Statements Write your own IF/THEN statements with data [illegible] tsunami buoy. Make up the data.

If the shoreline height is 1.2 m and the tsunami is 8 m tall

THEN

If the shoreline height is _____ m and the tsunami is _____ m tall

THEN

If the shoreline height is _____ m and the tsunami is _____ m tall

THEN

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Name _____ 130

Storing Code – Tsunami Buoys

We can store data that we want to use later to help with our computer program. We could store preset display messages that are sent based on the height of the waves.

Example

If wave height is greater than 7 m
THEN display warning level 3

Storing Data
warning level 3 = elderly should evacuate

Storing Data ...e display messages for your computer screen for each warning level.

Warning Level	Warning Display Message
0	
1	
2	
3	
4	
5	

PREVIEW

If/Then Statements Write your own IF/THEN statements ...rec...y the tsunami buoy. Make up the data.

If the shoreline height is _____ m and the tsunami is _____
THEN display warning level _____ (number)

If the shoreline height is _____ m and the tsunami is _____ m tall
THEN

If the shoreline height is _____ m and the tsunami is _____ m tall
THEN

If the shoreline height is _____ m and the tsunami is _____ m tall
THEN

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Name: _____

Forces – Unit Test

Multiple Choice /5

1) Sitting on a chair is an example of which force?

a) Torsion

b) Tension

c) Compression

d) Shear

2) Playing tug of war with friends is an example of which force?

a) Torsion

b) Tension

c) Compression

d) Shear

3) Using [illegible] example of which force?

a) Torsion

b) Tension

c) Compression

d) Shear

4) A bridge with cars driving on it is an example of which type of load?

a) Dead load

b) Static load

c) Total load

d) [illegible]ve load

5) A strong structure has a _____ [illegible] gravity

a) Low

b) High

c) Left

d) Right

[illegible] are an example of a(n)

a) In[illegible]

[illegible] force

c) E[illegible]

d) All of t[illegible]

7) Which material is good at withstanding the force of a hurricane?

a) Wood

b) Plastic

c) Rubber

d) Concrete

8) The Tacoma N[illegible]ro[illegible] because of which int[illegible]

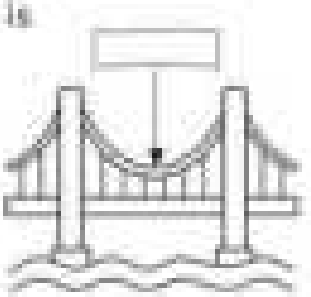
a) Torsion

b) Tension

c) Compression

d) Shear

9) The part of the bridge is under which force?



a) Torsion

b) Tension

c) Compression

d) Shear

10) Helmets protect against which force?

a) Torsion

b) Tension

c) Compression

d) Shear

PREVIEW

Definitions (1 marks each) /4

Term	Definition (what does it mean)
Natural Disaster	
Truss	
Com	
Tension	

PREVIEW

Short Answer Questions (2 marks each)

1) What is an external force? Give an example.

2) What is the difference between a live load and a dead load?

3) Why are the pyramids so strong? How has the Pyramid of Giza stood for almost 5000 years?

Long Answer Questions /5

1) What forces occur in sports? Give some examples and explain how athletes use equipment to prevent injuries.

2) Choose a natural phenomenon and describe the forces involved. How can we make structures that can withstand these forces? What people do to survive these forces?

PREVIEW

Workbook Preview

Grade 5 Science Unit

PROPERTIES OF AND CHANGES IN MATTER

	Curriculum Expectations	Pages
C1.1	assess the impacts on society and the environment of various processes used in the manufacture of common products	126-127, 136, 143
C1.2	assess how the use of specific materials in the manufacture of common products affects the environment, and identify actions that society and individuals can take to mitigate negative impacts	128-143
C2.1		97
C2.2		6-38, 108, 125
C2.3	home, in the community, or in the natural environment	2-63, 67-72, 102-103, 120-125
C2.4	describe physical changes in matter as changes of the state, volume, or form of the matter that do not result in the formation of a different substance	73-75, 78-92, 96-99, 101-103
C2.5	describe chemical changes in matter as changes that result in the formation of different substances, and identify signs that a chemical change has occurred	85-99, 101-103
C2.6	explain how changes of state can occur when matter absorbs or releases thermal energy	73-75, 78-84
C2.7	explain why specific physical properties of various solids, liquids, and gases make them useful for particular applications	14-20, 26-34, 36-38, 41-49, 102-113, 120-125

Preview of 100 pages from this product that contains 243 pages total.

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NAME: _____

PROPERTIES OF AND CHANGES IN MATTER



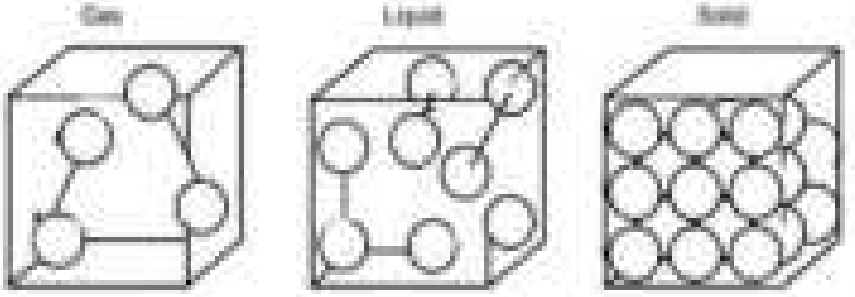
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Name: _____ 8

What is Matter?

What is Matter?

Everything is made of matter. Look around. The desks in your classroom are made of matter, t[illegible]e breathe and th[illegible]k are both [illegible]r bo[illegible]our bodies are made of matter!



Matter [illegible]ng th[illegible]p space and has mass (weight). Air is matter because air weigh[illegible]s because a balloon that is full of air weighs more than an emp[illegible]n.



Particles – A[illegible]

All matter is made [illegible]y p[illegible]d atoms. When you look at matter, you ca[illegible] tiny [illegible]. Even with the best light microscope, sing[illegible]s [illegible]. But atoms are there. You are made of 7 bil[illegible], atoms, or 7,000,000,000,000,000,000,000,000[illegible]

PREVIEW

States of Matter

All matter can be grouped into three states – solid, liquid, or gas. An example of matter that goes through the three states of matter is water.

Water can be ice as a solid, regular water as a liquid, and steam as a gas. The atoms in a solid are very close together, while they get further apart in a liquid, and very far apart in a gas.

Name: _____ 9

Questions Answer the questions below using evidence from the text.

1) What does matter mean?

2) What are the three phases of matter? Explain how water can be all three phases of matter.

PREVIEW

Questioning Write 3 questions you have about matter.

1)	
2)	
3)	

True or False Circle whether the statement is true or false.

1) The atoms in a solid are further apart than in a gas.	True	False
2) Matter is everything that takes up space and has mass/weight.	True	False
3) Our bodies are matter.	True	False
4) Our thoughts and dreams are matter.	True	False
5) Matter is made up of tiny particles called atoms.	True	False

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Circle the correct answer.

1) The smallest unit of matter is ___	Atom / Cell
2) Air is a type of ___	Solid / Gas
3) Which is NOT a state?	Liquid / Energy
4) Atoms in a solid move ___	Freely / Slowly

Name: _____ | Mark

Circle the correct answer.

1) The smallest unit of matter is ___	Atom / Cell
2) Air is a type of ___	Solid / Gas
3) Which is NOT a state?	Liquid / Energy
4) Atoms in a solid move ___	Freely / Slowly

Name: _____ | Mark

Circle the correct answer.

1) The smallest unit of matter is ___	Atom / Cell
2) Air is a type of ___	Solid / Gas
3) Which is NOT a state?	Liquid / Energy
4) Atoms in a solid move ___	Freely / Slowly

Name: _____ | Mark

Circle the correct answer.

1) The smallest unit of matter is ___	Atom / Cell
2) Air is a type of ___	Solid / Gas
3) Which is NOT a state?	Liquid / Energy
4) Atoms in a solid move ___	Freely / Slowly

PREVIEW

Name: _____ 11

Matter

Multiple Choice Circle the correct answer. There may be more than one!

1) Matter is...	2) What are the 3 phases of matter:
❑ Anything that has weight	❑ Solid
❑ Anything we think of	❑ Gas
❑ Anyth[illegible] takes up space	❑ Energy
❑ Anyt[illegible] ters energy	❑ Liquid
3) W[illegible] of matter	4) The particles are furthest apart in a...
❑ Wa[illegible] e dri	❑ Solid
❑ Noise we [illegible]	❑ Glass of water
❑ Food	❑ Gas
❑ Rocks	❑ Liquid

PREVIEW

Matching Draw a line connecting the [illegible] e example.

Liquid		[illegible]
Not Matter		[illegible]
Solid		❑ Love
Gas		❑ Apple Juice
Not Matter		❑ Water
Liquid		❑ Oxygen
Solid		❑ TV
Gas		❑ Dreams



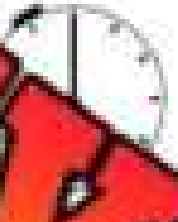
Reflection Do you think air is considered matter? Explain why or why not.

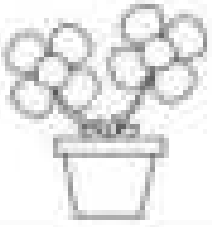
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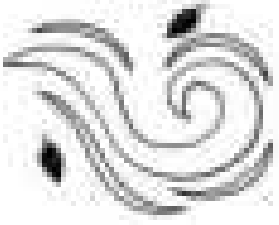
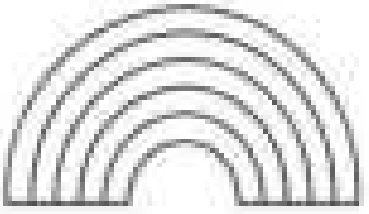
Name: _____ 12

Matter – Yes or No? Is the example matter – yes or no?

Dream	Cereal	Human
		
Yes / No	Yes / No	Yes / No

Love	Time	Idea
		
Yes / No	Yes / No	Yes / No

Flower	Dog	Table
		
Yes / No	Yes / No	Yes / No

Wind	Rainbow	Sunlight
		
Yes / No	Yes / No	Yes / No

PREVIEW

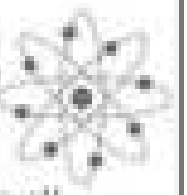
Name: _____ 13

Particle Theory

Particle Theory
The **particle theory** states that all matter is made up of tiny particles that are constantly moving. The speed the particles move depends on which state of matter they are in.

Solids
Particles in solids are held tightly together. They are strongly attracted to each other, meaning they move slowly. These particles vibrate instead of move, but they are not still.

Liquids
Particles [illegible] are fairly close together with some attraction between them. They mo[illegible] all directions, but they can't move too far because they are attrac[illegible] near them.



Gas[illegible]
Particle[illegible] gas[illegible] a[illegible] attraction between them. They move rapidly in all directions. Th[illegible] ea[illegible] and the walls of the container they are in.

PREVIEW

Fill in the Blanks [illegible]ds from the word bank.

Small	Particles	[illegible]	[illegible]oving	Matter
Gas	Solid	Liquid	[illegible]	Weakest

All things we can touch are made up of _____ [illegible] _____ compounds that make up _____. The particle t[illegible]es [illegible]rticles are _____ constantly. They move faster based on which _____ matter they are in. Particles in _____ have the strongest a[illegible] Particles in _____ have the _____. Particles in _____ are fairly close together. The _____ the attraction, the less the particles will move, like in solids.

Draw Add particles (dots) to the beakers to represent which state of matter it is.



Gas **Liquid** **Solid**

© Super Simple Physics [illegible]

Name: _____ 14

All About Solids

All About Solids

A **solid** is one of the states of matter. In a solid, the particles are very closely packed together because they are attracted to each other. The forces between the particles are strong so that the particles cannot move freely. Instead of moving, the particles stay in place and vibrate. As a result, a solid:



- has a definite shape (do not take the shape of their container)
- holds that shape unless an outside force acts upon it (example – cuts it)
- is difficult to compress as the particles are already packed tightly
- is dense because there are many particles packed closely together

Transforming

Solids can be transformed into the other states of matter. When a solid is melted, it becomes a liquid. For example, a frozen ice cube transforms from solid ice to liquid water. A solid can also be transformed into a gas through a process called sublimination. This process happens rarely in nature, however, it can be observed when dry ice turns directly into a gas (carbon dioxide).

PREVIEW

Questions Use information from the text to support your answer.

1) What do you think it means for a solid to have a definite shape? (hint: a gas/liquid does not have a definite shape)

2) How can solids be transformed into other states of matter? Explain.

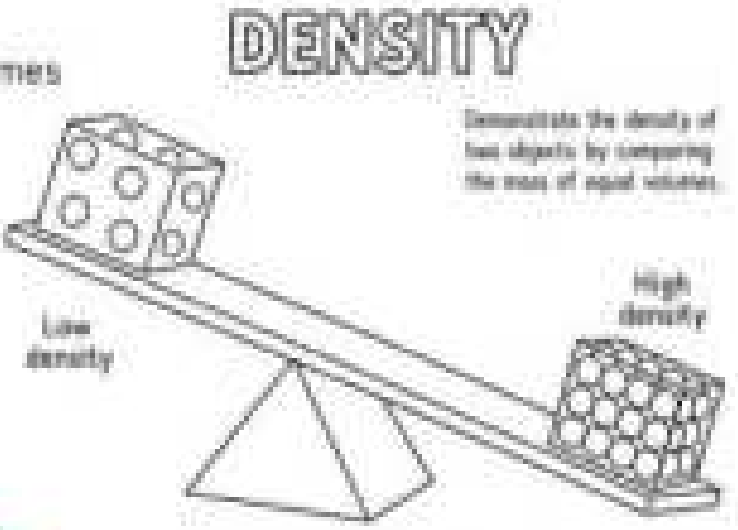
Visualizing What were you picturing while you were reading? Draw it!

Name: _____ 15

Buoyancy - Density Of Solids

Sink or Float?

When we mix a solid with a liquid, sometimes the solid dissolves so we can't see it. Other times, the solid sinks or floats. For exam[illegible]d will sink in water. This is [illegible] sand floated, our [illegible]s!



Density of Sol[illegible]

Solids will sink or f[illegible]ity. Remember that solids are made of particles. **Density** is how [illegible] are. A high dense solid has very tightly packed particles, like a r[illegible]vy compared to their size.

A solid with a low density has l[illegible]. This makes the solid light compared to its size. Examples of solid[illegible] low [illegible]lastic water bottles, paper, leaves, feathers, and sponges.

Density of Water

Water is made of particles as well. So, water has a density too. Water [illegible] can't high or low, it's somewhere in between.



Why Do Solids Sink Or Float?

If a solid has a higher density than water, it will sink. It weighs too much compared to its size, so it cuts right through the water to the bottom.

If a solid has a lower density than water, it will float. When something floats, we say it is **buoyant**. A piece of Lego is buoyant. A brick is not buoyant.

PREVIEW

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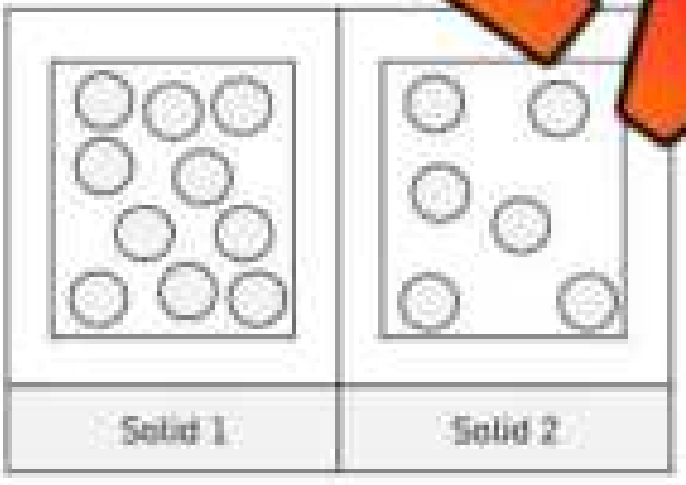
Name: _____ 16

True or False Ice floats in water. Are the statements below true or false?

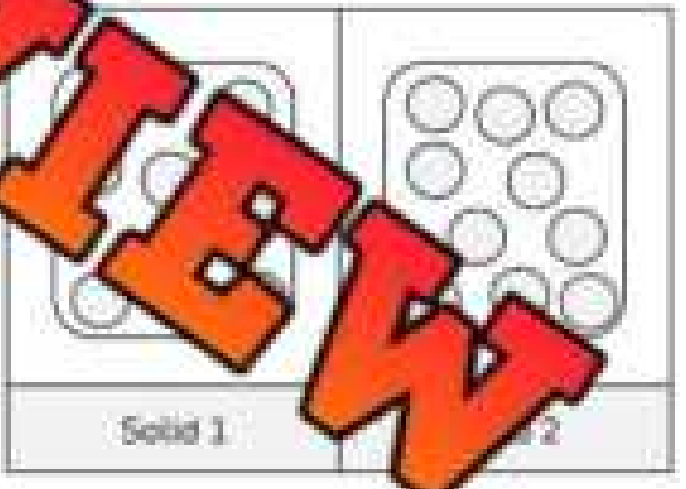
1) Ice is buoyant in water.	True	False
2) Ice has a higher density than water.	True	False
3) Ice is not buoyant in water.	True	False
4) Really [illegible] cubes will sink in water.	True	False
5) One [illegible] more than one cup of water.	True	False

Density W[illegible]er density?

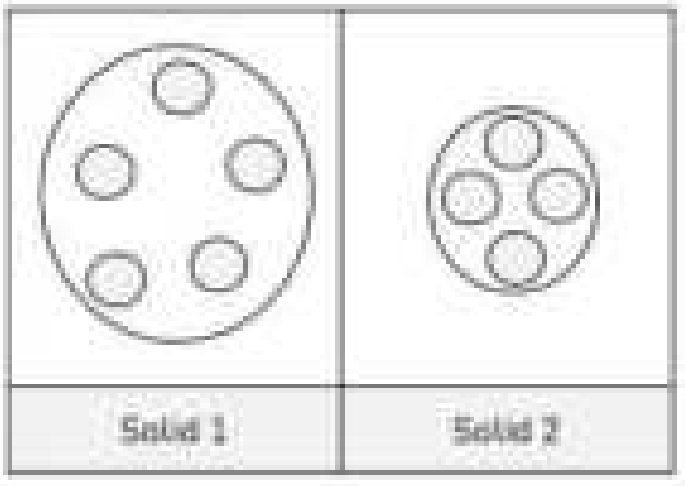
The particles in the [illegible] Circle which solid has a higher density.



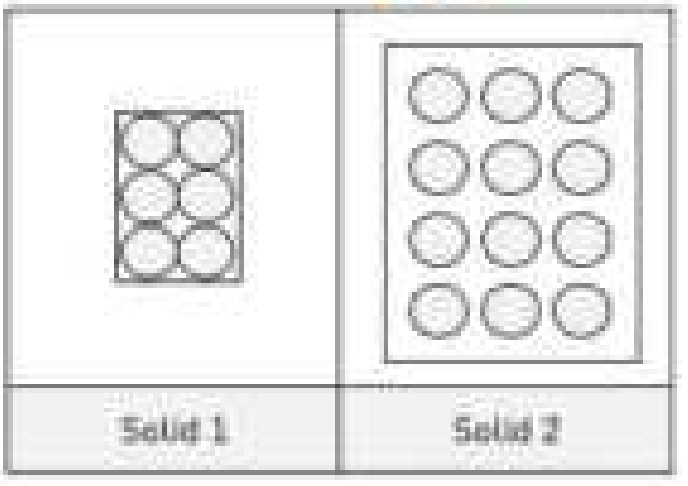
Solid 1 | Solid 2



Solid 1 | Solid 2



Solid 1 | Solid 2



Solid 1 | Solid 2

PREVIEW

Name: _____ 17

All About Liquids

All About Liquids

A **liquid** is one of the states of matter. The forces between the particles cause them to be fairly close together, but they do move around slightly in all directions. As a result, liquids:

- do not have a definite shape
- fill the bottom of a container or spread when they are not contained
- maintain the same volume unless the temperature of the liquid changes
- are difficult to compress because the particles can move and will flow when compressed



Transform[illegible]ids

Liquids can be transformed to a solid or a gas. This happens if the liquid absorbs or releases heat energy. If we release heat from a liquid by p[illegible] it will transform into a solid. This happens when a liquid reaches its freez[illegible]t, which is different for different liquids.

A liquid [illegible] where it will become a gas. For example, water begins to boil at 100° [illegible]. If a [illegible] absorbs enough heat, it could reach its boiling point and become a gas.

PREVIEW

Questions Use information [illegible] your answer.

1) Why do you think liquids flow and fill [illegible] of [illegible]? Explain.

2) How can liquids be transformed into other states of matter? [illegible] ar[illegible]

Making Connections When have you seen a liquid change states? Explain.

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Is the statement true (T) or false (F)?

1) Liquids do not have a definite shape.	T / F
2) Liquids do not take the shape of their container.	T / F
3) All liquids freeze and boil at the same point.	T / F
4) Liquids keep the same volume in different containers.	T / F

Name: _____ | Mark

Is the statement true (T) or false (F)?

1) Liquids do not have a definite shape.	T / F
2) Liquids do not take the shape of their container.	T / F
3) All liquids freeze and boil at the same point.	T / F
4) Liquids keep the same volume in different containers.	T / F

Name: _____ | Mark

Is the statement true (T) or false (F)?

1) Liquids do not have a definite shape.	T / F
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3) All liquids freeze and boil at the same point.	T / F
4) Liquids keep the same volume in different containers.	T / F

Name: _____ | Mark

Is the statement true (T) or false (F)?

1) Liquids do not have a definite shape.	T / F
2) Liquids do not take the shape of their container.	T / F
3) All liquids freeze and boil at the same point.	T / F
4) Liquids keep the same volume in different containers.	T / F

PREVIEW

Name: _____ 19

Experiment - Viscosity

Research Question What are we testing?

Which liquids will be the most viscous (thick), and which will be the least viscous (runny)?



Materials do we need for our experiment?

- Small clear cups
- Small candies
- Various liquids (water, oil, corn syrup, etc.)
- Stopwatch (optional)

PREVIEW

Method How do we complete the experiment?

1) Fill each of the cups full of the different liquids.
2) Drop a candy into the first liquid. Use the stopwatch to time how long it takes to drop to the bottom of the cup.
3) Repeat this step for all liquids.
4) Record the length of time for each liquid on this page.

Hypothesis Which liquid is the thickest (most viscous)? Which is the thinnest (least viscous)?

Most Viscous (thickest) _____

Least Viscous (thinnest) _____

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Name: _____ 20

Observations Record how long the candy takes to sink to the bottom.

Liquid	Prediction (seconds)	Length of time (seconds)

PREVIEW

Results Answer the questions be

1) Was your hypothesis correct or wrong? Did
2) Which liquids flow the fastest?
3) Which liquids flow the slowest?

4) Can you think of a liquid that would flow faster?	
5) Can you think of a liquid that would flow slower?	

Name: _____ 21

Experiment - Weight Of Solid Vs Liquid

Research Question Liquid or solid? Which weighs more?

If we take an ice cube that was made from 25ml of water, does it weigh the same/more/less than 25ml of water?

Hypothesis What will happen? Will the ice weigh the same/more/less than the liquid form?

PREVIEW

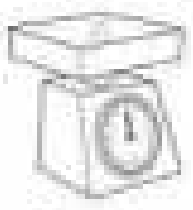
Materials What [illegible] experiment?

- 25ml of water (or other liquid a[illegible] form
- 25ml of other liquid (juice, pop, [illegible]) - optional
- Measuring cup
- Jug of water
- Weight scale



Procedure How will you complete the experiment?

1) Make ice by pouring 25ml of water into ice cube trays. Put tray [illegible] freezer. You could also make ice from other liquids to compare different substances.
2) Once the ice is made, weigh it quickly before it melts. Record the weight on this sheet.



3) Weigh the 25ml of water by putting it in a cup. If you are using a digital scale, use the "tear" button to minus the weight of the cup. If not, you will need to weigh the cup separately and subtract it from your total weight. Record your results.
4) Check your hypothesis. Which weighed more. Fill in the questions on the next page.

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Name: _____ 22

Observations How much does each solid or liquid weigh?

State of Matter	Weight
Solid – Ice Cube	
Liquid - Water	

Results Answ... below.

1) Was your hypo... corre...

2) Why do you think the solid and the liquid we... am...
Hint: Physical or Chemical Change?

3) How do you know that no chemical change has happened? Think back to the 5 signs of chemical changes – odour, precipitate, temperature, colour, and gas (bubbles).

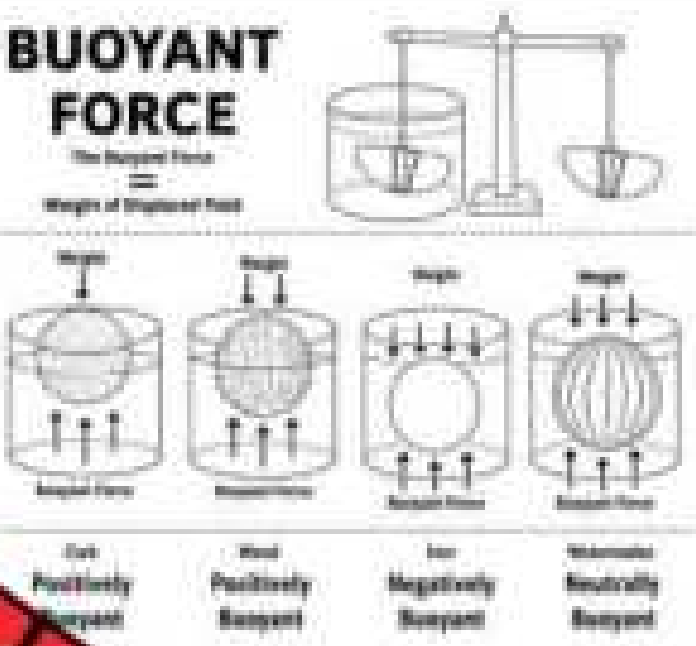
PREVIEW

Name: _____ 26

Buoyancy

What is Buoyancy?

Buoyancy is an upward force created by a fluid that opposes the weight of an object. Buoyancy is why an object sinks or floats when put in a fluid, like water. All objects in water have a buoyant force pushing up against it. Gravity is pulling that object down. If the buoyant force is not strong enough to overcome the weight of the water, it will sink.



Types of Buoyant Forces

Positively Buoyant

An object, like cork, is positively buoyant if its density is less than the fluid it is in. The result will be that the object floats in the fluid. In this graphic, cork is more positively buoyant than wood, but both float in the water, displacing the water and resting on the surface because their density is less than the water. They are both said to be positively buoyant.

Negatively Buoyant

An object is negatively buoyant if it sinks in water. This means if the object has a greater density than the fluid, it will be negatively buoyant. Negatively buoyant objects can vary, meaning some negatively buoyant objects will take time to sink, while other negatively buoyant objects will sink right away, like a large rock. This is because the objects have different densities.

Neutrally Buoyant

A neutrally buoyant object does not sink or float. Instead, it remains balanced at the same level in a fluid. Scuba divers aim to be neutrally buoyant so they cannot feel the force of gravity or buoyancy while they explore underwater. They do this by wearing scuba gear that balances these forces.

PREVIEW

Name _____ 27

Questions Use information from the text to support your answer.

1) Define the buoyancy terms below.	
Positively Buoyant	
Negatively Buoyant	
Neutrally Buoyant	

2) How can you determine the buoyancy of an object?

Examples What objects are positively buoyant, negatively buoyant, neutrally buoyant?

Positively Buoyant	
Negatively Buoyant	
Neutrally Buoyant	

True or False Circle whether the statement is true or false.

1) Steel is positively buoyant.	True	False
2) A good life preserver will be positively buoyant.	True	False
3) Boats are negatively buoyant.	True	False
4) A scuba diver aims to be neutrally buoyant so that can move easier.	True	False
5) A neutrally buoyant object floats for awhile and then sinks.	True	False

PREVIEW

Name: _____ 29

Experiment - Buoyancy of Water

Materials What do we need for our experiment?

- ❑ 3 clear cups or glasses that can fit an egg
- ❑ 1–3 eggs – one will work if you take the egg out each time to test the water
- ❑ 8 tablespoons of salt and sugar
- ❑ Wate
- ❑ Sp



PREVIEW

Procedure How to complete the experiment?

1) Fill the 3 cups
2) Label the cups of the labels – saltwater, control, and sugar water.
3) Put the 8 tablespoons of salt in saltwater. Stir well to dissolve the salt into the water.
4) Put the 8 tablespoons of sugar into the water. Stir well to dissolve the salt into the water.
5) Put the egg in the control glass of water and record what happened. Is the egg buoyant in the water?
6) Put the egg in the sugar water and record what happened. Is the egg buoyant in the sugar water?
7) Put the egg in the saltwater and record what happened. Is the egg buoyant in the saltwater?

Hypothesis Will the egg be buoyant in water, saltwater, sugar water? Rank the types of water providing the most buoyancy to least buoyancy.

Fluid	Buoyancy	
Water	Yes	No
Sugar Water	Yes	No
Saltwater	Yes	No

Fluid	Rank 1 = most buoyant, 3 = least buoyant
Water	
Sugar Water	
Saltwater	

Observations Fill in the tables below based on your observations.

Fluid	Buoyant	
Water	Yes	No
Sugar Water	Yes	No
Saltwater	Yes	No

Fluid	Rank 1 = most buoyant, 3 = least buoyant
Water	
Sugar Water	
Saltwater	

Results ...wer the questions below.

1) W... ct? Did anything surprise you? Explain.

2) Why was the egg buoyant i... Explain using the terms density, volume, and mass.

3) Could someone using the same amount of salt and sugar, but di... water get different results? Explain.

4) If you wanted to increase the buoyancy of the water, what could you do? How could you increase the buoyancy of the water so that the egg barely sinks at all.

PREVIEW

Name: _____ 35

Coding - Scuba Diving



PREVIEW

Direction Code the diver to pick up the treasure. Avoid the [illegible]weed! Draw arrows showing the diver's moves ending at the chest.

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19

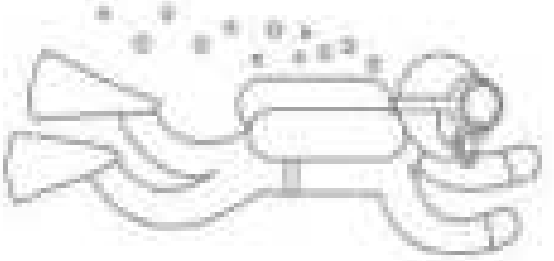
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Name: _____ 36

Scuba Diving Safely

Scuba Diving Safety

Scuba diving is a thrilling activity that allows us to explore the magical world under the sea. However, to enjoy these underwater adventures safely, it's essential to understand the changes in pressure that occur during a dive and how to manage them effectively.



Heading [illegible]r Descending Slowly

Diver[illegible]ly when they start their [illegible]e re[illegible]ow their bodies to adjust to the [illegible]pressu[illegible]more importantly, it help[illegible]ct [illegible]s, our ears are tiny air-filled spaces that need to have the same pressu[illegible]ter [illegible]el comfortable.

This is why divers often [illegible]e down, which is a way of letting more air in to balance the pressure. B[illegible]ding [illegible] divers give their ears a chance to adjust gradual[illegible]

The Dangers of Rising Quickly: Decompression Sickne[illegible]

When diving, the increased pressure causes the body to ab[illegible] more nitrogen gas from the air in the scuba tanks. Normally, this nitrogen is not a problem as it gets naturally breathed out by our lungs.

However, if a diver comes up too quickly, the pressure around them decreases faster than the body can remove the extra nitrogen gas. This can cause the nitrogen to form bubbles inside the diver's body, leading to a condition called decompression sickness, also known as "the bends". This can result in joint pain, dizziness, and even death.

To avoid decompression sickness, divers come up slowly and perform what's known as "decompression stops". These stops are like short breaks at certain depths where the diver waits for a while. This gives their body time to safely release the extra nitrogen gas.

PREVIEW

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Name: _____ 37

Questions Answer the questions below using evidence from the text.

1) Why do scuba divers have to dive down slowly?

2) Why [illegible] have to come up slowly from a deep dive? What do they do?

PREVIEW

Questioning Write 2 questions you [illegible] about

1)	
2)	

True or False Circle whether the statement is true or false.

1) Divers descend quickly at the start of their dive.	True	False
2) Ears need the same pressure inside as the water outside.	True	False
3) Increased pressure causes the body to absorb less nitrogen.	True	False
4) Coming up quickly can lead to decompression sickness.	True	False
5) Decompression stops are breaks to release extra nitrogen safely.	True	False

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Name: _____ 39

Coding Activity - Scuba Diving Safely

In a video game, you need to control the scuba diver to get the treasure safely. You'll need to ensure your diver doesn't descend too quickly, which could cause damage to their ears. You'll also need to make sure they don't get decompression sickness on their way up.

Diving Use this map to write the code on the next page.



PREVIEW

Name: _____ 40

Coding Activity - Scuba Diving Safely

Coding Code the diver to the treasure and then back to its original spot safely.

A **loop** is a code that helps programmers write efficient programs. When you use a loop, you can say how many times you want the commands below it to be repeated.

For example, you might use a loop to move a scuba diver in a [illegible] through the grid.

Move
Move
Collect



Example Codes

- Move up 1 space
- Move down 1 space
- Swim forward 1 space
- Turn around
- Wait 1 minute
- Loop 5 times

PREVIEW

Name: _____ 42

Does Air Have Any Weight?

Research Question What are we testing?

Does air have any weight?

Materials do we need for our experiment?

- 2 b[illegible]ons
- A metre st[illegible]
- String that is about 1 metre long



Procedure How do we do the experiment?

1) Blow up the 2 balloons to the same size.
2) Cut two 15-centimeter-long pieces of string.
3) Attach a balloon to opposite ends of the metre stick using the 15 cm string pieces.
4) Tie the left-over string around the centre point of the metre stick.
5) Hold the string up and observe the balloons.
6) Make a hole in one of the balloons letting the air out.
7) Observe what happens.

PREVIEW

Name: _____ 43



Hypothesis What do you think will happen?

Results Answer the questions below.

1) Which balloon is more?



2) How do you know one balloon is heavier than the other?

3) Does air have any weight? Explain how you know.

PREVIEW

Name: _____ 47

Fact or Fiction – States of Matter

Objective What are we learning about?

Students will explore the properties and behaviors of solids, liquids, and gases. By evaluating fact and fiction statements about matter, students develop critical thinking skills and [illegible]tand how these states of matter differ and interact in real life.

Materials [illegible]eed for the activity?

- Fact or Fi[illegible]nts
- A 'Fact' sign and [illegible] the two sides of the ro[illegible]
- Designated areas in the classroom [illegible] the 'Fact' and 'Fiction' signs, allowing space for students to move to either side.



PREVIEW

Instructions How will you complete the activity?

1) Your teacher will read statements. Pay close attention as each [illegible] shared.
2) Consider carefully whether you think the statement is true or false.
3) If you decide the statement is true, walk to the 'Fact' side of the room.
4) If your guess is that it's not true, move to the 'Fiction' side of the room.
5) Stay on your chosen side and listen attentively for the correct answer to be revealed.
6) When the right answer is announced, return to your seat, ready for the next round.
7) Have fun getting up and moving!

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Name: _____ 48

Fact Or Fiction | Read the statements to the class.

#	Statement	
1	Air is mostly made up of oxygen, with nitrogen being the smallest part.	Fiction
2	Liquids can turn into gases when heated to their boiling point.	Fact
3	Solids can be poured into containers just like liquids.	Fiction
4	Gases spread out to fill the space of any container.	Fact
5	Wat[illegible] most common liquid on Earth.	Fact
6	S[illegible] particles that move freely and quickly.	Fiction
7	[illegible] ed to make soda fizzy.	Fact
8	Solids e[illegible] available in a container.	Fiction
9	Gases are [illegible] there is space between particles.	Fact
10	Liquids have a fixed [illegible] no [illegible].	Fact
11	Solids can change shape [illegible] s on them.	Fact
12	Air cannot be felt because it is in[illegible]	Fiction
13	Liquids always keep the same shape no m[illegible] co[illegible]	Fiction
14	Compressed gas can be stored in strong co[illegible]	Fact
15	Solids have no fixed volume and can expand easi[illegible]	Fiction
16	Liquids take the shape of the container they are in.	[illegible]
17	Gases cannot be compressed because their particles are tight[illegible]	Fiction
18	Heating a solid can make it melt and become a liquid.	Fact
19	Air has colour, which makes it easy to see.	Fiction
20	Solids have a fixed shape and do not take the shape of their container.	Fact
21	Liquids are used in hydraulic systems to transfer force.	Fact
22	Solids are not rigid and can easily change their shape.	Fiction
23	Air is a form of gas that makes up the atmosphere around Earth.	Fact
24	Liquids cannot be squashed because their particles are close together.	Fact
25	Gases move freely and quickly in all directions.	Fact

PREVIEW

Name: _____ 51

Examples of Evaporation

Evaporation at Home

At home, evaporation happens often. We understand that the water used to clean our clothes will evaporate when we hang them or when we put them in a drying machine.

When we spill a drink on a table, we will notice it will dry hours later. This is due to evaporation. If the drink was sugary, there will be a [illegible] on the table.



Evaporation in the Community

In the community, [illegible] during a rainy day, everything is wet and covered in water. Once it stops raining, the process of evaporation will dry up the puddles. If the sun is out, the evaporation process will happen faster.

Evaporation in the Natural Environment

Animals use the process of evaporation to cool them down. They use **evaporative cooling** to regulate their body temperature. They do this by swimming in water or by wallowing in mud. The water is then evaporated off their bodies just like how humans sweat is evaporated.



Some animals also pant, which means they breathe rapidly with their mouth open to increase evaporation from the hot air they release from their mouths.

In the natural environment, we will notice that water levels in ponds, lakes, and rivers will lower after several hot days without rain. Rainfall will often even out the evaporation. When we see rain, it is because water from rivers, lakes, and ponds is evaporated and formed into a raincloud. Evaporation is key for our water cycle.

PREVIEW

Name: _____ 52

Questions Use information from the text to support your answer.

1) What is evaporation?

2) When did you see evaporation today or recently? Describe it.

PREVIEW

Examples Write examples of evaporation in the settings below.

At Home	
In the Community	
In the Natural Environment	

Name: _____ 53

Lab Experiment – Evaporation

Research Question What are we trying to answer?

1) What happens to water after it rains?
2) How does the sun, shade, and wind affect the process of evaporation?

Hypothesis Answer the research questions below before you do the experiment.

1) What happens to water after it rains?

2) How does the sun affect evaporation? Does shade speed up or slow down evaporation?

3) How does wind affect evaporation?

PREVIEW

Materials What will you need for the experiment?

1) Pail/cup of water for each student
2) Paintbrush for each student
3) Chalk for each student
4) Stopwatch – optional

Procedure How will you complete the experiment?

1) Go outside and use the water and paintbrush to paint a simple picture on pavement in the sun.
2) Use the chalk to make an outline of your picture.
3) Use the results page to track how your picture looks after 2 minutes, 5 minutes, and 10 minutes.
4) Next, complete the steps above in a new shady location. Compare the results.
5) Lastly, complete the steps above but this time, blow on your picture or use a fan to simulate wind. You could also draw your picture on the side of the school as it will receive more wind than the pavement.

Name: _____ 54

Observations Fill in the table below as you complete the experiment.

Location	Time	Observations – Examples Below – No evaporation – Half evaporated – Completed evaporated
Sunny Location	After 2 Minutes	
	After 5 Minutes	
	10 Minutes	
Shady Location	After 2 Minutes	
	After 5 Minutes	
	After 10 Minutes	
Windy Location	After 2 Minutes	
	After 5 Minutes	
	After 10 Minutes	

PREVIEW

Results Answer the research questions now that you have completed the experiment.

1) What happens to water after it rains?

2) How does the sun affect evaporation? Does shade speed up or slow down evaporation?

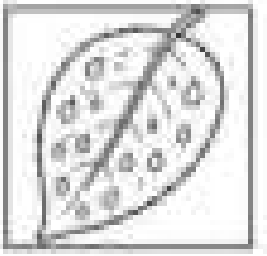
3) How does wind affect evaporation?

Name: _____ 55

Condensation

What Is Condensation?
Condensation is when water changes from a gas to a liquid. Condensation is the opposite of evaporation, which is the changing of water from a liquid to a gas.

Why Does Condensation Happen?
Condensation happens when a gas touches a cooler surface. The cooler surface will cause the gas to release heat. When the gas cools, the particles [illegible] slow down, causing them to be more attracted to each oth[illegible] into water droplets.



Con[illegible]
Have [illegible] your cold drink "sweats" on a hot day? Well, your drink doesn't actually sweat, [illegible] is occurring. On a hot day, there is a lot of water vapour in the [illegible] of e[illegible]. When this warm air makes contact with your cold glass, the wa[illegible]our [illegible]ses on the side of your glass. This forms water droplets on the [illegible]

Water Cycle – Formation of C[illegible]
Condensation is very important [illegible] w[illegible] from lakes, rivers, and oceans evaporate, the water vapour goes up i[illegible]mos[illegible]esn't disappear! Instead, it rises until it comes into contact with a cooler surf[illegible]our[illegible]here, the water vapour commonly clings to dust particles, salt [illegible], bac[illegible] released from volcanoes.

We usually think of clouds only being in the sky, [illegible]en be [illegible]ground level too! When we see a cloud near the ground, we call it fog[illegible]hr[illegible]t like walking through a cloud!

PREVIEW

Visualizing What were you picturing while you were reading? Draw

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Name: _____ 56

Multiple Choice Circle the correct answer.

1) Condensation is when...	2) Condensation happens when...
a) vapour/gas turns into a liquid	a) water vapour suddenly freezes
b) liquids turn into a gas	b) water droplets form a liquid
c) a solid melts into a liquid	c) water freezes into ice
d) a gas turns into a solid	d) water heats up into a vapour

Fill in the ...ll in the blanks using words from the word bank.

Word Bank				
Condensation	...uids	Condenses	Vapour	Volcanoes
Droplets	...ter	...aces	Cold	

Condensation occurs wh... ...evaporated and _____ into water droplets. _____ from the evaporation collects on a _____ surface. This can be ...en ...t drink has water _____ on the can. The process of the ... ...er droplets is called _____. A common exampl... ...formation of _____. Evaporated water from lakes, rivers, and o... _____ in the air, like dust, salt, bacteria, or even ash...

Question What is happening in the picture?



_____

_____

_____

_____

_____

PREVIEW

Name: _____ SB

Examples of Condensation

Condensation at Home

- A dehumidifier draws in warm air into its system. The warm air has water in it, that is condensed on a freezing cold coil. The condensed water is dropped into a bucket that can be discarded. Dehumidifiers are used to dry out a room that has been flooded or that has a lot of moisture in the air. They are commonly used in basements.



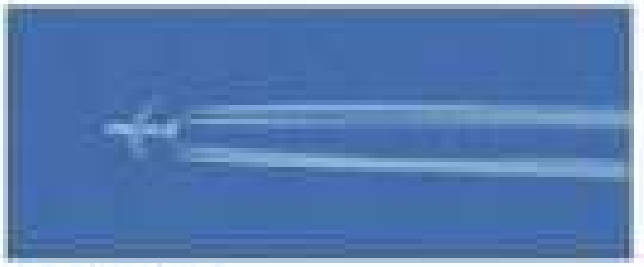
- [illegible] a shower happens because of condensation. The water vapour condenses on the cooler surface of the mirror.
- Foggy eyeglasses happen when your glasses are cooler than the environment around them. This can happen during a workout, when your face is warm and sweaty. It could also happen when you go outside on a hot day after your glasses have been in the air conditioning.

PREVIEW

Condensation in the Environment

- Condensation causes morning dew on the grass. It [illegible] a warm day is followed by a cool night. During the warm day, water evaporates into the air. When nighttime comes, the warm ground will begin to cool and [illegible] the moisture. At a certain temperature called the dew point, water vapour in the air will begin to condense faster than the water is evaporating. The water condenses on grass, leaves, vehicles, spider webs and anything cool it can cling to.
- Clouds are the most commonly seen example of condensation in our environment.

Condensation in the Community



- Contrails are vapour trails in the sky made by aircrafts. This is not pollution. Instead, it is water vapour released by the aircraft's engine condensing in the colder air temperature.

Name: _____ SV

Questions Answer the questions below using evidence from the text.

1) Why do glasses fog up?

2) Why is there often dew on the grass in the morning?

PREVIEW

Examples Write [illegible] condensation in the settings below.

At Home	
In the Community	
In the Natural Environment	

Name: _____ 60

Lab Experiment – Condensation

Research Question What are we trying to answer?

Will hot water evaporate and condense on a colder surface? What will happen with the condensed water droplets?

Hypothesis Answer the research questions below before you do the experiment.

1) Will hot water evaporate and condense on a colder surface? Explain.

2) What will happen with the condensed water droplets?

PREVIEW

Materials What will you need for the experiment?

- 1 cup per group/person (glass or see-through)
- 1 plate per group/person
- Approximately 5-10 ice cubes per group
- Hot Water



Procedure How will you complete the experiment?

1) Pour about 5-10cm of hot water into the cup.
2) Quickly put the plate on top of the cup and let it sit for about 30-40 seconds.
3) Put your ice cubes on top of the plate.
4) Record what happens!

Name: _____ 61

Observations Fill in the table below as you complete the experiment.

Steps	What Happened
After hot water was poured and the plate was placed on top	
After the ice was added to the	

PREVIEW

Results Answer the research question after you have completed the experiment.

1) How was this experiment an example of condensation?

2) When the water poured down the side of the glass, what did that [illegible] environment?

3) Why did the water pour down the sides of the cup? How does this relate to our real-world water cycle?

Name: _____ 62

Melting and Freezing

What is Melting?

Melting is the process of a solid changing into a liquid when heat is applied. For example, an ice cube in a freezer will remain a solid because there is no heat added. If you take the ice cube out of the freezer, the room temperature is warmer, which means the ice will absorb the heat.

The heat will cause the particles inside the solid to move. This will cause the particles to spread out and flow into the bottom of the container they are held in.

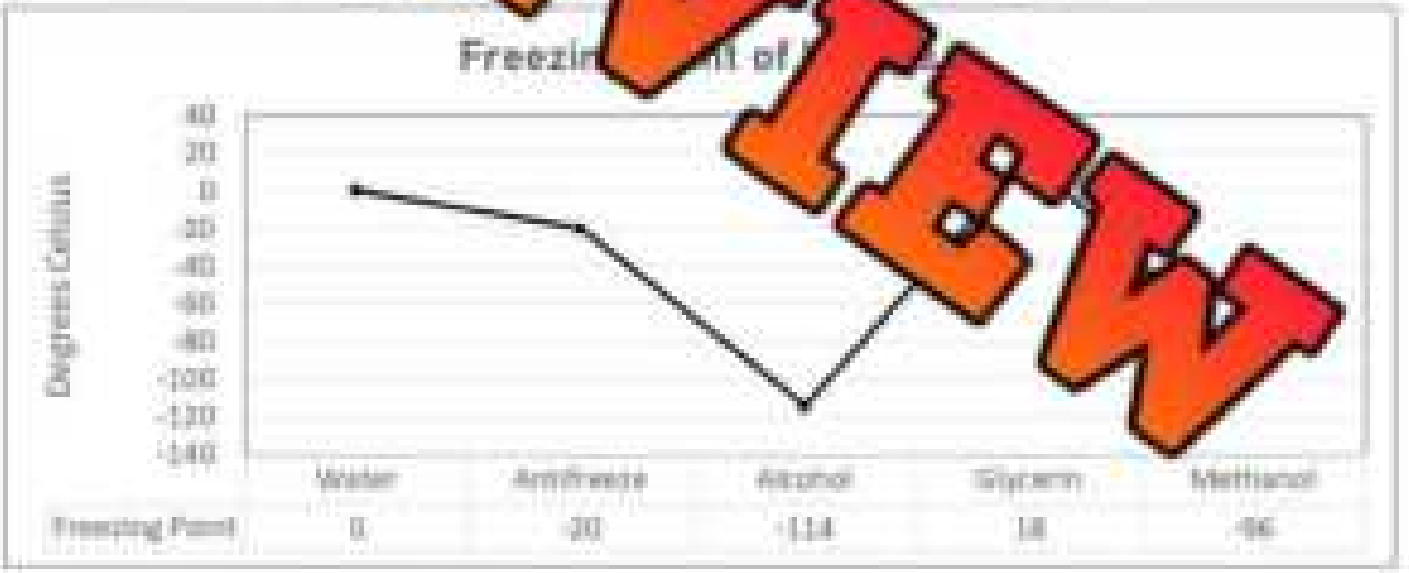
What is a Melting Point?

All solids have a melting point. The melting point for ice is 0° C. If you put an ice cube in a freezer and then bring it outside into an environment of 10° C, it will stay a solid because it hasn't reached its melting point.



Freezing and Freezing Points

Freezing is the opposite of melting. It is when a liquid changes state to a solid. Different liquids have different freezing points. Water has a freezing point of 0 degrees Celsius. Check out the graph below to see other liquids freezing points.



Understanding Science to Help Our Lives

Water will freeze at 0° C, which means it would not make good anti-freeze for your car. Anti-freeze is used to stop water from freezing and damaging a car's engine. Anti-freeze is made of ethylene glycol, which has a freezing point of -20° C.



Windshield wiper fluid is made of methanol. Methanol has a freezing point of -96° C. This makes it a great choice to clean our windshields on extremely cold days!

PREVIEW

Name: _____ 63

Fill in the Blanks

Fill in the blanks using words from the word bank.



Word Bank				
Solid	Melting	Liquid	Temperature	Same
Gas	Boiling			

Melting occurs when a _____ reaches a temperature warmer than its _____ point, turning it into a _____. For example, an ice cube melts at a _____ warmer than 0 degrees Celsius. The melting point is the _____ g point! Liquids don't melt, however they do have a _____ ge states into a _____.

PREVIEW

Questions

Fill in [illegible] from the word bank.

1) Explain how melting and [illegible] anges in states.

2) Why is it helpful to understand freezing points, espe[illegible] wi[illegible]

Making Connections

What does the reading remind you of in your life?

Name _____ 64

Lab Experiment – Melting



Research Question What question are we trying to answer?

How does salt, sugar, hot water, and cold water affect the melting process? Will applying these substances to ice slow down or speed up the melting process?

Hypothesis Answer the research questions below before you do the experiment.

1) Which of the substances above will speed up the melting process?

2) Which of the substances above will slow down the melting process? Explain.

Which will melt first? Rank (1–5) with 1 being the first to melt and 5 being the last to melt	
Control – Just Ice	
Sugar	
Cold Water	

PREVIEW

Materials What will you need for the experiment?

1) Small plastic cups (mini-solo cups)
2) Water (hot and cold)
3) Salt
4) Sugar
5) Muffin Tin



Procedure How will you complete the experiment?

1) Fill 5 plastic cups with the same amount of water in each
2) Put them in the freezer overnight
3) Pop the ice out of each cup. You may need to cut the cup around the ice
4) Place one ice cup in each compartment in a muffin tin
5) Pour hot water on one ice cup, cold water on another, salt on another, and sugar on another. Leave one of the ice cups as is. This will be the control. Consider labeling the muffin tins so you can remember how you treated each ice cup.
6) Record the order in which the ice cups melt by checking frequently

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Name: _____ 65

Observations Fill in the table below as you complete the experiment.

Step	What Happened – Which is melting the fastest? Slowest?
After 10 Minutes	
After 30 Minutes	
After 1	
Aft…	

Results Answer… …ow that you have completed the experiment.

1) What surprised you abo… …? … get wrong from your hypothesis?

2) Why do you think the cold water melted the ice cup fas… …e untreated (control)?

3) Why do people use salt on their driveway or steps in the winter to melt the snow or ice? Why don't they use hot water?

PREVIEW

Name: _____ 67

Sublimation

What is Sublimation?

Sublimation is the process of a solid changing directly into a gas. Sublimation does not happen very often in our day-to-day lives. Only a small number of compounds can change from a solid directly to a gas. For example, carbon dioxide can transform from dry ice (frozen carbon dioxide) to carbon-dioxide gas.

Why Does Sublimation Happen?

Sublimation happens when a solid absorbs heat energy so quickly from its surroundings that it never melts, it changes directly into a gas. The solid absorbs so much heat energy that the particles in the solid go from being strongly attracted to loosely attracted. The particles then begin to vibrate faster and move to fill the shape of the container.



Examples of Sublimation

- When snow melts it turns into water vapour
- Freezer burn on food when water turns from ice to water vapour
- Dry ice – frozen carbon dioxide changes into carbon dioxide gas
- Mothballs – made of naphthalene changes from solid mothballs to a gas during the summer months. Sublimation can take one-year.

PREVIEW

Draw Draw the particles in the solid, gas, and heat is absorbed by the solid.

Particles in a Solid	Particles in a Gas

Question Why does sublimation happen? Explain.

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Name: _____ 68

Definitions

What do the terms below mean?

Sublimination	
Dry Ice	

Yes or No

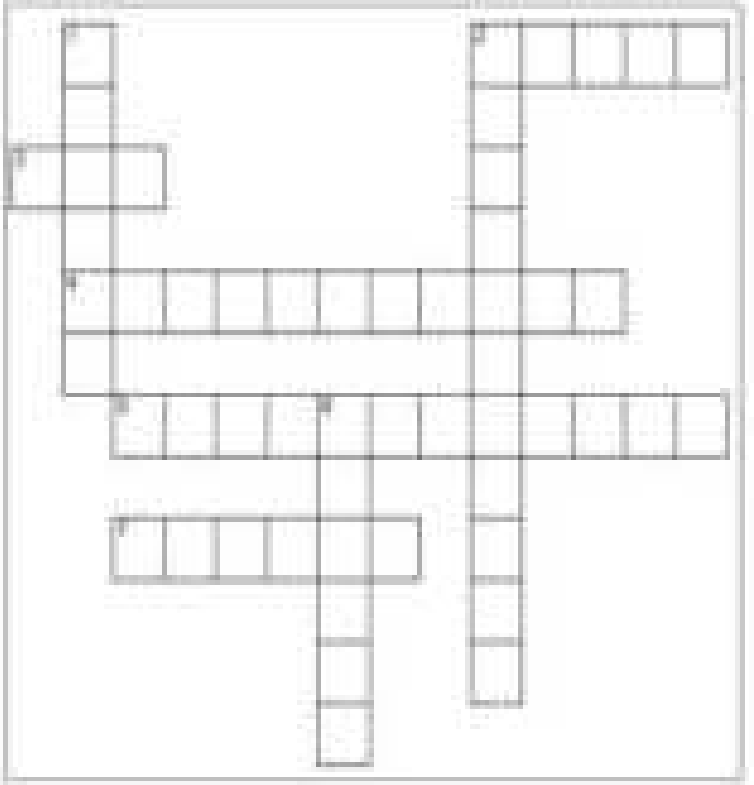
Is the scenario an example of sublimination?

1)	[illegible]	Yes	No
2)	[illegible] carbon dioxide	Yes	No
3)	A milk[illegible]	Yes	No
4)	Ice crystals [illegible]	Yes	No
5)	Ice gradually disap[illegible] ing slushy and wet	Yes	No
6)	Your sunglasses fog up	Yes	No

PREVIEW

Crossword

Fill in the crossword using the [illegible]



Across

2. First [illegible]
3. Final stage of [illegible]
4. Matter changing [illegible] to a gas
5. Matter changing from a gas to a liquid
7. Has weight and takes up space

Down

1. Solid, Liquid, Gas
2. Process of a solid turning into a gas
6. Needed to create conditions for matter to change states

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Match each internal force to its correct definition.

Sublimation	❑ The gas form of water.
Dry Ice	❑ A change of state where a solid changes directly into a gas.
Water Vapour	❑ Energy absorbed by a solid that allows its particles to move faster.
Heat Energy	❑ Frozen carbon dioxide that changes directly into a gas.

Name: _____ Mark

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Name: _____ Mark

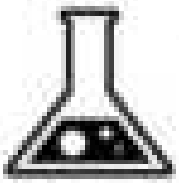
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PREVIEW

Name: _____ 71

Changes in States of Matter



When matter changes state, it goes through a process. These processes will be explored below.

Matching

Draw a line connecting the process to the definition and to its example.

TERM	DEFINITION	Example
Evaporation	When vapour or gas turns into a liquid.	Dry ice
Condensation	When a solid turns into a [illegible]	Frost on a leaf
Sublimation	[illegible] turning from [illegible]	A cold drink has water droplets on the outside
Fusion (melting)	[illegible] directi[illegible] solid	A wet shirt is drying on a clothesline
Solidification (freezing)	When anything [illegible] into a gas witho[illegible] becoming liquid.	An ice cube tray [illegible] filled with [illegible]r and put [illegible] the freezer
Deposition	When a liquid turns into a solid.	

PREVIEW

Which Process?

Which process has happened when the matter changed states?

Change of State Scenario	Process
1) The grease from the bacon in my frying pan is now thick like butter.	
2) Butter in a hot pan is now a liquid.	
3) Your glasses fog up on a cold day.	
4) Frozen vapour crystals appear on a window.	
5) A wet floor that was just mopped is now dry.	
6) A solid air freshener releases a nice smell and slowly disappears.	

Name: _____ 72

Instruction Start at the START box and follow the pathway by choosing the correct answer to each question about changes of state. Continue through the maze until you reach the FINISH box.



PREVIEW

Name: _____ 73

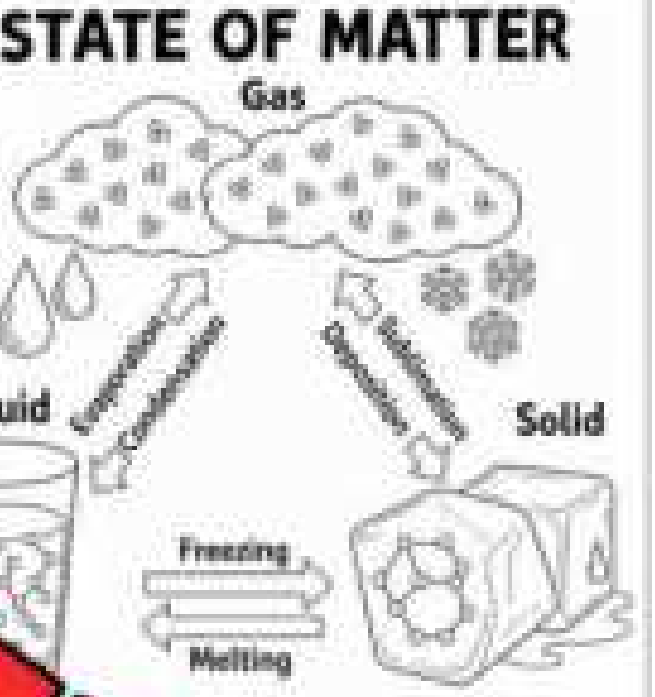
Changes in State - Physical Changes Involving Heat

Changes in State – Physical Changes

When a solid, liquid or gas changes state, they have completed a physical change. Changes in state are reversible because no new substance is formed. The matter's chemical [illegible] the exact same.

[illegible] has the chemical [illegible] oxygen (H_2O).

It does not matter [illegible] is in liquid form, gas form [illegible] form, it still has the same chemical [illegible] of H_2O.



PREVIEW

Changes in State Involve Heat

When matter changes state, it can be reversed [illegible] heat. When matter absorbs heat, it could undergo [illegible] evaporation, melting (fusion), or sublimation.

When matter releases heat, it could undergo the process [illegible] freezing (solidification), condensation or deposition.

Heat changes the particles in matter by changing the attractions between particles. When heat is absorbed by matter, the particles in the matter lose attraction and begin to move faster. They collide with each other and spread out, changing the state to a liquid or a gas.

When heat is released by matter, the particles in the matter gain attraction and get closer together. If enough heat is released, the particles may slow down and begin to vibrate instead of move, causing a change of state to a solid.

Name: _____ 74

Matter and Heat How is heat affecting the matter below?

Matter	Heat	New State of Matter?	Particles Movement – Circle One		
Water	Absorbed		Vibrate	Slow	Fast
Water	Released		Vibrate	Slow	Fast
Ice	Absorbed		Vibrate	Slow	Fast
Vapour			Vibrate	Slow	Fast

Questions Answer the questions below using evidence from the text.

1) If matter is left in ... heat added or released), will it change phases? Explain using an example.

2) What happens when heat is released by matter?

Visualizing Draw what you were picturing while you were reading. Explain the picture.

PREVIEW

Name: _____ 76

Experiment – Water Cycle

Research Question How does water move through our environment?

How does the heating and cooling of water move water around our environment?

Materials What do we need?

- ✓ La…
- ✓ …small
- ✓ Plastic w…
- ✓ String or la… ber …
- ✓ Hot water – optio… …an u… water as well
- ✓ Ice Cubes – optional



PREVIEW

Method How do we complete the experime…

1) Place the cup or mug in the middle of the bowl.
2) Fill the bowl with hot water about 2/3 of the way up. Do n… …ide the cup.
3) Cover the bowl with the plastic wrap. Wrap the elastic or use the string to secure the plastic to the top of the bowl.
4) Place a few ice cubes on the plastic wrap above the cup.
5) If you used cold water, put the bowl in the sun for a couple of hours.
6) If you used hot water, you should see condensation clinging to the plastic wrap.
7) Label the diagram on the next page.

Diagram Label the diagram using the word bank.

Precipitation	Condensation	Collection	Evaporation



PREVIEW

Results Label the stages of the water cycle below.

The water that is in the cup	
When the water went up to the top of the bowl	
When the water stuck to the plastic wrap	
When the water fell from the plastic wrap	

Name: _____ 85

Chemical Vs Physical Change

Physical Changes

A **physical change** happens when matter changes its appearance. If you take a piece of paper and rip it in half, the paper has been physically changed. It simply looks different. A physical change is reversible as a new substance is not formed. You could tape or glue the paper back together and reverse the change. A chemical change on the other hand, is irreversible.

Chemical Changes

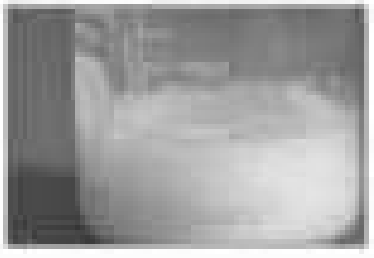
In a **chemical change,** the atoms in the matter connect differently to form a new substance with different characteristics than the original matter. When you mix Kool-Aid with water, it is a chemical change because the atoms in the Kool-Aid connect with the water molecules in order to change the matter completely. The changed matter is now Kool-Aid.

We know if a chemical change has occurred if any of these five signs have happened:

Colour Change	[illegible]	Change in Temperature
Gas has Formed		Solid has Formed

Examples of Chemical Changes

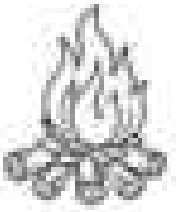
Rust is an example of a chemical change. [illegible] occurs and the change is irreversible. **Rusting** is also called [illegible] process where metal reacts with oxygen in the air as well as [illegible] in the air. The combination of metal, air, and water produces a new substance called **rust.** The equation for rust is: iron + oxygen + water.



Another example of a chemical change is when we mix baking soda with vinegar. The sodium bicarbonate (baking soda) reacts with the acetic acid and water (vinegar) which produces carbon dioxide that we can see in the form of bubbles releasing into the air. You may also smell the new substance, which tells us a chemical reaction has happened.



Physical Change
The tree has not changed it has just been broken into two pieces. This change can be reversed.



Chemical Change
The wood has been chemically changed because it is turning into ashes. You cannot turn the ashes back into wood.

PREVIEW

Name: _____ 86

Making Connections What does the reading remind you of in your life?

True or F C r the statement is true or false.

1) A chemical ch when to form ice.	True	False
2) A physical change is eated.	True	False
3) A chemical change is irrev tance is formed.	True	False
4) Rust occurs when iron, air, and wat mbin	True	False
5) Cutting down a tree is a physical change.	True	False

Questions Use information from the text to suppo we

1) What is a chemical change? Provide an example.

2) What is the difference between a chemical and physical change?

PREVIEW

Name _____ 87

Chemical Vs Physical Changes

Fill in the Blanks Fill in the blanks using words from the word bank.

Word Bank				
Reversible	Matter	Irreversible	Chemically	Physically

A chemical change is _____, while a physical change is _____. _____ can change both _____ and _____.

Physical or Chemical ...e a physical or chemical change?

A paper is cut in...	Physical	Chemical
Batter turns into...	Physical	Chemical
A glass breaks on the...	...sical	Chemical
A can is crushed		Chemical
A fire burning wood	...sical	Chemical
Food digesting in your body	...ysical	...mical
Mixing sand and water		
A knife that is rusting	Physical	

Questions Use information from the text to support your answers.

1) How do you know if matter has changed chemically or physically?

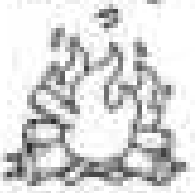
2) Why is salt mixing with water a physical change?

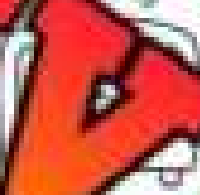
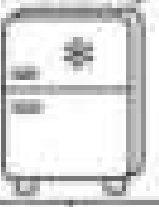
PREVIEW

Name: _____ 89

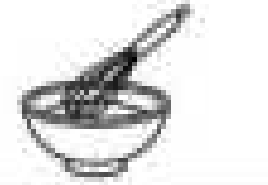
Activity – Physical or Chemical Change

Directions Is the picture showing a chemical or physical change?

Cutting Hair	Burning	Boiling
		
Physical / Chemical	Physical / Chemical	Physical / Chemical

Chopping	[illegible]king	Freezing
		
Physical / Chemical	Physical / [illegible]	[illegible]ical / Chemical

Boiled Egg	Drilling	[illegible]
		
Physical / Chemical	Physical / Chemical	Physical / Chemical

Rotting Food	Fireworks	Mixing
		
Physical / Chemical	Physical / Chemical	Physical / Chemical

PREVIEW

Name: _____ 90

Experiment – Whipping Cream Physical Change

Research Question | Is making whipped cream a physical change?

If we mix and stir whipping cream, will the cream change? Will it be a chemical or physical change?

Hypothesis | What will happen? Made a prediction.

	Hypothesis – Prediction
1) What will happen when the cream is mixed?	
2) Will the change be physical or chemical?	Physical Chemical

PREVIEW

Materials | What will you need for the experiment?

- A glass jar with a lid
- Whipping cream
- Stopwatch, clock



Procedure | How will you complete the experiment?

1) Fill the jar about half full of whipping cream.
2) Check the time and begin to shake the jar. Pass it around to students, letting them have a turn to shake the jar.
3) Continue shaking the jar until changes begin to happen to the whipping cream. When whipped cream is made, fill in the observations on the back of the page, noting how long it took for the whipping cream to change into whipped cream.
4) Continue shaking the jar until the cream changes into butter. Note how long it took.

Name: _____ 91

Observations What happened?

Changes	Time – How Long	Chemical or Physical Change?
To Make Whipped Cream		Chemical Physical
To Make Butter		Chemical Physical

What cha[illegible]appened to the whipping cream?

Results Answer [illegible]

1) Do you think these chang[illegible]ph[illegible]ical? Explain your thoughts.

2) Draw a diagram of the experiment. Draw the jar, whipping cream, and someone shaking it.

PREVIEW

Name: _____ 93

Evidence of a Chemical Change

Evidence of a Chemical Change
It can sometimes be difficult to tell if a substance has undergone a chemical change. We can use the signs below to help us tell if a chemical change has occurred.

1) Colour Change
If matter has changed colour, it may have undergone a chemical change. For example, a bike that begins to rust will have orange spots on it. This change from gr[illegible] tells us a chemical change has happened.
[illegible]ng to water is **not** a chemical change. Although the water has [illegible] actually reverse the change if we boil the water and collect the wa[illegible] the process of condensation.



2) Change in [illegible]
When we can smel[illegible] matter, we know a chemical change has [illegible]. This [illegible] often with food as it begins to spoil. Rotten milk will have a dif[illegible]he[illegible]milk. This tells us that the milk has undergone an irreversible chem[illegible]

3) Change in Temperature
When matter changes its temperature, we k[illegible]chem[illegible]e has happened. A common example of this is when we burn [illegible]. This [illegible] temperature before it is on fire, but once on fire, [illegible]ch he[illegible]mperature! Another example would be fireworks. When you buy [illegible]ar[illegible] room temperature, but when you shoot it off, it will be h[illegible]t[illegible] lands.

4) Formation of a Precipitate
A solid is known as a precipitate. If matter begins to form a solid inside, we know a chemical change may have occurred. Remember the rotten milk from above? Spoiled milk will form solid chunks in it. These chunks are precipitates, and they tell us a chemical change has happened. This process is irreversible, so it is time to get rid of the milk!



5) Formation of a Gas
Gas bubbles will appear when some chemical changes happen. When we mix vinegar and baking soda, a new mixture will form and begin to foam up with carbon dioxide gas. Another example is that delicious cake that has tiny holes in it when you cut into it.

PREVIEW

Name: _____ 94

Making Connections When have you seen each of the signs of chemical changes?

Sign	Your Experience – Example: a loaf of bread turned green and smelled bad
New Odour	
Temperature Change	
New Colour	
Gas	
New Precipitate(s)	

PREVIEW

True or False Circle whether the statement is true or false.

1) Adding food colouring to water is a chemical change.	True	False
2) Cookies that come out of the oven hot have changed chemically.	True	False
3) When matter shows one of the 5 signs, it has undergone a chemical change.	True	False
4) When leaves change colour, they have changed chemically.	True	False
5) Adding chunks of clay to water is a chemical change because a precipitate has formed.	True	False

Questions Use information from the text to support your answer.

A muffin that was just baked is a chemical change. Explain why using 4 of the 5 signs.

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the blanks using the word bank.

Colour change	Odour	Mark
Gas	Precipitate	

1) A new _____ may be produced when vinegar and baking soda react.
2) Rust forming on iron is an example of a _____ that shows chemical change.
3) Rotten milk has a different _____ than fresh milk.
4) Solid chunks that form during a chemical reaction are called a _____.

Name: _____

Fill in the blanks using the word bank.

Colour change	Odour	Mark
Gas	Precipitate	

1) A new _____ may be produced when vinegar and baking soda react.
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Colour change	Odour	Mark
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4) Solid chunks that form during a chemical reaction are called a _____.

PREVIEW

Name: _____ 104

Using Solids - Real-World Applications

Properties of Solids

Solids have the following general properties:

- Rigid
- Fixed shape
- Fixed volume
- Cannot be compressed (squashed)



Applications of Solids

Solids are used in many structures we have in our lives. We use solids because they are rigid, have a fixed shape, have a fixed volume, and they cannot be squashed.

Solids are **rigid**, which means they have a certain structure that will not change shape. Solids are great to build structures and tend to be strong. A chair is made of rigid solids, like wood, steel, and plastic.

Having a **fixed shape** means the solid will not change shape when you move it or apply pressure to it. A **fixed volume** means solids occupy the same amount of space. A desk has a fixed shape that does not change volume. This is helpful so you can work on the desk and know it won't change shape. A teacher appreciates that it has a fixed volume, meaning it won't grow!

Solids cannot be **compressed**, meaning you can't squeeze them. If you're thinking a sponge is a solid that you can squeeze, your misunderstanding that the solid has air inside that you are squeezing.



Solids need to be strong and stable, which is why it is good they can't be compressed. If the road vehicles drive on compressed under heavy loads, the road would eventually be very thin. A thin road would crumble under the changing weather and heavy loads.

PREVIEW

Name: _____ 105

Making Connections What does this remind you of in your life?

Questions Ans... using evidence from the text.

1) What are the 4 ph...

2) How would life be different if solids were n... a fixed shape?

PREVIEW

True Or False Is the statement true or false?

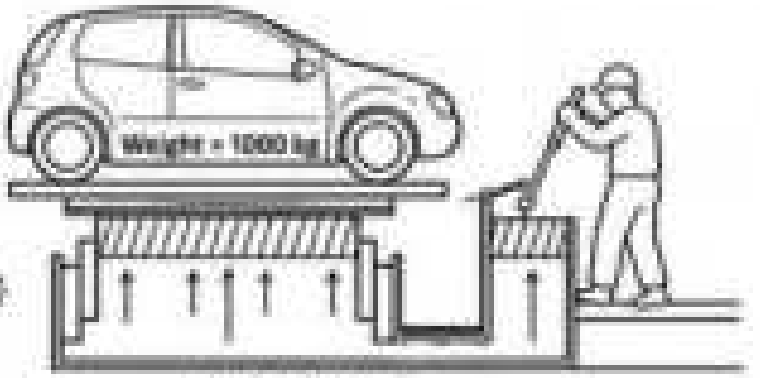
1) Solids have no fixed volume and can grow to take up more space.	True	False
2) Solids are rigid, meaning they have a certain structure.	True	False
3) Solids do not change shape easily but will under strong forces.	True	False
4) Solids can be compressed because a sponge can be compressed.	True	False
5) A road is made of solids that cannot be compressed.	True	False

Name _____ 107

Using Liquids – Real-World Applications

Properties of Liquids

- Not rigid
- No fixed shape
- Fixed volume
- Cannot be compressed (squashed)



hydraulic crane

Applications

Liquids are used in many ways in our lives because of their properties.

1) We use liquid lubricants so that friction doesn't cause the engine to seize. Oil is the [illegible] engines. The liquid oil can change its shape to fit into all [illegible] moving parts do not rub together.

2) Liquids are used in hydraulic systems to generate [illegible] forces. Liquids cannot be compressed, so when a piston pushes [illegible] liquid, the liquid pushes a piston on the other side of the hydraulic system [illegible] transmits our force from one place to another.

When we use a smaller piston to move a larger piston, our force is multiplied, allowing us to generate more force.



Hydraulic brakes use our force on the brake pedal to stop the wheels on our tires.

3) Liquids have a fixed volume, meaning they will take up the same amount of space regardless of how you position the liquid. When you fill your bottle with water, you can move the bottle around and the liquid will not expand or condense. It will continue to take up the exact same amount of space.

PREVIEW

Name: _____ 108

Questions Answer the questions below using evidence from the text.

1) What are the 4 properties of a liquid?

2) How do hydraulic system use liquids to generate force?

PREVIEW

Visualizing Draw what you were reading. Explain the picture.

True Or False Circle whether the statement is true or false.

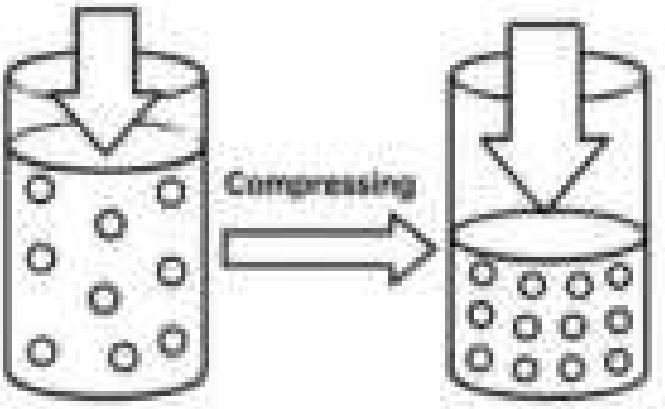
1) A hydraulic system needs liquids to be compressible.	True	False
2) A hydraulic system transmits force from one place to another.	True	False
3) A backhoe uses hydraulic systems.	True	False
4) Liquids have a fixed volume that doesn't grow or shrink.	True	False
5) If you shake a water bottle, the water will expand and pop the bottle.	True	False

Name _____ 109

Using Gases – Real-World Applications

Properties of Liquids

- Not rigid
- No fixed shape
- No fixed volume
- Can be compressed (squashed)



Compressed Gases

Gases are unique in that which allows humans to use them to their advantage.

Compressed gas is a gas that had its pressure increased by the reduction of its volume. Compressed gas is stored in strong containers that can support the pressure created by the gas or the force of the gas.

The diagram shows how gas is compressed so that the particles of the gas are forced to occupy a smaller volume due to compressive forces. Gas can be compressed because its particles are spread out. When compressed gas is stored, it will create a force when it is released because the particles will move quickly to expand all over their new container.



Applications of Gases

- Carbon Dioxide in Soda – Carbon dioxide is compressed inside soda cans to give the delicious acidic flavour and fizz. It is stored inside a can and not a juice box because the can is able to hold the compressed gas. When you open the can, the carbon dioxide gas rushes out.
- Hairspray – Gas is compressed in hairspray bottles. It is mixed with the hairspray product. When you push the button, the gas rushes out along with the hairspray. This is why you need to shake the bottle before pressing the button.
- Air Compressor – Gas is stored in a tank so that it can create a force used in nail guns, paint sprayers, and many other tools.

PREVIEW

Name _____ 110

Questions Answer the questions below using evidence from the text.

1) What are the 4 properties of a gas?

2) What [illegible] gas? How does it create a force?

3) How does a hairspray bottle [illegible]

PREVIEW

Making Connections What does this remind you of in your life? Writ[illegible]

Name: _____ 111

Swim Bladder - Buoyancy

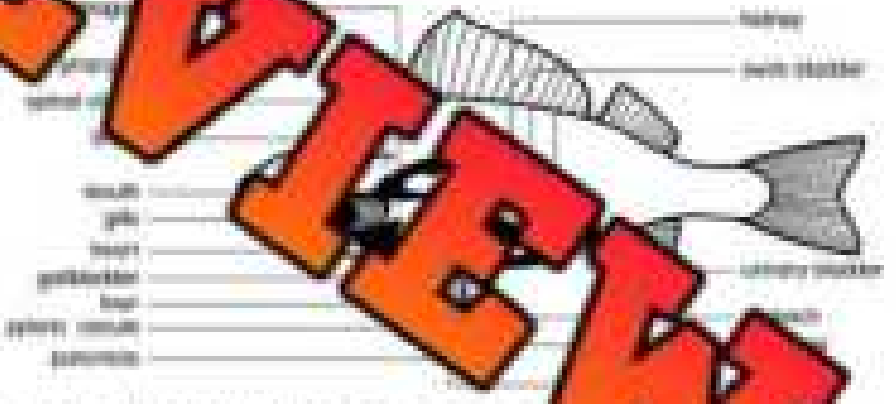
The Swim Bladder – A Fish's Buoyancy Tool
The swim bladder works like a little inflatable balloon within a fish. The bladder can be filled with gas or deflated as needed.

Swim Bladder in Action

- Going Deeper: If a fish wants to go deeper into the water, it lets some gas out of its swim bladder. This increases the fish's density, making it heavier than the surrounding water, which causes it to sink.

- [illegible] the surface, the fish fills its swim bladder with more gas. This increases its volume, making it lighter than the water around it, and it floats up.

- Staying Level: [illegible] at the same depth, it can adjust the amount of gas in its swim bladder to match the density of the water. This way, the fish can maintain a steady position without sinking or floating.



PREVIEW

This is the key concept of buoyancy: objects that are denser than the water will sink, and objects that are less dens[illegible] adjusting its density, a fish has the ability to control its position in th[illegible]r.

Fish Swim Bladders and Submarines – A Similar Technique
Just like fish, submarines also use the principle of buoyancy to move up and down in the water. Submarines have special tanks that can be filled with water or air.

- Diving: When a submarine needs to dive, it fills its tanks with water. This makes the submarine denser than the water around it, so it sinks.

- Surfacing: To rise to the surface, the submarine pumps the water out of the tanks and fills them with air. This makes the submarine less dense, and it floats to the surface.

© Super Simple Physics

Name: _____ 112

Questions Answer the questions below using evidence from the text.

1) How does a fish use a swim bladder to control its depth in water?

2) How do [illegible] go up and down in the water?

Diagram Draw diagrams of a fish [illegible] and a submarine with its ballast tanks. Explain the [illegible]

PREVIEW

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Fill in the blanks using the word bank.

Gas	Buoyancy	Mark
Submarine	Density	

1) The ability of an object to float or sink in water is called _____.

2) Letting out air to sink deeper increases a fish's _____.

3) A machine that rises and sinks in water like a fish is a _____.

4) The substance inside a bladder or tank that controls floating is _____.

Name: _____

Fill in the blanks using the word bank.

Gas	Buoyancy	Mark
Submarine	Density	

1) The ability of an object to float or sink in water is called _____.

2) Letting out air to sink deeper increases a fish's _____.

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Fill in the blanks using the word bank.

Gas	Buoyancy	Mark
Submarine	Density	

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Name: _____

Fill in the blanks using the word bank.

Gas	Buoyancy	Mark
Submarine	Density	

1) The ability of an object to float or sink in water is called _____.

2) Letting out air to sink deeper increases a fish's _____.

3) A machine that rises and sinks in water like a fish is a _____.

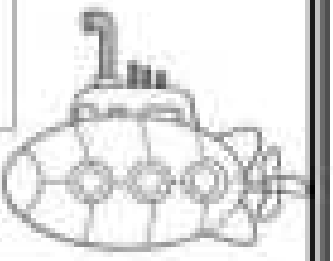
4) The substance inside a bladder or tank that controls floating is _____.

PREVIEW

Name: _____ 114

Coding Activity - Submarine Adventure

Code the submarine to take pictures of the underwater objects. You will use the grid on this page to write your code on the next page. Your submarine will add water to its ballast tanks to move down and release water and add air to its tanks to move up.



Mapping Use this map to write the code on the next page.



PREVIEW

Name: _____ 115

Coding Activity - Submarine Adventure

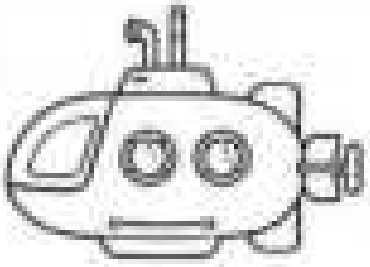
Coding Write code that gets the submarine to the different objects underwater.



Wh... you w... to ... to have the s... water to its ta... to release water ...

Example codes:

- Add water to tank
- Move down to (1, 1)
- Take picture of anchor



Code

PREVIEW

Question What are submarines useful for?

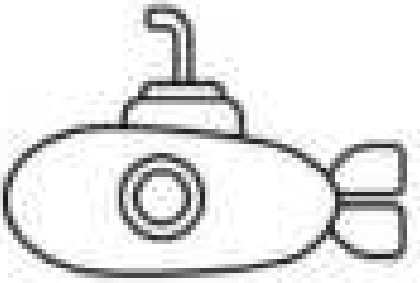
Name: _____ 116

STEM Assignment - Designing A Submarine

Create your own submarine that can dive deep into the ocean.

What tools does your submarine need?
- Periscope, sonar system, ballast tanks, propeller, GPS, oxygen tanks, lights, carbon dioxide scrubbers (to get rid of CO_2 we breathe out)

What is your submarine capable of doing?
- Can it [illegible] anywhere in the ocean?
- Can it [illegible]ickly?
- Can [illegible]?
- [illegible] the bottom of the ocean?



What is your submarine designed to do?
- Will it see[illegible] underground?
- Will it be u[illegible]rism [illegible]ple to shipwrecks?
- Will it be used [illegible]val ships?

PREVIEW

Questions Answer the qu[illegible]bo[illegible]arine below.

1) What is the name of your submarine?

2) What tools will your submarine have?

3) What is your submarine capable of doing?

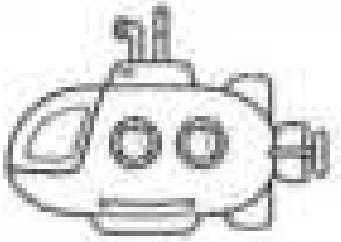
4) What will your submarine be designed to do? What is the goal of using the submarine?

Name: _____ 117

Write simple If/Then statements so that the operator of the submarine can move the sub and perform the tasks it needs to do.

IF the up arrow button is pressed

THEN release ballast water and add air



IF/THEN Write code for each tool that your submarine has so that you can control the tools.

IF

THEN

IF

THEN

IF

THEN

IF

THEN

IF

THEN

IF

THEN

IF

THEN

PREVIEW

Name: _____ 126

Memory Game: Matter, States, And Properties

Objective What are we learning about?

The goal of this activity is to help students understand matter, its states, and properties such as density, buoyancy, compressibility, and volume. Students will match key terms with their correct definitions or examples.

Materials What will you need for the activity?

- Memory game cards with terms on one set & matching definitions on the other
- A flat surface like a table or floor to lay out the cards.



Instructions How will you complete the activity?

1) Divide the class into groups of 3 or 4. Give each group a set of Memory Game cards. (Provided)
2) Have each group lay all the cards face down in a grid on a flat surface.
3) Each group takes turns flipping over two cards at a time, aiming to find a matching term and definition.
4) If a student finds a match, they remove those cards from the grid and keep them.
5) If the cards do not match, they are turned back over, and the next student takes a turn.
6) The game continues until all the cards have been matched.
7) After the game, review each term and its meaning with the class.
8) Discuss how matter and its properties like buoyancy, density, and compressibility are used in everyday life.

PREVIEW

© Super Simple Science

Name: _____ 121

Cards | Memory Game Cards

Term	Definition
Buoyancy	The upward force that helps objects float.
	Has a fixed shape and volume.
Air Compressor	...stores and ...ssed air.
Density	How tightly ma...er is packed into a space.
Oxygen	The gas we breathe in to live.

PREVIEW

Name: _____ 122

Cards | Memory Game Cards

Term	Definition
Condensation	When a gas cools and changes into a liquid.
Hydraulics	The use of liquid pressure to move or lift objects.
Matter	Anything that has mass and takes up space.
Carbon Dioxide	A gas people breathe out that plants use to make food.
Compressibility	How much a substance can be squeezed or squished.

PREVIEW

© Super Simple Science

Name: _____ 123

Cards | Memory Game Cards

Term	Definition
Swim Bladder	A gas-filled organ that helps fish float or sink.
[illegible]	The amount of space an object takes up.
Liquid	[illegible] volume but [illegible] shape [illegible].
Nitrogen	The main gas in air, about 78 percent.
Evaporation	When a liquid turns into a gas.

PREVIEW

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Name: _____ L24

Cards | Memory Game Cards

Term	Definition
Gas	Has no fixed shape or volume and spreads out easily.
	A mixture of gases surrounding the Earth.
Mass	[illegible] of matter [illegible]
Water Pressure	The force water p[illegible]es with when moved or squeezed.
Atom	The smallest particle that makes up all matter.

PREVIEW

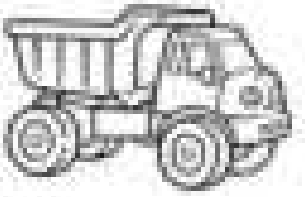
© Super Simple Science

Name: _____ 129

Chemical Change – Making Plastic

How is Plastic Made?

Plastic is a very important material that is used to make many objects in our lives. To make plastic, chemical changes are made to different materials.



How Plastic Is Made

1) Oil is [illegible] from the ground.
2) The [illegible], making a new chemical called naphtha (NAP-THA).
3) [illegible] with naphtha to make plastic.
4) [illegible] a liquid.
5) Dyes are [illegible] to change the colour.
6) The liquid is [illegible] shapes with the plastic.



PREVIEW

Questions Answer the qu[illegible]

1) Summarize how plastic is made i[illegible] own

2) Look around, what plastic things do you see?

Yes/No Is the answer yes or no?

1) Is making plastic a chemical change?	Yes	No
2) When oil is pulled out of the ground, is the oil changed chemically?	Yes	No
3) When the oil is heated, is it a physical change?	Yes	No
4) When the liquid plastic is poured into a form, is it changed chemically?	Yes	No
5) When the plastic is melted, is it changed physically?	Yes	No

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Check only the facts.

- ☐ Heating oil is one step of making plastic.
- ☐ Plastic is made directly from water.
- ☐ Making plastic is a chemical change.
- ☐ Melting plastic into a liquid is a physical change.
- ☐ Plastic is poured into a mould to give it a shape.
- ☐ Melted plastic creates a new substance.
- ☐ Oil is taken from underground before it is used to make plastic.
- ☐ Adding dye changes the colour of the plastic.
- ☐ Plastic can be made without any chemicals.

Name: _____ Mark

Check only the facts.

- ☐ Heating oil is one step of making plastic.
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- ☐ Plastic can be made without any chemicals.

PREVIEW

Name: _____ 134

Types of Packaging

Different Types of Packaging Materials
Almost everything we buy comes in a package. Food, toys, electronics and more are usually wrapped in some form of package that protects the product inside. The problem is that all packaging is waste. This is because we don't buy the product for the packaging. The packaging is extra and unwanted. Some types of packaging are better for the environment than others. Check out the list below.



Plastic	
Advantages	...stic has a low cost, is durable, lasts a long time, is light-weight, and can ... many different ways (shrink wrap, hard plastic covering, bottles,
Disadvantages	...adable, which means it won't break down naturally. We ... to ... plastic pollution. Some plastics can leak chemicals ... food.

Advantages	Cardboard ... to ... ight for people to carry. Businesses can print th... ... Cardboard can be easily recycled. Cardboard is ... degr...
Disadvantages	Cardboard isn't as durable as pl... wood ... damaged by water (rain). Cardboard does not prot... ...oro... ...ell because it can be damaged (deformed) easily.

Aluminum	
Advantages	Aluminum is 100 percent recyclable. It can be repur... ...back in a store in as little as two months. Aluminum as the ...e rate at 68 percent. It is also inexpensive.
Disadvantages	Aluminum is a non-renewable resource, which means when we run out of aluminum, it is gone forever. To make aluminum, a lot of energy is burned. Some research suggests that aluminum could be bad for our health.

Glass	
Advantages	Glass keeps the contents fresh. No chemicals will leech into the food or drinks. Glass can store contents for a long time. Glass is 100 percent recyclable. They can be washed and reused as well.
Disadvantages	Glass costs a lot, which means the product costs more. It can be broken easily when being moved around. If glass is not recycled, it can take up to 1 million years to fully decompose.

PREVIEW

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Name: _____ 135

Questions Answer the questions below using evidence from the text.

1) What is packaging? What are the four main types of packaging?

2) Why is choosing packaging materials an important choice? Explain some of the advantages and disadvantages in your answer.

PREVIEW

Reflection Which packaging material is the best?

True or False Is the statement true or false?

1) Plastic is biodegradable and will break down naturally.	T	F
2) Some plastics can be harmful to eat and drink out of.	T	F
3) Cardboard is biodegradable and will break down naturally.	T	F
4) Glass is biodegradable and better for the environment.	T	F
5) All packaging needs to be recycled, especially glass, plastic, and aluminum.	T	F

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Name: _____ 137

Decreasing Waste – The Three R's

Decreasing Waste

We all know that waste is not good for our environment. When waste ends up in our environment, it is pollution that affects our air quality as well as our ecosystems. Plants and animals suffer when we produce too much waste. That is why we all need to work together to decrease the amount of waste we produce.

The Three

To keep t[illegible]ple, Canadians and people around the world have been learning about t[illegible]educe, reuse, recycle. By following the three R's, we can decr[illegible]aste we produce.

PREVIEW

Reduce

We can reduc[illegible] by [illegible]ng less. The less we buy, the less waste we will have. When [illegible]uy [illegible]d to make sure we use them and try to choose packages th[illegible]ecyclable. For example, buying plastic water bottles and then [illegible]age is terrible for the environment.

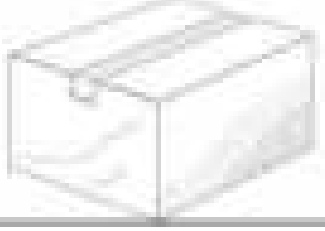
We should reduce the amount [illegible] purchase by buying a reusable water bottle. We can also [illegible] how many things we are buying. Sometimes we buy things we do[illegible]en we don't use them. Most of the time, these things end up [illegible]

Reuse

Reusing items instead of throwing them away is another way to reduce waste. When we buy new items, we throw out our older stuff, which adds to the landfills and causes pollution. You should consider reusing [illegible]posing items before buying new. For example, you can reuse paper by writing on the back of a page or using scrap paper for less important things.

Recycle

Recycling is making new products out of already used materials that would have been otherwise thrown away. When we recycle materials, they are sent to factories to be sorted and eventually reused for new products. The recycled materials like plastic, cardboard, and metal are made into new products. This means those plastics, carboards, and metals never end up as waste, since they are always being used.



© Super Simple Books

Name: _____ 138

Questions Answer the questions below using evidence from the text.

1) What can we do to decrease the amount of waste we make?

2) Which R do you think you need to work on the most?

Summarize What is the [illegible] summarize using the important details.

True or False Is the statement true or false?

1) We need to decrease our waste to keep our environment healthy.	True	False
2) Doing the three R's will decrease the amount of waste we make.	True	False
3) We should recycle everything we are throwing away.	True	False
4) We can reduce the number of things we buy.	True	False
5) We don't need to worry about which type of package a product comes in.	True	False

PREVIEW

Name: _____ 139

Beyond The Three R's

Beyond the Three R's

Waste is a big problem and the three R's are a great start to solving it. But there is more we can do to stop how much we are wasting. We should consider the new 7 R's! Calgary is the world's cleanest city, and they do it by having their residents follow the 7 R's. Beyond the three r's, we can add 4 more – Refuse, Repair, Regift, and Recover.

PREVIEW

Refuse

The term refuse means all things left over after use. It is similar to waste, but waste is anything left over that cannot be recycled. When we buy things, we should consider anything refuse that will be leftover after we use the item. We should ask ourselves:

- Is this product recyclable or can I find something else with less packaging?
- Do I need this product?
- Is this product recyclable?



Repair

We quite often buy new things because our old things have stopped working. To cut down on waste, we should consider repairing what we already own. For example, our old shoes can have new soles put on them to allow them to last longer. We could also get our TV or washing machines fixed before buying new ones.

Regift

If we have items that we don't like anymore, we shouldn't just throw them in the trash. Instead, we can regift them to someone who will appreciate them. If you post these items for free, you will quite often find someone who will love them. This means the item did not end up in the trash and it is helping someone else.

Recover or Rot (Compost)

We need to remember that organic waste is helpful for our environment. We should never throw away food scraps, glass clippings and other organic waste because we can compost it. Composting organic waste means the waste becomes nutrient rich soil. Allowing organic waste to rot in composters is good for our environment.



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Name: _____ 340

Questions Answer the questions below using evidence from the text.

1) What can we do beyond the 3 R's?

2) Does the city or town you live in have thrift shops? Can you easily regift or sell some of your old t

PREVIEW

Making Connections Wh is nd you of in your life?

True or False Is the statement true or false?

1) Letting organic material rot is good for our environment.	True	False
2) Throwing out old food is okay because it is old.	True	False
3) We can reduce waste by regifting or reselling our old stuff.	True	False
4) Refuse is only the leftover waste that can't be recycled.	True	False
5) You can repair your old things, so you don't have to throw them away.	True	False

Name: _____ 1A3

Rate the Impact

Many product we use every day are made by people (manufactured). Some products have a bigger impact on the environment that others.

- Look at each product in the table.
- Rate its environmental impact from 1 to 5 stars.
- 1 star = low impact (better for the environment)
- 5 stars = high impact (worse for the environment)
- Shade the stars to show your rating.
- Write a sentence to explain why you gave that rating.



Product	Rate the Impact	Explain your Rating
Glass Jar	☆☆☆☆☆	
Plastic Bag	☆☆☆☆☆	
Aluminum Can	☆☆☆☆☆	
Paper Notebook	☆☆☆☆☆	
Rubber tire	☆☆☆☆☆	
Cotton T-shirt	☆☆☆☆☆	
Plastic water Bottle	☆☆☆☆☆	

Think More! Which product has the highest impact? Which has the lowest? Why?

PREVIEW

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Name: _____ 144

Coding – Supercomputers Predicting Weather

A **meteorologist** is someone who studies the air to predict the weather. Meteorologists use the temperatures of the air as well as the air movement to predict if it will rain, snow, or storm.



Meteorologists need data to make their predictions. They get their data from satellites in the sky. These satellites move around the Earth, taking pictures and tracking the movement of air.

On [illegible] supercomputers used by meteorologists can process quadrillions of calculati[illegible]cond. The data from the satellites is automatically sent to these comput[illegible]ual sets of code. The supercomputers make models of what the weat[illegible] meteorologists can study them. All of this is possible becau[illegible]comp[illegible]at tell the technology what to do.

PREVIEW

Fill in the Blanks [illegible] wo[illegible]ds to fill in the blanks.

models	coding	data	weather

1) A meteorologist is someone who stud[illegible]

2) Meteorologists can predict the _____

3) Satellites collect _____ fro[illegible]

4) Supercomputers make _____ of what the w[illegible]ok like.

5) We wouldn't be able to predict the weather without _____

Directions Read the if statement and come up with your own then statement.

1)	If it is cold outside	then	
2)	If it is going to rain today	then	
3)	If it is going to snow today	then	
4)	If there is lightning today	then	

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Name: _____ 145

Investigate – Local Weather

Weather Reports
A weather report is a prediction of what the skies will bring to an area. The weather report uses tools and data to measure the air pressure, wind speed, and movement of weather fronts.

The data from these tools give meteorologists the ability to make strong predictions of the upcoming weather. The weather report predicts the short-term forecast (usually 36 hours) with a higher accuracy than the 14-day forecast.

Weather ...rmation about your local weather.

Weather ...	Information
Ta...	
Relative H...	
Wind Speed and Di...	
Probability of Precipitation (P...	
Type of Precipitation	
Sunny/Cloudy?	



PREVIEW

Questions Answer the questions below.

1) How does the weather look for the next couple of days?

2) Is there any extreme weather coming in the next 14 days – snowstorms or lightning?

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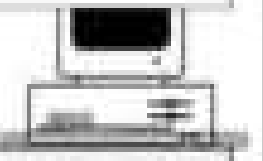
Name: _____ 147

Writing Code – Weather Reports

When data is collected from supercomputers, codes are used to display predictions about the weather. Check out the example below.

Input	Output
dark clouds full of rain are coming	It will rain today
winds ar[illegible]ong, over 100 kph	It will be windy and a tornado is possible
the tem[illegible]s 2° C	The temperature is cool, almost freezing

Coding Wr[illegible] code that goes with the inputted data.



Input	Outputs
There are no clouds in the[illegible]	
The wind is 0kph	
The temperature is 25° C	

Input	Outputs
Lightning clouds are on the way	
The wind is weak at 5kph	
The temperature is 20° C	

Input	Outputs
Clouds full of water are coming	
The wind is 15kph	
The temperature is -30° C	

PREVIEW

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Name: _____ 148

Coding: Storing Data – Weather Forecast

When we write code, we sometimes need to store data to be used later. We can store the data and name it a variable. A **variable** is a quantity that changes. We can use letters or words to represent the changing quantity.

Example – A program that collects data from a supercomputer.

```
Fetch [rainfall percentage] as the variable [rain]
Display [rain] on the screen
IF [rain] [illegible]e than 50%
Then [illegible] "probably rain today"
```



PREVIEW

Coding Write [illegible] that collects wind, rain, and temperature data and displays it as [illegible] on the screen.

1)

2)

3)

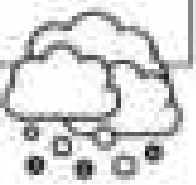
Name: _____ 1&9

If/Else Statements – Predicting Weather

When precipitation is expected, the precipitation can take the form of rain, snow, sleet or freezing rain. An if statement could be used to display which type of precipitation will fall.

Remember:

- **Rain** – starts as snow and melts in warm air and stays melted (liquid)
- **Freezing rain** – starts as snow and then melts in warm air and refreezes on the ground because it is frozen
- **Sleet** – starts as snow and melts in warm air and then refreezes before reaches the ground
- **Snow** – starts as snow and stays frozen



Directions Display which type of weather is coming. Write the THEN statements that would follow the if statements.

1) IF the snow melts and stays melted

THEN display, "

2) IF the snow melts and stays melted

3) IF the snow stays frozen

4) IF the snow melts and then refreezes before reaching the ground

PREVIEW

Directions Draw one screen of the app displaying one of the then statements above



Name: _____ 150

Coding – Excavator Hydraulic System

An excavator operator uses a control pad to move the boom and the bucket around. The boom is the long arm that the bucket attaches to. The boom moves left, right, up and down. The bucket moves up and down only.

Together, the boom and bucket allow the excavator to lift up to 5,000 kg (over 10,000 lbs). Hydraulic systems use liquids to generate more force to lift these massive loads.



To control the control pad, coding is used. If the operator moves the [illegible] left, then the boom moves to the left. If the operator [illegible] bucket down, then the bucket moves down and [illegible]

PREVIEW

Directions [illegible] done.

1) The operator sees [illegible] they need to lower the bucket and then scoop it up and then dump [illegible]

Turn boom _____

Move bucket _____

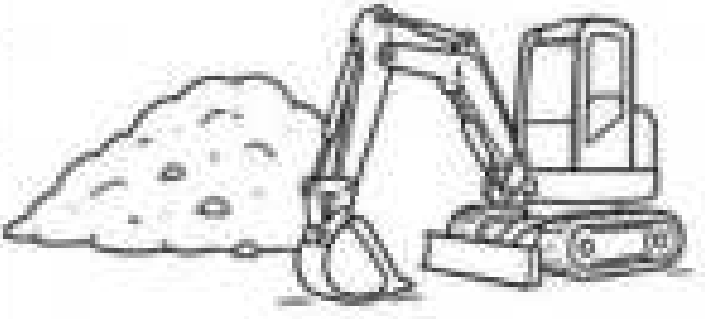
Move bucket _____

Turn boom _____

Move bucket _____



2) The operator needs to pick up dirt from their right this time. The bucket is lowered already, so they just need to scoop up the dirt and then dump it back where they started.



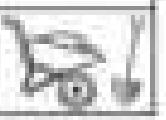
Name: _____ 151

If Then Conditional Statements – Activity

Directions Follow the if/then statements to move the backhoe to the job site.

1)	If matter can only be a liquid or solid	then	Move down 3 spots
2)	If the particles in solids are tightly packed	then	Move right 4 spots
3)	If a [illegible] takes the shape of its container	then	Move down 3 spots
4)	If [illegible] the shape of its container	then	Move right 4 spots
5)	If [illegible] of water is 10 degrees C	then	Move down 3 spots
6)	If chem[illegible]s [illegible]ible	then	Move left 5 spots
7)	If cutting [illegible] tree i[illegible] change	then	Move right 4 spots
8)	If a new odou[illegible] [illegible]ange	then	Move down 1 spots
9)	If hydraulic systems [illegible]	then	Move up 3 spots
10)	If plastics are made from fossil [illegible]	then	Move down 4 spots





PREVIEW

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Name: _____ 155

Understanding Matter and Energy

Multiple Choice | Circle the best answer. Only choose 1 answer!

1) When glass breaks, which change occurred? a) Chemical Change b) Physical Change c) Particle Change d) All of the above	2) When water mixes with salt, which change occurred? a) Chemical Change b) Physical Change c) Particle Change d) All of the above
3) Ev... and takes up space is... a) Particles b) Sublimation c) Matter d) Energy	4) When a solid turns to a liquid... a) Freezing b) Sublimation c) ...ting (Fusion) d) ...ation
5) When a liquid turns into a solid... a) Freezing b) Sublimation c) Melting (Fusion) d) Evaporation	6) Wh... turns to a gas... a) ...sat... b) ... c) Melti... d) Evaporation
7) When a gas turns into a liquid... a) Condensation b) Sublimation c) Melting (Fusion) d) Evaporation	8) Condensation hap... a) water vapour suddenly ... b) water droplets form a liquid c) water freezes into ice d) water heats up into a vapour
9) When a solid turns directly into a gas... a) Condensation b) Sublimation c) Melting (Fusion) d) Evaporation	10) Adding food colouring to water is a... a) Chemical Change b) Physical Change c) Particle Change d) All of the above

PREVIEW

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Definitions What does each term mean? (1 mark each)

Term	Definition (what does it mean)
Freezing Point	
Matter	
Chem... Ch...	
Phy... Change	

PREVIEW

Short Answer Ans... ...estio... ... – Each question is worth 2 marks

1) Do particles in a solid move faste... ...r t... ...particles in a liquid or a gas?

2) What happens to the particles in a solid when they s... ...e...

3) What is the difference between sublimation and deposition?

4) Explain how water goes through the 3 states of matter?

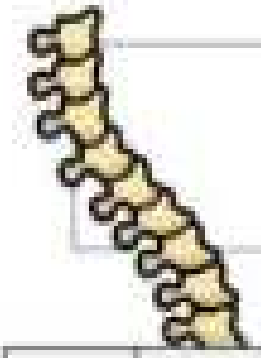
Long Answer | Answer the questions below – Each question is worth 5 marks

1) How does heat affect matter? How does heat change matter from one state to another?
Use some of following terms in your answer:
release, absorb, matter, freeze, melt, evaporate, condense, particles, heat

PREVIEW

2) How does the production of food affect our environment?
Use some of following terms in your answer:
processing, waste, fossil fuels, transportation, [illegible]/physical changes

Workbook Preview



Grade 5 Science Unit

Human Health and Body Systems

	Curriculum Expectations	Pages
B1.1	assess effects of a variety of social and environmental factors on human health, and describe ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial	106-118
B1.2		
B1.3		
B2.1	identify systems of the human body, and describe their basic function	[illegible]-40, 43-46, 49-71, 86-88, 99-105
B2.2	describe the basic structure and function of vital organs in various systems in the human body	12-14, 17-32, 38-40, 43-46, 49-71, 86-88, 99-105
B2.3	describe interrelationships between human body systems	66-71, 86-88, 91-94, 97-98
B2.4	identify various diseases and medical disorders in humans and the organs and/or body system or systems that they affect	72-85, 86-90, 101-102

Preview of 100 pages from this product that contains 217 pages total.

Grade 5 Science Unit

Strand A - STEM Investigation and Communication Skills

	Curriculum Expectations	Pages
A1.1	use a scientific research process and associated skills to conduct investigations	123-124, 130-132
A1.2	use a scientific experimentation process and associated skills to conduct investigations	15-16, 33-34, 84-85
A1.3	use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	41-42, 47-48
A1.4	follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials	15-16, 33-34, 41-42, 47-48, 84-85
A1.5	communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes	15-16, 33-34, 41-42, 47-48, 84-85
A2.1	write and execute code in investigations and when modelling concepts, with a focus on using different methods to store and process data for a variety of purposes	35-37, 95-96, 124-129, 132
A2.2	identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades	35-36, 132
A3.1	describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems	35-36, 123-124, 130-131
A3.2	investigate how science and technology can be used with other subject areas to address real-world problems	35-36, 123-124, 130-132
A3.3	analyse contributions to science and technology from various communities	35-36, 123-124, 130-131

NAME: _____

HUMAN HEALTH AND BODY SYSTEMS



Name: _____ 9

Introduction to Life Systems



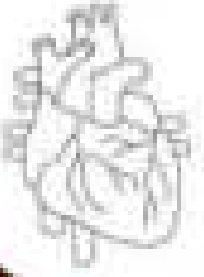
What is a Life System?

To better understand the term life system, it helps to break down the two words. The word **life** means to be alive – to grow and use energy. The word **system** means a combination of things that work together as a whole. Therefore, a **life system** is a group of body parts that work together to allow us to stay alive.

Different Life Systems

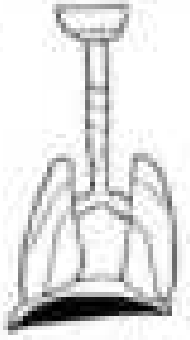
There are 11 different life systems that keep us alive. Some examples of major life systems include, the circulatory system, the respiratory system, the nervous system and the digestive system.

Each of these systems has a unique job the system needs to take care of in order for the body to survive. For example, the circulatory system's main organ is the heart. Humans have two hearts in total.



Interesting Facts about Life Systems

- Your heart will beat about 100,000 times a day, sending blood [illegible] the body
- You have two lungs in your respiratory system, but they are not exactly the same
- Your sense of smell is around 10,000 times more sensitive than you sense of taste
- The brain uses over a quarter of the oxygen used by the human body
- The brain of an adult weighs around 3 pounds (1.5 kg)
- When listening to music, your heartbeat will sync with the rhythm
- Skin is the human body's largest organ
- The largest bone in the body is the femur (thigh bone)
- You can't breathe and swallow at the same time
- A runny nose is the way our bodies flush out germs from our nose when we catch a cold



PREVIEW

Name: _____ 10

True or False: Circle whether the statement is true or false.

1) We have 7 life systems in our bodies.	True	False
2) The lungs are the main organ in the circulatory system.	True	False
3) It is not that important to take care of our life systems.	True	False
4) Our heart beats approximately 100,000 times a day.	True	False
5) Humans have only one organ in each life system.	True	False

Questions: Answer the questions below using evidence from the text.

1) W[illegible] life [illegible]

2) What are organs? List some [illegible] know about.

PREVIEW

Questioning Write 4 questions that you hope to learn more about [illegible] systems.

1)	
2)	
3)	
4)	

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Check only the facts.

- ☐ A life system helps keep us alive.
- ☐ The brain weighs about 3 pounds.
- ☐ Skin is an organ
- ☐ Humans have 87 organs in total.
- ☐ The heart is an organ
- ☐ The circulatory system pumps blood
- ☐ There are 15 different life systems
- ☐ The largest bone is the femur
- ☐ Your heart beats a million times a day

Name: _____ Mark

Check only the facts.

- ☐ A life system helps keep us alive.
- ☐ The brain weighs about 3 pounds.
- ☐ Skin is an organ
- ☐ Humans have 87 organs in total.
- ☐ The heart is an organ
- ☐ The circulatory system pumps blood
- ☐ There are 15 different life systems
- ☐ The largest bone is the femur
- ☐ Your heart beats a million times a day

PREVIEW

Name: _____ 12

Nervous System

What is the Nervous System?

The **nervous system** controls everything we do, including breathing, walking, thinking, and feeling. The nervous system is made up of the brain, spinal cord, and all the nerves in our bodies. These three organs work together to allow us to move and understand the world around us.



How Does [illegible]rvous System Work?

The brain [illegible] centre of the body. It makes the decisions and sends and rece[illegible] from the rest of the body. The spinal cord is the major highw[illegible] these [illegible] to be sent through. The nerves are the smaller roads that reach all [illegible]o

The ner[illegible]m is a[illegible] These three organs work together so that we can sense the wo[illegible]und[illegible] to our surroundings. The nerves in our bodies can sense pai[illegible] [illegible]ickly up through the spinal cord and into the brain. For examp[illegible]ie[illegible] tack, the nerves in your foot will feel pain and send a message [illegible] y[illegible] your foot.

The Brain

The brain is the boss of your body. It control[illegible] even when you're asleep. The brain is made up of the cerebru[illegible]bell[illegible], pituitary gland, and hypothalamus.

Cerebrum	Controls the thinking part of the brain and [illegible]s muscles. It helps us solve math problems, remem[illegible]. The cerebrum is the largest part of the brain, loca[illegible]
Cerebellum	Located at the back of the brain. Controls our balance, m[illegible]ement, and coordination – how our muscles work together.
Brain Stem	Sits beneath the cerebellum connecting the brain to the spinal cord. Controls involuntary muscles – ones we need to work automatically, like breathing, digesting, and keeping our heart beating.
Pituitary Gland	Tiny gland that produces and releases hormones. Hormones are important in many ways, like making us grow!
Hypothalamus	Keeps our body temperature at 37°C by either shivering if were cold or sweating when we are hot. It is located right in the middle of the brain.

PREVIEW

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Name _____ 13

Diagram Fill in the blanks on the diagram using words from the word bank.

Word Bank					
Cerebrum	Cerebellum	Spinal Cord	Brain Stem	Hypothalamus	Pituitary Gland



What happens in your nervous system if you put your hand too close to a fire?

_____

_____

_____

_____

_____

_____

Matching Write the letter from the [illegible] ch nervous system part.

Nervous System Part	Func[illegible] Wh[illegible]
_____ Brain Stem	a) Helps with coordinat[illegible] ba[illegible]
_____ Brain	b) Releases hormones to the [illegible]
_____ Cerebellum	c) The computer that controls the [illegible]
_____ Spinal Cord	d) Controls thinking and memory
_____ Cerebrum	e) Connects the brain with the nerves going to th[illegible] the body
_____ Hypothalamus	f) Connects the brain to the spinal cord
_____ Pituitary Gland	g) Controls the temperature of the body

Question What could happen if your nervous system wasn't working properly?

_____

_____

_____

_____

PREVIEW

Name: _____ 14

Nervous System

The nervous system has over 100 billion nerves throughout the body. If you stretched the nerves out, they would reach 150,000km in length! There are two main types of nerves: **Sensory Nerves, Motor Nerves.** Our nerves only send signals one way!

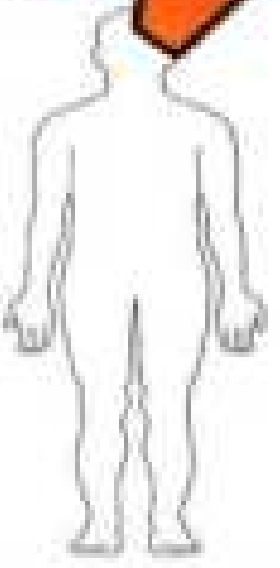
Type of Nerve	Definition
Sensory Nerves	Sensory nerves are in our skin (touch), eyes (sight), tongue (taste), nose (smell), and ears (hear) and send signals to our brain
Motor Nerves	Motor nerves sends signals through the motor nerves to expand or contract muscles so we can move. The nerves only travel from the brain to the muscle

Directions Label the nerves type as sensory or motor based on the description.

Description	Nerves Type - Sensory/Motor
1) You feel an itch on your foot	
2) You scratch your itchy foot	
3) You smell something awful	
4) You leave the room from an awful smell	

Directions Draw the nervous system on the body. Include the

Nervous System Parts	Colour
- Brain - Brainstem - Spinal Cord	N/A
- Sensory Nerves	Red
- Motor Nerves	Blue



PREVIEW

Name: _____ 15

Experiment – Ruler Drop

Research Question What are we learning more about?

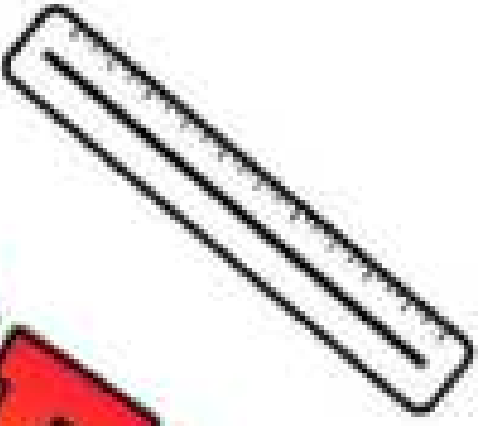
Your brain and nervous system interacts with all of the systems in your body. When we sense something, like a sound, sight, or touch, our organs tell our brain so we can decide what to do. For example, if you see a fire nearby, you might decide to run and call for help!

So, how long does this interaction take? Do we see and then decide to move right away, or is there a delay?

PREVIEW

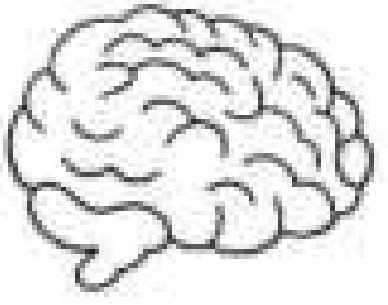
Materials What we need for our experiment?

- Ruler
- Subjects to run the experiment



Method How do we complete the experiment?

1) Find someone whose reaction time you want to test.
2) Have them stand in front of you.
3) Hold the ruler with your thumb and index finger at the end with the highest measurement.
4) Have your subject put their thumb and index finger at the bottom of the ruler on the lower measurement. Their thumb and finger should be slightly open so the ruler can fall through.
5) Without warning them, drop the ruler. Tell them to squeeze it as soon as they see it drop.
6) Record their reaction time as how many centimetres the ruler fell.
7) Repeat with 5 subjects in total.



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Name: _____ 16



Observations: What happened?

Subject Name	Reaction Time (centimetres)

PREVIEW

Results [illegible] below.

1) Why do you think the [illegible] we see the ruler move and when we move our muscles to squ[illegible]

2) Which body systems are interacting in this expe[illegible]uich [illegible] are working?

3) Did some people have better reaction times than others? Do you think a better reaction time helps people in their jobs? Explain which communities might have quick reflexes.

Name: _____ 20

Circulatory System

What is the Circulatory System?
The circulatory system is the movement of blood through the body. The blood carries nutrients to the cells in our body to feed them and help them fight disease. Therefore, the **circulatory system's** main job is to send nutrients in blood to the rest of our body.

Meet the Team – Organs in the Circulatory System
The main [illegible] in the circulatory system are blood vessels and the heart. There are three typ[illegible]d vessels: arteries, veins, and capillaries.

1) [illegible]ed blood away from the heart to the rest of the body. You c[illegible]emb[illegible] calling "A is for 'artery' and 'away' (from the heart).
2) Veins car[illegible]od back to the heart.
3) Capillarie[illegible]lood [illegible]hat connect arteries to veins.



[illegible] oxy[illegible]r blood. The cells in our body need oxy[illegible] v[illegible]ay they get oxygen is from the heart p[illegible]ing[illegible]oxygen to them.

The hea[illegible]ins b[illegible]blood through the lungs, where oxygen [illegible]t into [illegible]. Oxygen rich blood is sent away from the h[illegible]arte[illegible]he cells in our bodies use the oxygen, [illegible]d [illegible]k by veins to the heart and lungs so it ca[illegible] oxyge[illegible]. The entire process takes about 1-2 minut[illegible]d [illegible]through your entire body!

PREVIEW

The Heart
Your heart is a muscle that acts like 2 pumps. On the right side of your [illegible]used blood from the body is received and pumped to the lungs to get oxygen. On the left side, the heart receives blood from the lungs and pumps it to the body.

The heart is a complex organ. Learn more about the parts of the heart below.

Atrium	Upper chamber where blood enters the ventricles of the heart
Ventricle	One of two large chambers towards the bottom of the heart
Aorta	Major blood vessel that carries blood away from the heart
Tricuspid Valve	On the right side and separates the upper and lower chambers
Pulmonary Veins	Carries oxygenated blood from lungs to the heart (2 on each side)
Pulmonary Artery	Carries used blood from the heart to the lungs

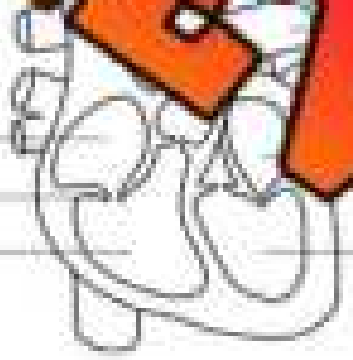
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Name: _____ 21

Definitions What do the blood vessels below do?

Blood Vessels	Function – What do the Blood Vessels do?
Arteries	
Veins	
Capil	

Diagram Label the diagram below using the terms in the word bank.



Word Bank
- Pulmonary vein
- Pulmonary artery
- Tricuspid valve
- Right atrium
- Left atrium
- Right ventricle
- Left ventricle

Questions Answer the questions below using evidence from th

1) What is the main job of the heart?

2) How do the lungs and heart work together to get oxygen to our cells?

PREVIEW

Name: _____ 22

Matching Write the letter from the description beside the matching term.

_____ 1. Arteries	a) Pumps blood throughout the body
_____ 2. Veins	b) Movement of a liquid through a system
_____ 3. Capillaries	c) Carries blood rich in oxygen and nutrients away from the heart to the cells in the body
_____ 4. [illegible]	d) Carries blood full of waste materials from the cells to the heart
_____ [illegible]	e) Connects arteries and veins



Fill in the blank [illegible] word bank vocabulary to fill in the blanks below.

Word Bank			
Circulation	[illegible]	Blood	Waste
Heart	[illegible]	[illegible]aries	Arteries

1) The movement of blood throughout a [illegible]stem is _____.

2) The _____ is the main organ [illegible]irc[illegible] and is responsible for circulating the blood.

3) The 3 types of blood vessels are _____, _____ and _____.

4) Arteries carry _____ rich blood away from th[illegible]

5) Our bodies are constantly circulating _____ throughout our body.

6) Veins carry _____ in our blood to our heart.

Question Blood is used to circulate nutrients and oxygen to our bodies. Can you infer how the food we eat affects the nutrients our cells get? What do you think?

PREVIEW

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Match each internal force to its correct definition.

Heart	❑ Tiny blood vessels that connect arteries to veins.
Arteries	❑ Carries oxygen-rich blood away from the heart to the rest of the body.
Veins	❑ Carries oxygen-poor blood back to the heart.
Capillaries	❑ A muscular organ that pumps blood throughout the body.
Blood	❑ Transports oxygen and nutrients to the body's cells.

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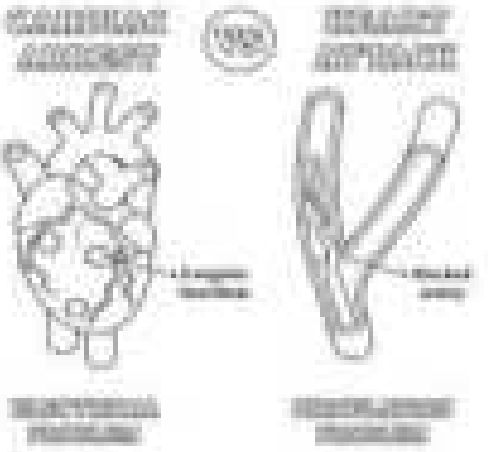
PREVIEW

Name: _____ 30

What Is Cardiac Arrest?

What is Cardiac Arrest?

Cardiac arrest is a serious emergency where the heart suddenly stops. It's not the same as a heart attack, which involves blocked blood flow.



When cardiac arrest occurs, the person will lose consciousness and will not be able to breathe properly. Without treatment, cardiac arrest can lead to brain damage or death in minutes.

The most common cause of cardiac arrest is a condition called ventricular fibrillation, which is an irregular heartbeat that causes the ventricles (the heart's lower chambers) to quiver instead of pump. Other causes include trauma, electric shock, drowning, drug overdose, and other heart conditions.

PREVIEW



CPR – Cardiopulmonary Resuscitation

CPR stands for cardiopulmonary resuscitation. It is an emergency procedure that is used to manually pump blood to the heart and brain when the heart stops or is not working properly.

During CPR, a person uses their hands to compress the person's chest to pump the blood and uses their mouth to breathe air into the person's lungs. This helps to keep the person's brain and other vital organs alive until more advanced medical treatment can be given.

CPR can help in case of cardiac arrest because it keeps oxygenated blood flowing to the brain and other vital organs, which can prevent brain damage. It buys time until advanced medical treatment such as defibrillation can be administered.

The effectiveness of CPR depends on how quickly it is given after cardiac arrest. The survival rate decreases rapidly the longer the person goes without CPR and defibrillation. That's why it's important to know CPR and be prepared to give it if needed.

Name: _____ 31

Questions Answer the questions below using evidence from the text.

1) What is cardiac arrest? How is it different than a heart attack?
2) What is CPR? How does it help someone who is suffering from a cardiac arrest?

True or False Is it true or false?

1) CPR is done by compressing the chest.	True	False
2) When CPR is given effectively, blood with oxygen flows again.	True	False
3) Even if you've been trained in CPR, you should not do it on someone under 16.	True	False
4) It is wise to learn CPR	True	False
5) Cardiac arrest happens when blood flow is blocked	True	False

Questioning Write 3 questions you have about the reading.

1)	
2)	
3)	

PREVIEW

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Circle yes or no for each question.

1) Can cardiac arrest stop breathing?	Yes / No
2) Is cardiac arrest a heart attack?	Yes / No
3) Does CPR move oxygen to the brain?	Yes / No
4) CPR stands for cardiopulmonary rescue	Yes / No

Name: _____ | Mark

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Name: _____ | Mark

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Name: _____ | Mark

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3) Does CPR move oxygen to the brain?	Yes / No
4) CPR stands for cardiopulmonary rescue	Yes / No

PREVIEW

Name: _____ 33

Lab – Experiment – Heart Rate

Research Question What are we trying to answer?

How many times will your heart beat in 1 minute when resting, walking, and running? Will there be a big difference?

Hypothesis Answer the research questions below before you do the experiment.

1) How many times do you think your heart will beat in one minute while you are:

Resting: _____ Per Minute (BPM)

Walking: _____ Minute (BPM)

Running: _____ (BPM)



2) Will there be a difference between your resting heart rate and your running heart rate? Explain your answer.

PREVIEW

Materials What will you need for the experiment?



1) Stopwatch or clock
2) This paper/Writing Utensil
3) Heart rate monitor (optional)

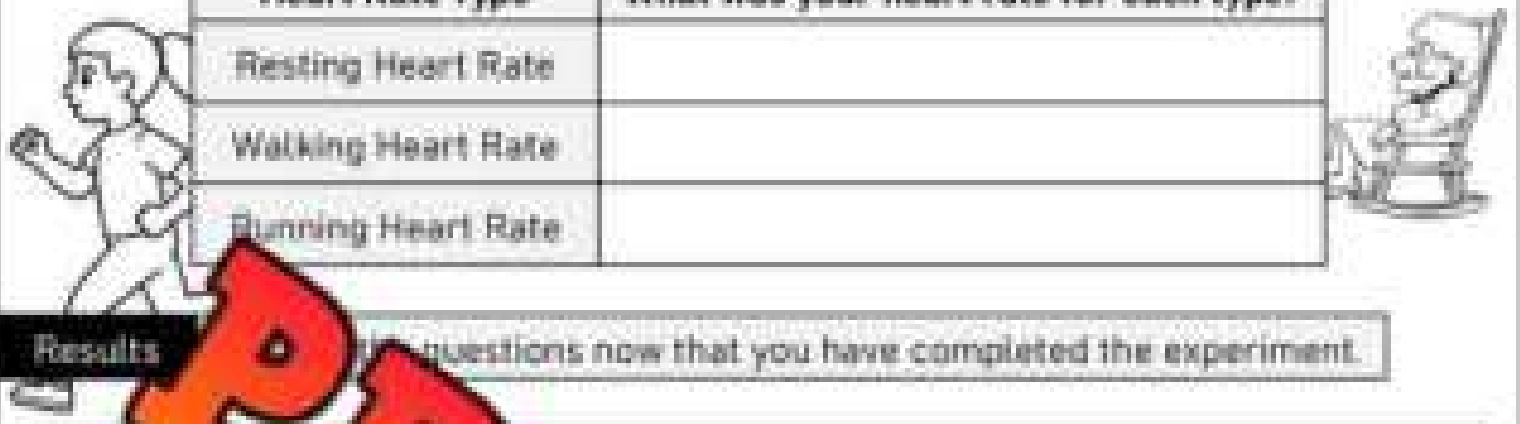
Procedure How will you complete the experiment?

1) If you do not have a heart rate monitor, you can find your heartbeat by placing two fingers on your wrist.
2) Count each thump as a beat.
3) Find your resting heart rate by sitting in your chair and rest for approximately 1-2 minutes. Then have your partner time 20 seconds while you count the number of beats.
4) Multiply this number by 3 to get your beats per minute. Record this as your resting heart rate.
5) To find your walking heart rate, go walk around at a normal pace for 1 minute. Then have your partner time 20 seconds again while you count the number of beats. You can do this while you are walking, or you can stop to count.
6) To find your running heart rate, complete step number 5, but this time after running for 1 minute.

Name: _____ 3A

Observations Fill in the table below as your complete the experiment.

Heart Rate Type	What was your heart rate for each type?
Resting Heart Rate	
Walking Heart Rate	
Running Heart Rate	



Results questions now that you have completed the experiment.

1) Did a[illegible]? Was your hypothesis correct?

2) Why do you think your heart rate [illegible] running and lowest when resting?

3) Does everyone have the same heart rate? How do you think [illegible] (muscle) can help you perform in sports?

4) How can you keep your heart strong and healthy? What are things that you do to exercise your heart? What could you start doing?

PREVIEW

STEM – Pacemakers

Science And Technology – Healthcare

Improvements in science and technology make us healthier and help us live longer. As scientists learn more about our organs and body systems, engineers develop technologies that help these systems.

PREVIEW

What Is

A pa[illegible] that is placed (implanted) in the chest t[illegible] ctbeat. It is used in patients who ha[illegible] The pacemaker makes sure the heart [illegible] To implant a pacemaker, the patient wi[illegible]



How Does A Pacemaker Work?

The heart beats because of the heart's electri[illegible] older, their electrical system can get damaged, causing an irre[illegible] A pacemaker only works when needed. If your heartbeat is [illegible] sends an electrical signal to your heart to correct the beat.

Writing Code – Pacemakers

A pacemaker device uses code to tell the machine what to do. If/Then statements are used in the following way:

If the heart beats are irregular
then send an electrical signal

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Name: _____ 36



True or False Is the statement true or false?

1) A pacemaker is worn in a shirt pocket.	True	False
2) The heart beats because of its electrical system.	True	False
3) Everyone's heart beats the same.	True	False
4) Pacemakers work to keep people's heart beat regular.	True	False
5) A pace[illegible]r will send an electrical signal to the heart if needed.	True	False

Questi[illegible] [illegible]questions below.

1) How do pa[illegible]k[illegible] are they needed by some people?

2) How has science and technology [illegible]peop[illegible]lthy? Use the pacemaker as an example.

Visualizing Draw what you were picturing while you were reading. Ex[illegible]e picture.

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Writing Code - Pacemakers

Directions Follow the instructions below.

Before a pacemaker can be used, it needs to find out how many seconds apart the person's heartbeat is normally apart. Let's define this number as a variable, called normal.

1) Write code to find out what 'normal' is.
Example: set normal = how many seconds apart the heart beats

2) The data is [illegible] every 1 second. Now that you know how many seconds apart the [illegible] write an if/then code that sends an electrical signal to the heart if [illegible]

Directions Based on the code given, will the [illegible]

set normal = how many seconds apart the heart [illegible]
normal = 1.1 seconds

if heartbeat skips by 1 second more than normal
then send electrical signal

Patient's Heartbeat	Yes	No
1.5 seconds	Yes	No
2.2 seconds	Yes	No
1.1 seconds	Yes	No
1.5 seconds	Yes	No

Patient's Heartbeat	Yes	No
2.5 seconds	Yes	No
3 seconds	Yes	No
1.1 seconds	Yes	No
2 seconds	Yes	No

PREVIEW

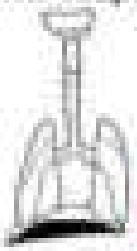
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Name: _____ 38

Respiratory System

What is the Respiratory System?

The **respiratory system's** main function is to provide us with a steady supply of oxygen and to get rid of carbon dioxide. All animals need oxygen in order to survive. Oxygen allows us to break down food in order to get the energy we need.

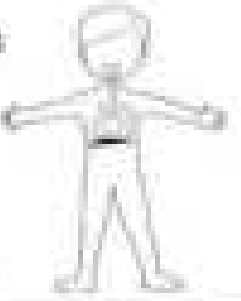


Luckily for us, oxygen is found in the air. Our respiratory system is designed to bring oxygen in through the process of breathing (inhalation), and send carbon dioxide out through the process of exhalation.

How the Respiratory System Works

The br[illegible]eathing. When we breathe in, our diaphragm moves down towa[illegible]e ribs expand outwards. This makes our chest bigger and pulls [illegible] our l[illegible]

When w[illegible]agm moves upward and the chest and ribs relax, causing [illegible] smal[illegible]pushes out of the respiratory system through th[illegible]n or



Blood and the Respirator[illegible]

If you have learned about th[illegible]on [illegible]now that blood circulates oxygen through our b[illegible]es t[illegible]does this work?

Steps	What is Happening
1	We breathe in air to our lungs. They [illegible]nd
2	Blood in our lungs picks up the oxygen [illegible]
3	The oxygen rich blood is then sent throughout [illegible]
4	As the blood picks up oxygen, it also brings carbon diox[illegible] body to the alveoli (tiny air sacs on the end of the bronc[illegible])
5	The air is exhaled, and the carbon dioxide (waste) is sent out [illegible] body

Parts of the Respiratory System

Lungs	Bag like organs used for breathing. We have 2 lungs that fill with air when we inhale. They push carbon dioxide out when we exhale.
Bronchus	Major airways that go into the lungs from the trachea (windpipe).
Larynx	A tube that lets air pass from your throat to your trachea. Also contains your vocal cords, which allow you to speak.
Diaphragm	A muscle that is below your lungs. It contracts and relaxes to allow your lungs to expand and relax.
Trachea	Known as the windpipe that connects the nose/mouth to the lungs.

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Multiple Choice Circle the best answer.

1) The respiratory system is responsible for:

a) Pumping blood in your body

b) Breaking down food

c) Bringing in fresh air

d) Fighting diseases/bacteria

2) The main organ for the respiratory system is:



a) Heart

b) Lungs

c) Kidneys

d) Brain

3) The average person takes how many breaths per day?

a) 23,040

b) 120,000

c) 585

d) 2750

4) How many lungs are you born with?

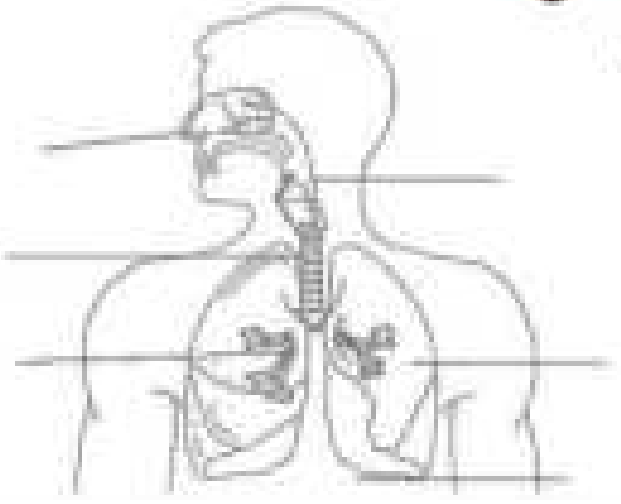
a) 1

b) 2

c) 3

PREVIEW

Diagram Label the diagram below using the words from the word bank.



Word Bank

- Nasal Cavity
- Lungs
- Trachea
- Diaphragm
- Larynx
- Bronchus

How can you take care of your lungs? What are some things people do that damage their lungs?

_____

_____

_____

Name: _____ 40

Matching Write the letter from the description beside the correct term.

_____ 1. Bronchus	a) Hollow cavity that allows food and air to enter the body
_____ 2. Trachea	b) Muscular wall that separates the lungs from the stomach
_____ 3. Alveoli	c) Hollow cavity that allows air to be taken in and sent to the lungs
_____ 4. Lungs	d) Air passageway **directly** to the lungs
_____ 5. N[illegible]	e) Wide hollow tube that allows the flow of air to and from the lungs – "Windpipe"
_____ 6. [illegible]	f) Bag like organ that transports oxygen into the bloodstream and releases carbon dioxide when exhaling.
_____ [illegible]	[illegible] air sacs in the lungs that exchange oxygen and carbon dioxide

Activity When [illegible]se, your breathing rate will increase just like you heart rate.

1) Count how many breaths you take in 30 seconds. Double that number to get your breathing rate in a minute. Write it here: _____

2) Stand up and run or exercise for 30 seconds. Count your breathing rate again: _____

3) Stand up and run or exercise for 1 minute. Count your breathing rate: _____

Questions Answer the questions below using evidence from the [illegible]

1) What happened to your breathing as you exercised? Why do you think this happens?

2) How does your circulatory and respiratory system work together?

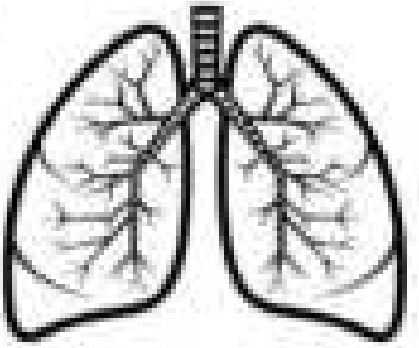
PREVIEW

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Lung Activity – Paper Bag Lungs

Materials What do we need for our experiment?

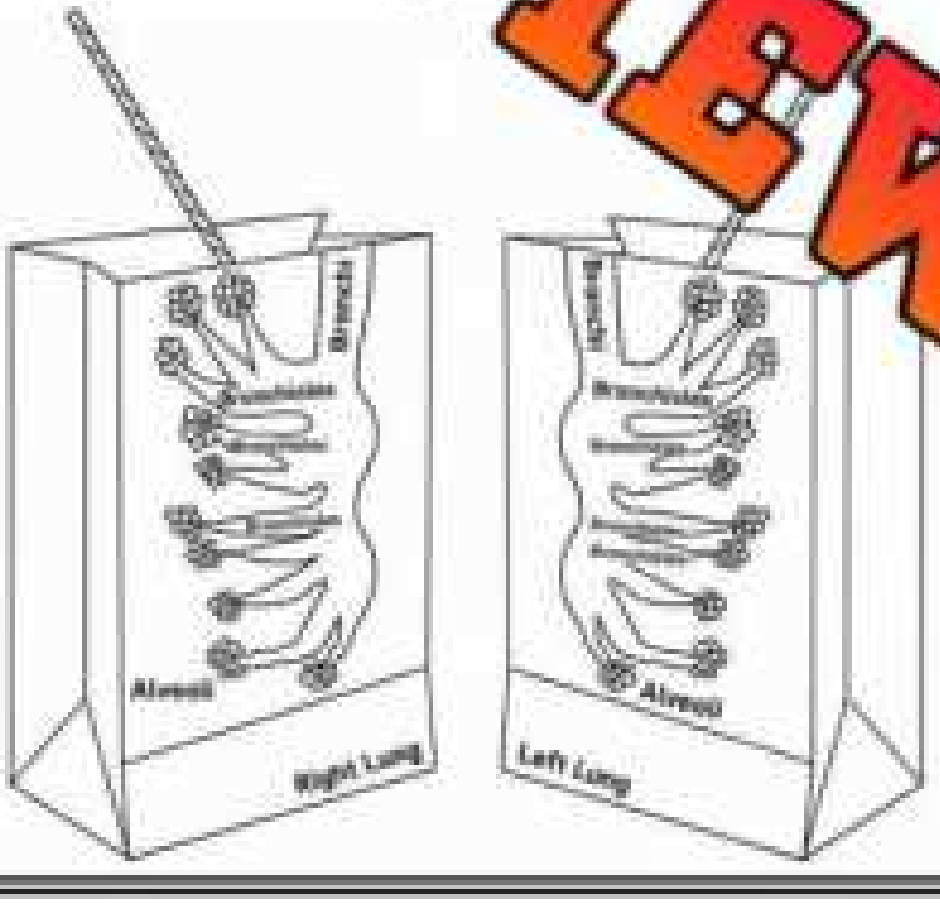
1) 2 paper bags
2) Strong tape (duct tape or packing tape)
3) 2 straws
4) marker



Method do we complete the experiment?

1) D[illegible] and right lung on both paper bags. See picture at the bottom of [illegible]. Or research what a lung looks like for yourself.
2) Label you[illegible] the [illegible] labels:
   - Bronchi[illegible] Lung, Left Lung
3) Insert one straw [illegible]
4) Tape the straws so th[illegible]
5) Blow into the straws to [illegible] air. Interestingly, as you blow air into the model lungs, you're d[illegible] your lungs. Your lungs are emptying, and the model lungs are [illegible] with

PREVIEW



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Research What do each of the parts of the lung do?

Part of the Lungs	Function – What They Do
Bronchi	
Bronchioles	
Alveoli	
Left Lung	
Right Lung	

PREVIEW

Results Answer the questions below.

1) Why does this model represent how our lungs work?

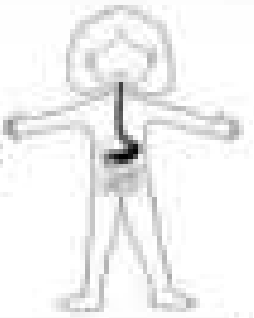
2) Explain how when you blow out, the opposite happens inside your model lungs.

Name: _____ 43

Digestive System

What is the Digestive System?

The **digestive system** has the important job of breaking down food and extracting the nutrients from it so that our body can have the energy it needs to survive. From start to finish, the digestive system has organs that allow us to eat food, get nutrients from the food, break down the food so that we can get rid of the food that as waste.



Major Stages of Digestion

Stage	What is Happening
1 – Chewing	When we chew food, we break up big pieces into little pieces that are easier to digest and swallow. The saliva in our mouth helps as well. Saliva has enzymes that act like acids to break down food.
2 – Swallowing	When we swallow, our tongue first pushes the food into the back of our throat. Then our pharynx (throat) muscles carry the food to our esophagus. The esophagus is a long tube that leads to our stomach.
3 – Stomach	The stomach has acids (and enzymes) that break down things like proteins that our body needs. Food in the stomach usually sits for around four hours before being moved to the small intestine.
4 – Small Intestine	The small intestine gets acids from the liver and pancreas to break down food even further. As food travels through the intestine, its nutrients are absorbed by the intestine. Blood vessels carry these nutrients to the cells in our bodies.
5 – Large Intestine	Any food that has no nutrients left needs to be disposed of by our body. Our large intestine takes this leftover food (waste) and moves it through the intestine and out of our bodies.

PREVIEW

Helping Your Digestive System

Check out the tips below to learn more about how to help your digestive system.

1) Drinking lots of water will help the digestion system as the water we drink softens foods.
2) Chewing your food more makes it easier for the digestion process as you have done some of the work for it. Experts say we should chew around 32 times before swallowing.
3) Eat healthy foods with a lot of nutrients. Our bodies need nutrients and our digestive system wants to spread the nutrients to the rest of the body.
4) Eat food that is high in fibre. Fibre helps clean our digestive system and makes it easier for us to get rid of waste. Fibre rich foods include fruits, vegetables, and whole grains.

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Picture this – You've just finished eating your pizza at lunch and have forgotten all about how delicious it was. Meanwhile, your digestive system hasn't forgotten. It has just started the process of breaking down the food to extract all the nutrients and prepare to get rid of the waste.



Matching

Write the letter from the description beside each digestive system part.

	Mouth	a) Holds food to be broken up by acids
		b) Last stage in digestion. Food travels through this tube and becomes waste.
		c) Food travels through this tube while the nutrients are being absorbed
	Sma	ds acids to the small intestine to break food down
	Large Inte	to the stomach
	Liver and Pancreas	tem here

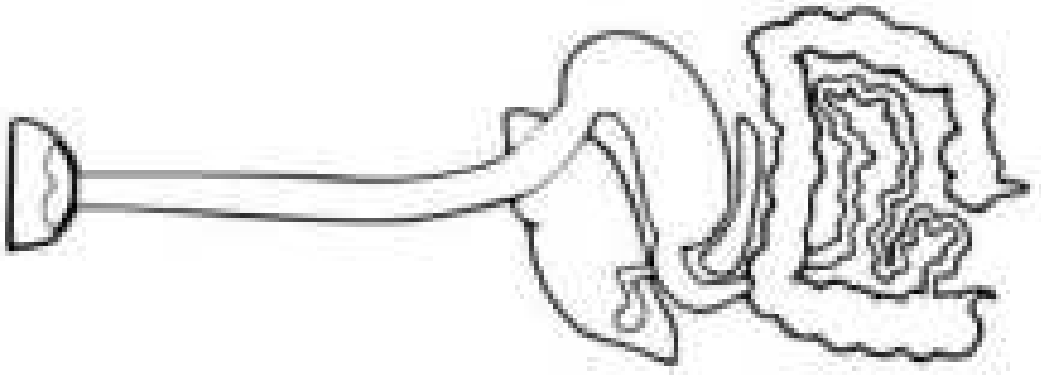
PREVIEW

Summarize

In your own words, expla at hap en it enters the mouth.

Diagram

Turn your page sideways and label the diagram. Colour it when you are done.



- Mouth
- Esophagus
- Stomach
- Small Intestine
- Large Intestine
- Liver
- Pancreas

Name: _____ 45

Directions Number the steps from 1 – 6 from the first (1) step of digestion to the last (6).

Process of food digestion	Steps
Food is stored and mixed up in the stomach by acids to form a liquid.	
You smell/see/think of food and saliva begins to form in your mouth.	
The small [illegible] breaks down food even more and absorbs the nutrients in the foods we [illegible]	
Chew [illegible] pushed to the back of your throat and swallow [illegible]	
The large intestine [illegible] that has no more nutrients in it and passes it as waste.	
Food travels through the esoph[illegible] stomach.	

PREVIEW

F K U E X S U K R Z D T [illegible] H
Z E H U Z X H U P H Z E O [illegible]
C Q V R T S R T J L T J M Z [illegible] M
Y H K L K U H B Y I P E O I D X [illegible]
X O Q Q V G C H X V D N U S A C O [illegible]
L H Z E P A A A S E I I T S D R N N
R F Q W D H M U X R G T H I U B X L
E E J U Y P O C O G E S M U H V X H
C C J X N O T V L K S E A C U Z L S
T W D D D S S G Q W T T J U V F H A
U J O T I E O D Q V I N D V Y J R L
M V O U C O Q G J V O I F V S C U I
O W F Z A Q S M C X N J J H S G W V
D E R Y R Y U U N A R N K M F X N A

ACID
DIGESTION
[illegible]25
FOOD
INTESTINE
LIVER
MOUTH
RECTUM
SALIVA
STOMACH

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Is the statement true (T) or false (F)?

1) The pharynx is a long tube that leads to the stomach.	T / F
2) The stomach uses acids to break down proteins.	T / F
3) Swallowing moves food from the mouth to the liver.	T / F
4) The small intestine sends waste out of the body.	T / F

Name: _____ | Mark

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4) The small intestine sends waste out of the body.	T / F

PREVIEW

Name _____ 47

Lab Experiment – Digestive System

Materials — What will you need for the experiment?

- Food to be digested (below are options that work)
  - 1 banana, 3-4 crackers
- Lemon juice or clear vinegar (acid)
- Wate
- Stro bag
- 1 c /stockings (i.e. small intestine)
- he mess
- cup food that passes through (large intestine)



Procedure — ow plete the experiment?

1) Place the banana and c bag (eating the food).
2) Slowly add a little bit of water (sa
3) Let all the air out of the bag and shut it.
4) Smash the ingredients with your hands unti (chew).
5) Squeeze the chewed-up food into one end of the b a ount of acid to it (the food has moved from the mouth to the stoma
6) Continue mashing the food in the stomach with the acid breaki
7) Now the food from the stomach will need to travel into the small int Tilt the bag up slightly so the food is on one side of the bag. Cut a small hole in the other corner of the bag (the corner you are not tipping).
8) Squeeze the chewed food into the cut-off tights while holding everything over the bowl/tray.
9) Squeeze the food through the tights (small intestine).
10) When the food is through the tights, cut a small hole in the end of the tights to let the waste move to the cup (large intestine).
11) Optional – cut a small hole in the bottom of the cup to represent getting rid of the waste in a trip to the toilet.

PREVIEW

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Explain Explain what each part of the experiment represented in our digestive system.

Part in the Experiment	What it Represented in our Digestive System
Bag when we added just water	
Bag when we added	
Cu	

PREVIEW

Results Answer the ques completed the experiment.

1) Which was easier to digest – the cr or th do you think that was?

2) Do you think some foods we eat are easier to digest than others? of food that might be hard to digest and food that is easy to digest.

3) Has your digestive system ever had trouble digesting food? (cramps, stomach pain, problems going to the bathroom). Why do you think this happens?

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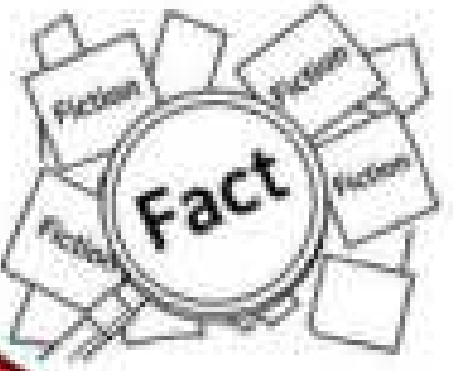
Fact or Fiction – Digestive Myths

Objective What are we learning about?

Students will challenge myths or truths about the digestive system, promoting critical thinking and clarification of common health misconceptions.

Material What will you need for the activity?

- A [illegible] statements about digestive systems
- A 'Fact' s[illegible] 'Fiction' [illegible] distinguish the two sides of the room
- Designated areas in the room for the 'Fact' and 'Fiction' signs, allowing students to move to either side



PREVIEW

Instructions How will you complete the activity?

1) Your teacher will read statements from cards [illegible] as each statement is shared.
2) Consider carefully whether you think the statement is true [illegible]
3) If you decide the statement is true, walk to the 'Fact' side of the room.
4) If your guess is that it's not true, move to the 'Fiction' side of the room.
5) Stay on your chosen side and listen attentively for the correct answer to be revealed.
6) When the right answer is announced, return to your seat, ready for the next round.
7) Have fun getting up and moving!

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Name: _____ 50

Fact or Fiction Read the statements to the class.

#	Statement	Fact or Fiction
1	You need to drink milk to have strong bones.	Fact
2	The stomach is the only part of the body that digests food.	Fiction
3	Chewing food well helps with digestion.	Fact
4	You [illegible] gum if you swallow it.	Fiction
5	[illegible]king down fats.	Fact
6	Eating to[illegible] [illegible]estion.	Fact
7	The large [illegible]sb[illegible] the nutrients from food.	Fiction
8	Digestion starts in [illegible]	Fact
9	Drinking water during meals ba[illegible]	Fiction
10	The small intestine is about 6 meters long.	Fact
11	Saliva has enzymes that break down food.	Fact
12	The appendix is essential for digestion.	Fiction
13	Spicy foods can cause ulcers.	[illegible]
14	The stomach produces acid to help digest food.	Fact
15	Fiber is important for a healthy digestive system.	Fact
16	The digestive system includes the esophagus and intestines.	Fact
17	Bile is stored in the liver.	Fiction
18	The pancreas helps regulate blood sugar levels.	Fact
19	All digestion happens in the stomach.	Fiction
20	The body can function without a gallbladder.	Fact

PREVIEW

© Super Simple Pages [illegible]

Name: _____ 51

Reflection | Answer the questions below.

1) Which statement surprised you the most and why?

2) D[illegible] believed turn out to be false? Which ones?

3) How did this activity help you learn about th[illegible]n?

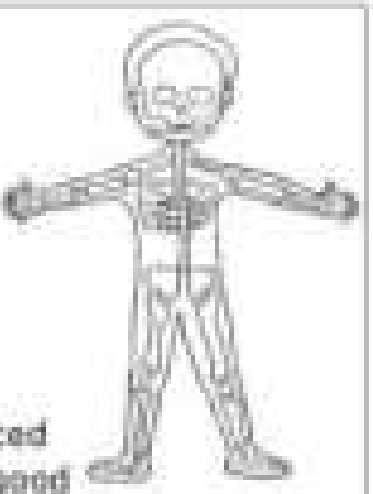
4) Why is it important to know the truth about how our body works?

PREVIEW

Name: _____ 52

Skeletal System

What is the Skeletal System?
The **skeletal system** is all of the bones in our bodies. We need our skeletal system to provide us with support, so we can be upright and not flop around like a jellyfish. When babies are born, they have around 300 bones. As babies grow, some of their bones fuse together, which leaves an adult with 206 bones wh[illegible]lly grown.

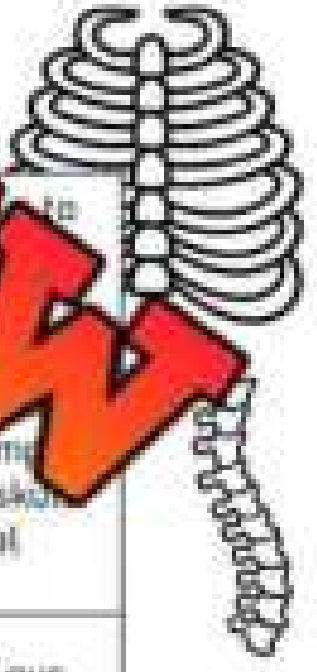


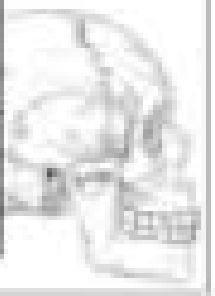
Bones
Our b[illegible]ng connective tissue that are reinforced with c[illegible]m. Th[illegible]u have likely been told that milk is good for your bone[illegible]r[illegible]ched by ligaments in our bodies.

Our bo[illegible]ne m[illegible]them. Bone marrow is a spongy substance found in the midd[illegible]ur b[illegible]arrow makes the white blood cells we need to fight infection[illegible]d bo[illegible]s our bodies need to carry oxygen.

Why We Need Our Skeletal S[illegible]
The skeletal system has more than j[illegible]ost f[illegible]e some important functions it does for us:

1 – Support	Yes, the most obvious fun[illegible]s th[illegible]to stay upright. Humans are luck[illegible]which allows our arms to be free[illegible]os want.
2 – Protection	Our bones protect our internal organs. Our [illegible] organs are the organs inside our body. For exam[illegible] our rib cage protects our heart and lungs. Our sku[illegible] protects our brain. Our spine protects our spinal cord.
3 – Movement	Our bones hold our muscles in place and allow our muscles to move us. Without our bones holding our muscles, we would be a blob on the ground!
4 – Blood	Our bones produce white and red blood cells.





PREVIEW

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Name: _____ 53

Summarize What does the skeletal system do for us?

True or False Circle whether the statement is true or false

1) Bones are no[illegible]	True	False
2) Adults have more bo[illegible]	True	False
3) Our skeletal system make[illegible]	True	False
4) Our bones protect our internal or[illegible]	True	False
5) Our skeletal system works by itself to m[illegible]	True	False

Questions Answer the questions below using evide[illegible]

1) What is bone marrow? Why is it important?

2) Which organs do the bones below protect?



Ribcage	
Skull	
Spine	



PREVIEW

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Name: _____ 54

Fill in the Blanks

Fill in the blanks using words from the word bank.

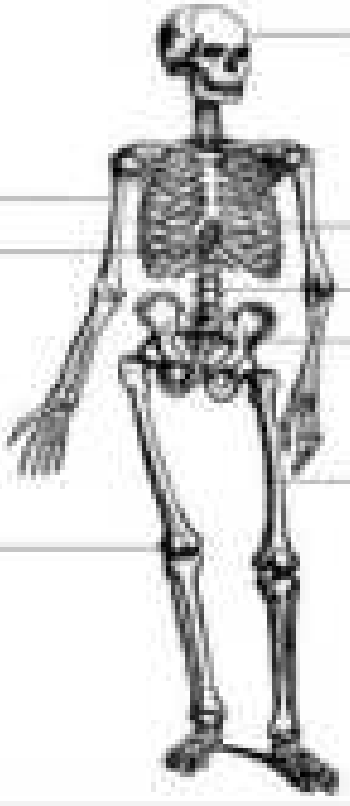
Word Bank				
Grow	Brain	Calcium	Spinal Fuse	206
Skull	Ribs	Equipment	Move	

An [illegible] adult has _____ bones. Bones _____ as we get older. A baby is born wi[illegible] and they _____ together as they get older. Your skeletal syst[illegible] muscles, allowing you to _____. Your spine is made up [illegible] your _____ cord and allow you to twist, bend, and stay [illegible] your _____ protect your vital organs, like your heart. Your _____ [illegible] organ, your brain! You can protect your bones by wearing proper _____ when playing sports. You can strengthen your bones by eating [illegible]

PREVIEW

Diagram

Label the Bones in the Skeleta[illegible]



- [illegible]
- Femur
- Cranium
- Humerus
- Ribs
- Pelvis
- Sternum
- Spine

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Name: _____ 55

Activity – Researching Bones

To complete this activity, perform some research online to learn more about the different bones in our bodies.

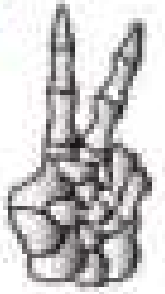
Matching Label the bone below using the word bank.



PREVIEW

Matching Write the letter from the description

	1. Compact Bone	a) Thick jelly like substance that cre
	2. Spongy Bone	b) Smooth and very hard outer layer of bone
	3. Bone Marrow	c) Cylinder shaped bone, longer than it is wide
	4. Flat Bones	d) Inner layer of bone that contains blood
	5. Long Bones	e) Cube shaped bones found in the wrists and ankle
	6. Short Bones	f) A bone that doesn't fit any other classification
	7. Irregular Bones	g) Typically thin bone that is often curved

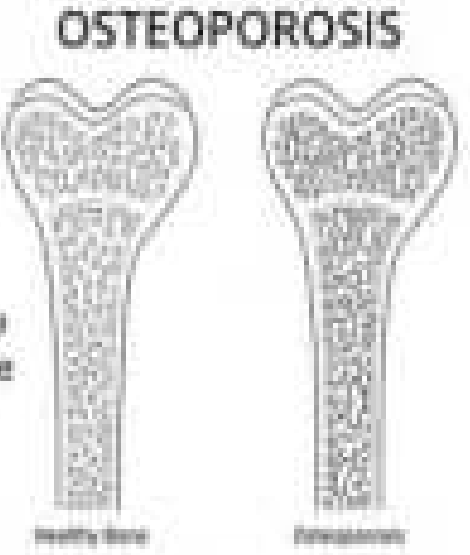


Name: _____ 56

Skeletal Disease - Osteoporosis

What is Osteoporosis?

Osteoporosis is a condition that makes your bones weaker and more fragile. It occurs when the body doesn't make enough new bone, or when too much old bone is lost. As a result, the bones become thinner and more porous, and they are more likely to break.



Bone density is a measure of how strong and healthy your bones are. When bones are dense, they are less likely to break. When bones are less dense, they are more likely to break. Bone density is often used to diagnose and monitor osteoporosis.

In osteoporosis, bone density is reduced, meaning the bones have less mass and are more likely to break. The most commonly affected by osteoporosis are the spine, the hip, and the wrist.

PREVIEW

What Causes Osteoporosis?

There are several factors that contribute to the development of osteoporosis. Some of them include:

- Age: As you get older, your body doesn't make new bone as quickly as it used to.
- Genetics: Some people are born with a higher risk of osteoporosis because of their genes.
- Gender: Women are more likely to develop osteoporosis than men.
- Low levels of calcium and vitamin D: Calcium and vitamin D are essential for healthy bones. If you don't get enough of these nutrients, your bones can become weaker.
- Lack of physical activity: Regular exercise helps keep your bones strong.
- Smoking and excessive alcohol consumption: Both of these can harm your bones.

How To Avoid Osteoporosis

1) Getting enough calcium and vitamin D: Calcium is essential for healthy bones, and vitamin D helps your body absorb calcium. Good sources of calcium include dairy products, leafy green vegetables, and calcium-fortified foods. Good sources of vitamin D include sunlight, fatty fish, and fortified foods.

2) Engaging in regular weight-bearing exercise: Weight-bearing exercises, such as walking, running, dancing, and weightlifting, help keep your bones strong.

Name: _____ 57

True or False Circle whether the statement is true or false.

1) Osteoporosis means bones have less density and will break easier.	T	F
2) Getting enough vitamin C is important to not getting osteoporosis.	T	F
3) Vitamin D helps your body absorb calcium.	T	F
4) Eating a diet without any calcium or vitamin D can lead to osteoporosis.	T	F
5) Osteoporosis happens more in young males than older females.	T	F

Questions Answer the questions below using evidence from the text.

1) What is osteoporosis? Why does it happen?

2) How can you prevent getting osteoporosis?

PREVIEW

Draw Draw and explain healthy foods you could eat that will keep your bones strong.

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Name: _____ 19

Experiment - Egg with Osteoporosis

Research Question — What are we learning about?

Osteoporosis causes bones to get weak and brittle. Calcium is a nutrient that can keep our bones dense and strong. When we don't get enough calcium, our bones get weak. Today, you will do an experiment that takes the calcium out of an eggshell to see how it affects the strength of the shell.

Material — you need for the experiment?

- ❑ 2 eggs
- ❑ 2 clear glasses or jars
- ❑ White vinegar
- ❑ A spoon





PREVIEW

Method — How will you complete the experiment?

1) Gently place an egg in each glass or jar.
2) Fill one glass or jar with enough white vinegar to cover the egg.
3) Leave the other egg in a glass or jar with no vinegar.
4) Leave the eggs in their respective glasses or jars for 3 days.
5) After 3 days, gently remove the eggs from the glasses or jars and compare them.

Explanation — What is happening?

The acid in the white vinegar is dissolving the calcium in the eggshell. This is similar to how osteoporosis causes the loss of calcium in bones. The egg in the other jar represents a healthy bone.

Name: _____ 60

Hypothesis What do you predict will happen?

1) What will the eggs feel like in each of the jars after the 3 days?	
Vinegar Egg	
Empty Jar Egg	

2) How [illegible] the eggs be?
Vinegar Egg
Empty Jar Egg

PREVIEW

Results What happened [illegible] the results

1) How did the eggs feel after the 3 [illegible] Describe [illegible] and how strong their shells were.

2) With the loss of calcium in the shells, what happened to them?

3) How is this experiment a demonstration of how osteoporosis affects our bones?

Name: _____ 61

Muscular System

What is the Muscular System?

The muscular system is all the muscles in our body that work to move us. If your body has moved, the muscular system was responsible for that movement. For example, the blinking of one eye uses multiple muscles, including the 4 muscles in your eyelid. To smile, your body will use about 43 different muscles!

In total, the muscular system has about 600 muscles. There are 3 types of muscles – skeletal, smooth, and cardiac.



- **Skeletal Muscles** – muscles that attach to bones. These muscles pull on bones to move. Tendons attach muscles to bones.
- **Smooth Muscles** – muscles we cannot control. These muscles work with organs. For example, our intestines have muscles that move food.
- **Cardiac Muscle** – also known as the cardiac muscle.

How Do Muscles Work?

Our muscular system works together with our skeletal system and our nervous system. Our skeletal muscles connect to our bones to move us where we want to go. But where do we want to go? Our nervous system will work with our muscular system to tell our muscles where to move.

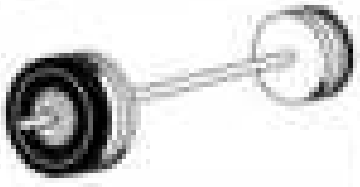
When our brain makes a decision to move, it sends signals through nerves in our muscles. Our muscles will then contract, meaning they will tighten, causing movement. This happens when we pick something up and when we walk.

Muscle contraction is followed by muscle relaxation, where our contracted muscles return back to their normal state.



Exercising

When we exercise, we make our muscles bigger and stronger by performing many muscle contractions. When a skeletal muscle is worked hard after many contractions, it may have micro-tears. These tiny tears are a good thing, as our body will use the nutrients from our digestive system to grow bigger and stronger muscles.



If you have ever had sore muscles, you have experienced these micro-tears. Hopefully afterwards, you ate some healthy foods that your body could get nutrients from. That way, your blood could send nutrients to these tears to allow them to grow back stronger.

PREVIEW

Name: _____ 62

True or False Circle whether the statement is true or false.

1) A smooth muscle connects to our bones.	True	False
2) Smooth muscles are involuntary, meaning they work without us knowing.	True	False
3) Micro-tears in our muscles are bad for us.	True	False
4) Muscles work by contracting and relaxing.	True	False
5) The heart is also the cardiac muscle.	True	False

Questions Answer the questions below using evidence from the text.

1) How can you get

2) How does the muscular system work with the [illegible] systems?

Making Connections Have you ever had sore muscles? Explain.

PREVIEW

Name: _____ 63

Muscular System

Your body has **3** types of muscles: **Smooth, Cardiac, and Skeletal.**



Directions Write an example of each type of muscle using words from the word bank.

Word Bank				
Biceps	Quadriceps	Heart	Esophagus	Stomach

Type	Function	Example
	...u cannot control. They are ...referred to as involuntary	
Cardiac	...cle t... blood throughout ...dy.	
Skeletal	The tr... ...scle... ...g you to move. The... ...nt... because you ...	

PREVIEW

Questions Answer the questions below using ...nce... the text.

1) A muscle strain is worse than a micro-tear. Th... ...ted before you contract it hard again. What can you do before a w... ...void... ...e strains?

2) How can you strengthen your muscles?

3) What would happen if your smooth muscles stopped working?

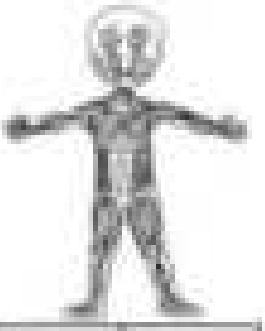
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Name: _____ 64

Muscular System

Your muscles work with your skeleton to allow you to move. Muscles contract to move the bones in your skeleton – allowing for movement. Your muscles work together to perform daily tasks. Some muscles have an opposing muscle. While one muscle contracts, the opposite relaxes. People who don't exercise their muscles can experience atrophy. **Atrophy** is when a muscle gets smaller.

Muscle Contracting	Muscle Relaxing (Quadricep or Triceps)
Bi	
Ha	

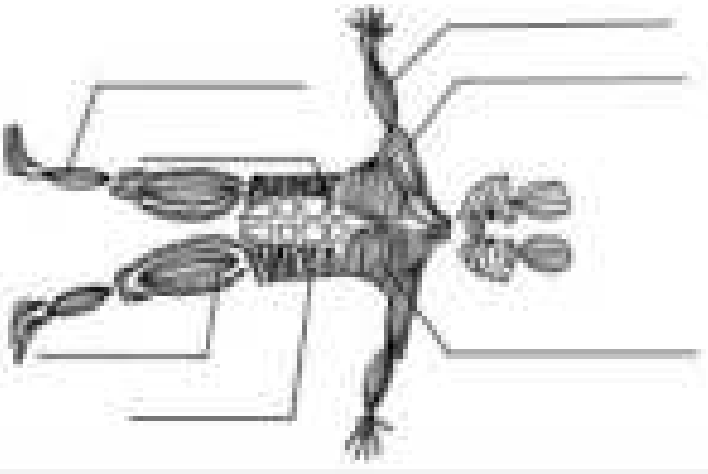


True or False Decide whether the statement is true or false.

1) A tendon co[illegible] to	True	False
2) A ligament conn[illegible]	True	False
3) Opposing muscles are [illegible] and	True	False
4) If you stop exercising, your [illegible]	True	False
5) A smooth muscle can be controlled.	True	False
6) A cardiac muscle controls your breathing.	True	False
7) Skeletal muscles can be strengthened by ex[illegible]	True	False
8) You have muscles in your face.	[illegible]rue	False
9) The esophagus is a muscle.		[illegible]alse
10) Breaking down muscles is bad for you.		[illegible]alse

PREVIEW

Diagram Turn your page sideways and label the diagram.



Word Bank
Biceps
Rectus Abdominis
Oblique
Quadriceps
Deltoid
Pectural Muscles
Gastrocnemius

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Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Check the facts about the muscular system.

- ☐ Muscles work in pairs to help move your body.
- ☐ Ligaments connect muscles to bones.
- ☐ When your biceps contract, your triceps relax.
- ☐ Tendons connect muscles to bones.
- ☐ Atrophy means a muscle becomes stronger from exercise.
- ☐ Exercising regularly can help strengthen your muscles.
- ☐ Your heart is made of a special type of muscle.

Name: _____ Mark

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PREVIEW

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- ☐ Tendons connect muscles to bones.
- ☐ Atrophy means a muscle becomes stronger from exercise.
- ☐ Exercising regularly can help strengthen your muscles.
- ☐ Your heart is made of a special type of muscle.

Name: _____ 67

Memory Game: Match the Organ with Its Function

Objective What are we learning about?

Students will improve their understanding and recall of human body systems by matching organs to their functions in a memory card game.

Material What will you need for the activity?

- Memory game cards (provided) with the terms on one set and definitions on another set.
- A flat surface like a table to lay out the cards.



Instructions How will you complete the activity?

1) Divide the class into groups of 3 or 4. Give each group a set of Memory Game cards. (Provided)
2) Have each group lay all the cards face down in a grid on a flat surface.
3) The students take turns flipping over two cards at a time, trying to find a matching term and its definition.
4) If a student finds a match, they remove those cards from the grid and keep them.
5) If the cards do not match, they are turned back over, and the next student takes a turn.
6) The game continues until all the cards have been matched.
7) After the game, review the terms and definitions with the class.
8) Discuss why these organs are important to understand and how they work together in the human body.

PREVIEW

Name: _____ 66

Cards | List of Human Organs

Organs	Functions
Mouth	Breaks down food with chewing and saliva.
Heart	Pumps blood throughout the body.
Lung	ak… …ygen and … dioxide.
Kidney	Filters waste f… the blood and makes urine.
Stomach	Digests food with acids and enzymes.

PREVIEW

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Name: _____ 69

Cards | List of Human Organs

Organs	Functions
Liver	Removes toxins from the blood and makes bile.
	Controls thoughts, memories, and actions.
Intestines	[illegible] nutrients from
Bladder	Stores urine before it leaves the body.
Pancreas	Produces insulin to regulate blood sugar.

PREVIEW

Name: _____ YR

Cards | List of Human Organs

Organs	Functions
Skin	Protects the body and controls temperature.
	Allows us to see.
Ears	En[illegible]s to hear [illegible].
Nose	Detects smells a[illegible] helps us breathe.
Bones	Supports the body and protects organs.

PREVIEW

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Name: _____ 71

Cards | List of Human Organs

Organs	Functions
Muscles	Helps move the body and maintain posture.
Esophagus	Moves food from the mouth to the stomach.
Spleen	Helps [illegible] infection and [illegible].
Gallbladder	Stores bile produced by the liver.
Thyroid Gland	Regulates metabolism and energy.

PREVIEW

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Name: _____ 72

Common Disease – Stroke

What is a Stroke?

A stroke is sometimes called a "brain attack" as it happens when blood flow to the brain stops, even for just a second. Since blood carries oxygen, a stroke leads to the brain not having oxygen, which causes brain cells to die.

Sometimes a person who had a stroke will have permanent brain damage, which may cause their body to stop working as it should. If a stroke is treated quickly by calling 911 and getting medical attention, the person can have a full recovery with no perma[illegible]rain damage.



When to C[illegible]

The acr[illegible]s us know when to call 911.

	Speech	Time
Is it droopin[illegible]	Is it slurred or jumbled?	To call 911 right away

PREVIEW

Questions Answe[illegible]ng evidence from the text.

1) What is a stroke? What hap[illegible]

2) How do you know if someone is having a stroke?

True or False Circle whether the statement is true or false.



1) A stroke affects the heart mainly.	True	False
2) A stroke is a brain organ disease.	True	False
3) Kids shouldn't call 911 if they think an adult around them is having a stroke.	True	False
4) A stroke happens when the brain doesn't receive oxygen.	True	False
5) A stroke always leads to permanent brain damage.	True	False

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ Mark

Write what each letter in F.A.S.T. stands for and explain what it means.

F	
A	
S	
T	

Name: _____ Mark

Write what each letter in F.A.S.T. stands for and explain what it means.

F	
A	
S	
T	

Name: _____ Mark

Write what each letter in F.A.S.T. stands for and explain what it means.

F	
A	
S	
T	

Name: _____ Mark

Write what each letter in F.A.S.T. stands for and explain what it means.

F	
A	
S	
T	

PREVIEW

Name: _____ 74

Common Disease – Asthma

What is Asthma?

Asthma is a disease that causes breathing problems because the airways in the lungs get swollen, smaller, and filled with mucus. Asthma can be mild, meaning it doesn't affect someone very much. Asthma can also be severe, causing people to take medication daily and avoid strenuous activity.

What Causes Asthma?

Experts aren't 100% sure what causes asthma. It is common in kids and tends to run in families. People with asthma get flare-ups from time to time. A **flare-up** is when the airways in the lungs swell, get pollen and shrink. Flare-ups happen due to triggers, like:

- Some kids only get asthma flare-ups when they exercise
- Air like pollen, mold, and pet dander
- [illegible] or flu
- [illegible]



Treating Asthma

Avoid flare-ups [illegible] the [illegible]ve. People with asthma can also take medicine that is inhaled direc[illegible] th[illegible]icine opens up tight airways.

PREVIEW

Questions Answer the qu[illegible]ce from the text.

1) What is asthma? What happens to p[illegible] with as[illegible]

2) How can someone treat asthma?

Making Connections Do you know anyone who has asthma? Have they had a flare-up?

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Name: _____ 75

Common Disease – Celiac

What is Celiac Disease?

Celiac disease is a digestive system disease that means someone cannot digest gluten properly. When someone with celiac disease eats gluten, their body overreacts to the gluten (protein) and damages their villi. When the villi are injured, the small intestine cannot properly absorb nutrients from food.

If your body cannot absorb nutrients, it will have issues because our bodies need vitamins and minerals like iron to survive. For example, iron is needed to produce blood.

Treatment of Celiac Disease



The treatment for celiac disease is simple – have a diet with no gluten. This is easier said than done! Gluten is in a lot of things, including wheat, which means bread, pasta, and crackers are off-limits. Gluten is even in some breading for your favourite chicken nuggets!

Luckily, having a gluten-free diet is no longer as hard as it was in the past. Many companies, restaurants, and fast food chains are offering gluten-free options.

Symptoms of Celiac Disease

Someone with celiac disease may experience headaches, diarrhea, weight loss, and a loss of appetite. It is estimated that 1 in 133 people have celiac.

PREVIEW

Questions Answer the questions below from the text.

1) How does gluten affect someone with celiac disease?

2) Is it hard to be someone with celiac disease? What do they need to do?

Reflect Have you seen gluten-free options at a grocery store or restaurant? Explain.

Name: _____ 77

Nervous System Injuries - Paralysis

What is Paralysis?

Paralysis is when a person is unable to move certain parts of their body. This can be caused by an injury, a disease, or a problem with the brain or nerves. When someone is paralyzed, their muscles do not work the way they should, and they cannot move the affected parts of their body even if they try. Paralysis can affect any part of the body, including the arms, legs, and even the muscles used to speak or swallow.

Paralysis and Spinal Cord Injuries

The spinal cord is a long, delicate tube of nerves that runs from the brain down through the spine. It is responsible for carrying messages back and forth between the brain and the rest of the body, allowing the body can move and do things like walk, run, and pick up objects. When someone has a spinal cord injury, it means that something has damaged the spinal cord, either cutting it, crushing it, or compressing it. This can cause the messages between the brain and body to be disrupted, which can lead to paralysis.

For example, if a person has a spinal cord injury in their lower back, this might affect the nerves that control the muscles in their legs. If the injury is severe, the person might not be able to move their legs at all, even if they try. They might also have trouble feeling sensations in their legs, such as pain or temperature. This can make it difficult for them to walk or do other activities that require the use of their legs.

Treating Paralysis With Stem Cells

Stem cells are special cells that have the ability to develop into many different types of cells in the body. They are like blank slates that can turn into any type of cell that is needed. For example, stem cells can turn into brain cells, muscle cells, skin cells, or any other type of cell that is needed to repair or replace damaged tissue.



In 2016, Kristopher Boesen was in a car accident that left him paralyzed from the neck down. After the incident, Kris could barely breathe due to his injuries, he was told he may never move his body again. Doctors gave Kris the options of a stem cell trial, or a surgery that will help his breathing, but not his movement. Kris chose the stem cell option.

Doctors injected Kris with embryonic stem cells into his spinal cord. The plan was for the stem cells to stimulate nerve cell growth and produce blood vessels that would bring oxygen and healing to the injured site.

After just two weeks, Kris could move his arms and hands in small motions. In three months, he was able to write his name with pen and paper and accomplish a good deal of other normal daily tasks. Kris went from being completely paralyzed and immobile to being able to function on his own again.

PREVIEW

Name: _____ 79

True or False Is the statement true or false?

1) Being paralyzed means there is a disconnect between your brain and body.	T	F
2) People can only be paralyzed from the waist down.	T	F
3) Being paralyzed means you lose control of parts of your body.	T	F
4) Injuring your spinal cord can lead to paralysis.	T	F
5) Stem cells can be used to heal an injured spinal cord.	T	F

Making C[illegible]s What does this reading remind you of in your life?

Questions Answer the questions below using [illegible]

1) What is paralysis? How can it be caused?

2) Why does a paralyzed individual lose control of parts of their body?

PREVIEW

Name: _____ 79

Nervous System Injuries - Paralysis

Research Question What are we learning more about?

Someone who is paralyzed has a disconnect between their brain and parts of their body. We all have body parts that we cannot control. For example, it is common that some people can move certain body parts better than others, like their ears, eyelids, [illegible] this doesn't mean they are paralyzed, but the feeling of not being able [illegible] is similar to what someone who has paralysis feels.

Materials [illegible] for our experiment?

- Observation page

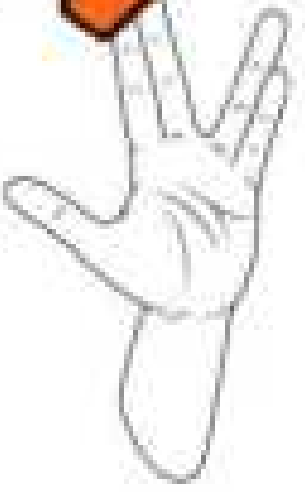
Method How do we [illegible]?

Try some of the following exercises below before answering questions on the observation page. Follow the instructions and [illegible] your brain to the body part in the instruction. Is there a connection?

1) Try blinking with your left eye. Then try your right eye. [illegible]

2) Try moving your big toe without moving any other toe. Then try the next biggest toe, without moving the other toes. Do this until you have tried all toes by themselves. Then compare your results with your toes on the other foot.

3) Can you do the Vulcan salute? It was done famously by Spock and is shown in the picture. In addition, try the same positioning, but with your pinky alone and the three fingers together. Then try your pinky with the two fingers next to it and the index finger alone.



4) Can you move your ears? Try to wiggle them and record your results.

PREVIEW

Name: _____ 80

Observations | What happened?

Activity	Results
Blink – Left Eye	
Blink –	
Move your toe themselves	
Vulcan Salute and Other Finger Placements	
Ears	

PREVIEW

Results | Answer the questions below.

How did it feel when you couldn't control a body part very well?

_____

_____

_____

_____

Name: _____ 81

Common Disease – Urinary Tract Infection

What is a Urinary Tract Infection?

A urinary tract infection (UTI) is an infection that occurs in the urinary tract. The urinary tract is a part of the body that helps to get rid of pee (urine). It is made up of the kidneys, ureters, bladder, and urethra.



UTIs are caused by bacteria that get into the urinary tract and cause an infection. They can happen frequently to people who have other urinary issues as bacteria can build up in the urinary tract if you hold your urge to go too long. UTIs can also be caused by poor hygiene, making it easier to get if you don't wipe or bathe regularly.

UTIs are more common in females than in males. This is because females have a shorter urethra, which is the tube that carries urine out of the body. Because the urethra is shorter, it is easier for bacteria to get into the urinary tract and cause an infection.

PREVIEW

Common Symptoms of a Urinary Tract Infection

- Pain or burning sensation when urinating
- Increased frequency of urination
- Increased urgency to urinate
- Blood in the urine
- Pelvic pain (in women) or lower abdominal pain (in men)

If you think you might have a UTI, it's important to tell your parent or guardian so they can take you to see a doctor. The doctor will be able to tell you if you have a UTI and give you medicine to help you feel better. It's also important to drink plenty of water and to urinate when you feel the urge, to help flush out the bacteria and make you feel better.

Name: _____ 82

True or False Is the statement true or false?

1) If you hold your urine too long, you could get a UTI.	True	False
2) Males get UTIs more frequently than females.	True	False
3) Males have a longer urethra, making them more prone to UTIs.	True	False
4) Having to urinate frequently is a sign of a UTI.	True	False
5) Drinking [illegible] of liquids can help a treat a UTI.	True	False

Questi Answer the questions below using evidence from the text.

1) What is a UTI and how [illegible]

2) What should you do if you have a UTI?

PREVIEW

Questioning Write two questions you have after reading the text.

1)	
2)	

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Explain what the terms mean in your own words in a short sentence.

Urinary Tract Infection	
Urinary Tract	
Symptoms	

Name: _____ | Mark

Explain what the terms mean in your own words in a short sentence.

Urinary Tract Infection	
Urinary Tract	
Symptoms	

Name: _____ | Mark

Explain what the terms mean in your own words in a short sentence.

Urinary Tract Infection	
Urinary Tract	
Symptoms	

Name: _____ | Mark

Explain what the terms mean in your own words in a short sentence.

Urinary Tract Infection	
Urinary Tract	
Symptoms	

PREVIEW

Name: _____ 8A

Experiment – Spreading Germs and Disease

Research Question What are we learning more about?

Germs spread from person to person in many ways, including by touch. Proper hand-washing is important to slow down the spread of disease. But how well does washing our hands kill germs? Let's find out!

Materials What do we need for our experiment?

1) [illegible] bag
2) 5 slices
3) Sticky notes
4) Marker
5) Soap & water
6) Hand sanitizer



PREVIEW

Method How do we complete the experiment?

1) Put one clean slice of bread inside a plastic bag [illegible].
2) Let 5 students handle a new slice of bread.
3) Put that slice of bread inside a plastic bag – dirty hands.
4) Have 5 students wash their hands really well with soap and wa[illegible]
5) Let these 5 students handle a new slice of bread.
6) Put that slice of bread inside a plastic bag – soap and water.
7) Choose 5 different students to wash their hands with hand sanitizer.
8) Have them handle a slice of bread and then put it in a plastic bag – sanitizer.
9) Lastly, wipe another slice of bread on computer keyboards, books, door handles, tablets, or anything that collects germs. Put it in a bag – dirty surfaces.
10) Label each bag using a sticky note. Describe how the bread was handled – ex. with dirty hands or wiped on dirty surfaces. Leave the bags for a week and observe the changes.

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Name: _____ 85

Observations What happened after a week? Describe each of the pieces of bread.



Bread	Description – What Does The Bread Look Like?
Clean – Control	
Dirty H...	
Soa...	
Hand Sanitiz...	
Wiped on Germy Surfaces	

PREVIEW

Results Answer the questions below.

1) Which bread had the most germs passed on to...

2) What does this tell you about the importance of washing yo...

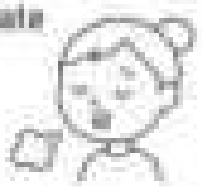
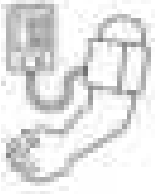
3) Since germs are bacteria and viruses, when should you wash your hands to avoid getting sick?

© Super Simple Science

Name: _____ 89

Vital Signs

What are Vital Signs?
Our vital signs are measurements of our bodies most basic functions. We can monitor these vital signs to see how healthy we are. Having an issue with one or more of these vital signs can be useful in detecting a health problem. Read about the three main vital signs that are monitored by doctors and health care providers below.

1) Body Temperature 	Normal body temperatures range from 36.5°C to 37.2°C. Common ways to check someone's temperature is an oral thermometer or by using a thermometer in the ear. If someone has a temperature of [illegible] 37.2°C, they likely have a fever. A fever indicates that the body [illegible] its temperature to fight off an infection.
2) Heart Rate 	[illegible] is how many times your heart beats per minute. A [illegible] someone over the age of 10 can range from 60 [illegible] If your heart is beating too much, it means it [illegible] exercise, your heart rate will go up a lot. [illegible] do as you are training your heart to be more [illegible] especially runners, have low resting heart rates [illegible] per minute. When someone who is fit does not [illegible] their heart rate stays low, which means their heart isn't [illegible] This is healthy and indicates a strong heart.
3) Respiration Rate 	A respiration rate is the numb[illegible]s per minute. This is measured at rest, [illegible] Respiration rates increase when someone has a fe[illegible] check your respiration rate to confirm an illne[illegible] is not used as much as the other vital signs. A [illegible] rate for school aged kids is between 18-30 breaths [illegible]
4) Blood Pressure 	Blood pressure is not a vital sign, but it is often used to help monitor someone's health. Blood pressure is the force of the blood pushing against the artery walls during the heart's beating process. High blood pressure increases the risk of heart attack, heart failure, and stroke. A healthy blood pressure is 120/80. You can check your blood pressure in many pharmacies.

Changing Your Vital Signs
You can change many of your vital signs by exercising. Your heart rate, body temperature, and respiration rate will go up with exercise, but this is only short term. To change your vital signs long term, it takes time and good healthy lifestyle habits. Exercising, proper nutrition, and sleeping are three of the best ways to improve your vital signs.

PREVIEW

Name: _____ 90

True or False Circle whether the statement is true or false.

1) A healthy respiration rate is between 18-32 breaths per minute.	True	False
2) Your resting heart rate is higher than your heart rate after exercise.	True	False
3) A high blood pressure increases the risk of a heart attack.	True	False
4) Doctors and nurses monitor patient's vital signs to monitor their health.	True	False
5) Blood [illegible] is the most important vital sign.	True	False

Question Answer the questions below using evidence from the text.

1) What are our vital signs and why are they important?

2) How can we change our vital signs?

Making Connections How do you stay healthy?

PREVIEW

Name: _____ 91

Interrelations Between Systems

Interrelations Between Body Systems
None of our life systems work independently on their own. Each system relies on other systems in order to complete the jobs they need to do. Check out some of the relationships between systems below.



Nervous System – Relationship with the Systems Below

Muscular/Skeletal	Digestive	Circulatory
Sends signals through nerves to our muscles and bones to carry out movement	Our automatic nervous system controls digestion by making our digestive muscles work (esophagus, intestines)	Our automatic nervous system controls our heartbeat



Skeletal System – Relationship with the Systems Below

Muscular	Nervous	Circulatory
Connects with the muscular system so we can move our bodies	Protects the brain and spinal cord	Protects the heart. Bone marrow produces white and red blood cells

Muscular System – Relationship with the Systems Below

Skeletal	Circulatory	Digestive
Skeletal muscles move our bones. Bones are connected to muscle with tendons.	The heart is a cardiac muscle. There are also smooth muscles in veins and arteries	Smooth muscles in the esophagus, stomach, and intestines



Digestive System – Relationship with the Systems Below

Circulatory	Muscular	Skeletal
Provides nutrients for the circulatory system to send to the cells throughout our bodies	Provides nutrients and energy for our muscles (for repair and to do work)	Provides nutrients for bone growth and repair

Respiratory System – Relationship with the Systems Below



Circulatory	Nervous	Muscular
Provides the oxygen that is carried by red blood cells to all cells in the body. Removes carbon dioxide as well.	Provides oxygen to the brain to avoid a stroke	Provides muscles with oxygen and removes carbon dioxide (waste) from muscle

PREVIEW

Name: _____ 92

True or False Circle whether the statement is true or false.

1) The nervous system has an automatic system that controls things we don't have to think about.	True	False
2) The digestive system provides nutrients to the other systems.	True	False
3) The respiratory system's only job is to provide oxygen to the other systems.	True	False
4) Our life[illegible]ms can do their jobs without the help from other systems.	True	False
5) The [illegible]otects many of our other systems.	True	False

Questions [illegible]s below using evidence from the text.

1) What would happ[illegible]igestive system stopped working? Be specific?

2) What would happen to other systems if the resp[illegible]king? Be specific.

PREVIEW

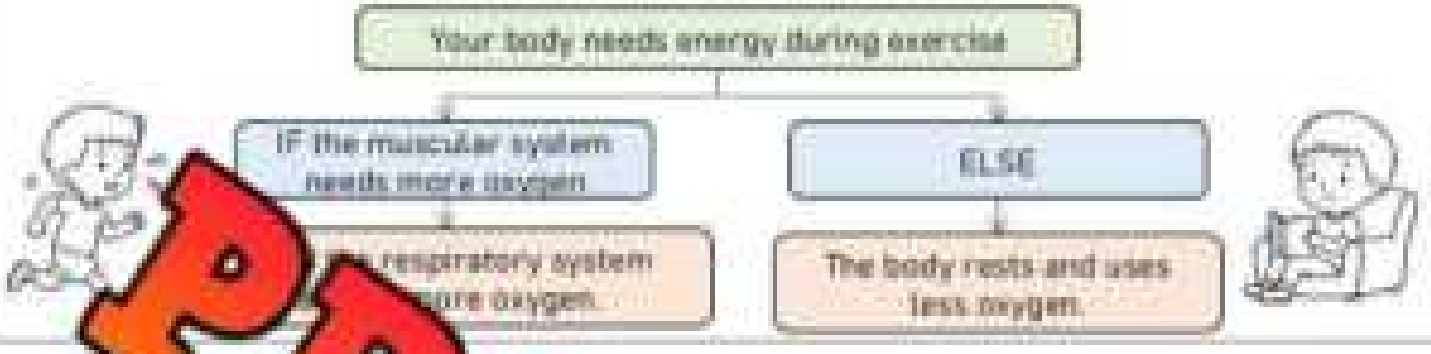
Questioning Write 2 questions you have about the relationship between systems.

1)	
2)	

Name: _____ 95

Coding – Else Statements

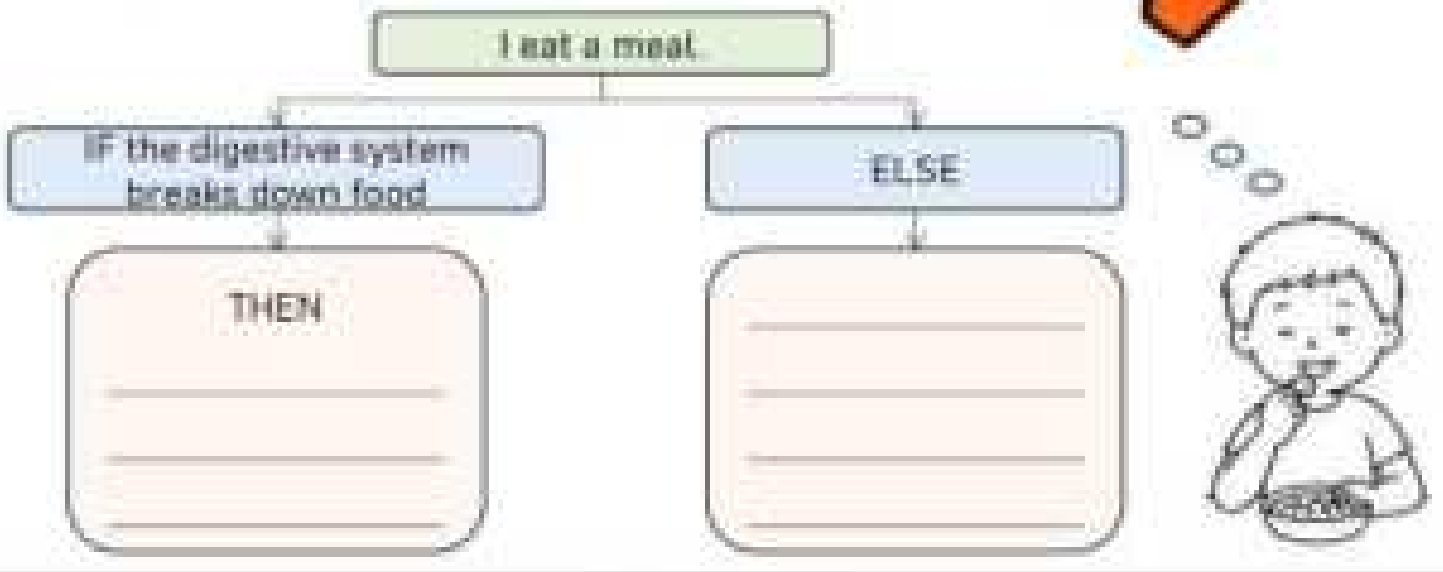
An **else** statement works like an if statement. When an if statement is false, we can have another command, instead of nothing happening.



PREVIEW

Directions ...ds below with your own ideas.





Name: _____ 96

Directions Fill in the ELSE commands below with your own ideas.

I touch something hot.

IF the nervous system detects heat

THEN

ELSE



IF the skin senses damage

THEN



I am feeling scared

If the nervous system senses danger

THEN

ELSE



PREVIEW

Name: _____ 97

Story - Body Systems Working Together

Jack the Future Olympian

There was a young athlete named Jack. Jack was determined to become the best runner in his school, so he trained hard every day.

Jack's training helped strengthen his heart. As he trained more and [illegible] his heart didn't have to work as hard when he ran. [illegible] run faster. His circulatory system, made [illegible] his h[illegible]ood vessels, pumped oxygen-rich blood to Jac[illegible] gi[illegible] the energy they needed to perfo[illegible]



Jack was also fo[illegible] bre[illegible]hile he ran. His respiratory system, [illegible]up[illegible] airways, brought oxygen into Jack's body and removed carbon dio[illegible] Jack [illegible] often, he was able to slow down his breathing, which saved his en[illegible] the [illegible] races.

Jack made sure to eat healthy foods to g[illegible] nts they needed to repair themselves after an intense workou[illegible] fruits, vegetables, and proteins that were broken down by his digestion system. [illegible]olo[illegible]ry system brought the nutrients to his muscles. The calcium in the [illegible] made his bones stronger and denser.

With his strengthened muscles and bones, Jack was able to run fast as they could support his body easily. He felt light on his feet!

Jack's training paid off, and soon he was the fastest runner in his school. He knew that the key to his success was the way his body systems worked together to keep him healthy and strong.

He decided to pursue his dream of winning an Olympic gold medal. He knew that his body systems would continue to work together to help him achieve his goal.

PREVIEW

Name: _____ 98

Write Write your own story that helps teach about how our body systems work together.



Name: _____ 106

Smoking – Effects on Health

Smoking in Canada

Smoking in 2022 is still the number one cause of preventable disease and death in Canada. The estimated percentage of smokers in Canada is 9.6%, which means roughly 1 in 10 people over the age of 12 smoke. The positive news is that this number has gone down significantly. In 1999, 22.6% of Canadians smoked.



How Smoking Affects Our Life Systems

Smoking affects many of our life systems, including our respiratory system, circulatory system, immune system, and digestive system.

System	Effects	Consequences
Respiratory System		When you inhale tobacco smoke, it contains over 7,000 chemicals, including nicotine. At least 250 of these chemicals • Can cause lung cancer. Nearly 9 out of 10 lung cancer deaths are due to smoking. • Can cause chronic bronchitis and worse asthma attacks.
Circulatory System		• Known to cause heart disease. The chemicals in cigarettes cause buildup of plaque in blood vessels, which limits how much blood can flow. • Can cause blood clots, chest pain, stroke, and heart attack
Immune System		• Can weaken our immune system so that our bodies fight other diseases as easily. • Causes more inflammation in our bodies. This makes our immune system work hard.
Digestive System		• Can cause gum disease in our mouth. • Often leads to loose and sensitive teeth and swollen gums which makes chewing more difficult.

Why Are People Smoking?

Our federal and provincial governments have done a good job with advertisements showcasing how bad smoking is for our health. Yet, smoking is still often shown in movies and TV shows as glamourous, even though the actors likely do not smoke.



If you are thinking about smoking, you should do your own research about the health consequences. You could ask a trusted adult or find research from a reliable website.

PREVIEW

Name: _____ 107

Smoking Effects

How does smoking affect the life systems below?

Life System	How Does Smoking Affect the Life System?
Respiratory System	
Circulato[illegible]em	

Questions

[illegible] below using evidence from the text.

1) Why do you thi[illegible] place?

2) Do you think it's good that some people [illegible] movies, social media) smoke? What message does that send [illegible]

PREVIEW

True or False

Circle whether the statement is true or false.

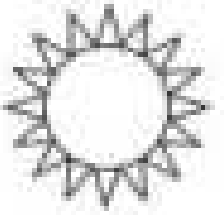
1) We can trust the information we hear on TV shows and movies.	True	False
2) Smoking is becoming a worse problem.	True	False
3) Smoking is the number two cause of preventable disease and death.	True	False
4) Smoking is good for some people and some body systems.	True	False
5) Before we decide to smoke, we should do our own research.	True	False

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Name: _____ 111

The Sun – Effects on Our Health

The Sun – Effects on our Health
There are benefits of sun exposure as well as health drawbacks from getting too much sunshine.



Benefits of Sun Exposure

- We get vitamin D from sunlight. Vitamin D strengthens our immune system, so we won't get sick as often. It also keeps our bones strong.
- Direct sunlight reduces stress. When we get sunlight, our bodies release melatonin, which lowers stress levels.
- Sunlight can improve our mood. Yes, sunshine boosts our body's level of serotonin, which is a chemical that makes us happier. That is why it is important to get outside, even in the winter.

Drawbacks of Sun Exposure
Too much sun exposure can cause:

- Skin changes – freckles and moles can lead to skin cancer
- Early aging – too much time in the sun causes our skin to age faster than normal. This can create wrinkled, tight, and leathery skin as well as dark spots.
- Weakened immune system – white blood cells are used for fighting bacteria in our bodies. When we get a sun burn, the white blood cells are busy making new skin cells. This means they won't be able to fight infections as well.
- Eye injuries – UV rays can damage your eyes. They can burn the outer layer, known as the cornea. This can cause blurred vision or even blindness.



Best Time for Sun Exposure
The sun's UV rays are strongest between 10am-3pm. If you will be exposed to the sun during this time period, you should wear sunscreen. You will get plenty of vitamin D in even a short time during this time.

It is best to get more sunshine outside of this time period, as you can stay out longer, and you won't get the drawbacks of sun exposure.

Making Healthy Decisions
It is not healthy to avoid the sun in fear of the drawbacks listed above. If you do, you will miss out on the important benefits of the sun. It is also not healthy to get too much sun, or you could feel some of the drawbacks. Finding a balance is important!

PREVIEW

Name _____ 112

Question What are the drawbacks and benefits of sun exposure?



Drawbacks	
Benefits	

PREVIEW

My Plan Write a plan below on how you will make sure you get enough sun, but not too much.

Questions	
What time will you get most of your sun exposure?	
What can you do to make sure you don't get sun burnt?	
What will you do to make sure you get enough sun?	

Name: _____ 120

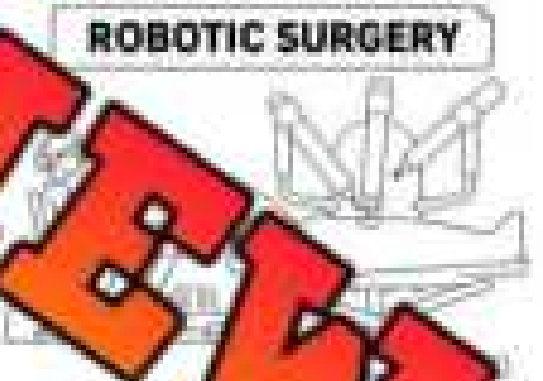
Robotic Surgery

What is Robotic Surgery?

Robot-assisted surgery, also known as robotic surgery, is a type of minimally invasive surgery that is performed using specialized surgical robots. The surgeon controls the robot using a console, which allows for very precise and delicate movements.

During the surgery, small incisions are made in the patient's body, and the surgical instruments are then inserted through these incisions. The robot's arms and hands move in a similar way to the surgeon's own hands, but with a greater range of motion and precision. The robot also provides a magnified 3D view of the surgical site, which allows the surgeon to see the patient's body more clearly than with traditional surgery.

Robot-assisted surgery can be used for a variety of procedures, including heart surgery, gynecological surgery, urological surgery, and general surgery. Some of the benefits of robot-assisted surgery include smaller incisions, less blood loss, less pain, and a faster recovery time.



Future of Robotic Surgery

In 2021, there were more than 10 million robotic surgeries done around the world. In 2012, less than 2% of all surgeries were done robotically. By 2018, that number had risen to over 15%. Today, an even higher percentage are performed by robot tools. Many scientists believe robots have the potential to replace most of the medical workers in hospitals.

This doesn't mean we won't always have doctors and nurses. Instead, medical professionals will use the technologies available to them to offer better diagnosis and treatment of what people are suffering from. Part of a medical professional's job is to empathize with their patients by listening to them, offer support, and understand their concerns so they can act in their best interest. Since healthcare is complicated, we need humans who can adapt to changing situations and who can use the technologies available to them to help people in need.

PREVIEW

Name: _____ L21

True or False Is the statement true or false?

1) Robotic surgeries are done only by robots.	True	False
2) A robotic surgery means a surgeon uses robotic tools.	True	False
3) Robotic surgeries are not happening much today.	True	False
4) A robotic surgery requires a smaller incision.	True	False
5) Robotic surgeries are less painful.	True	False

Questions Answer the questions below.

1) What is a robotic surgery? How often are they done?

2) What are the benefits of robotic surgeries?

Reflect Do you think we will ever have hospitals with mostly robots?

PREVIEW

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____ | Mark

Match each internal force to its correct definition.

Robot-Assisted Surgery	❑ Tiny cuts made in the body during surgery.
Surgeon	❑ The time it takes a patient to heal after surgery.
Small Incisions	❑ A type of surgery that uses robotic tools controlled by a surgeon.
3D Camera	❑ Helps the surgeon see inside the body more clearly.
Recovery Time	❑ A doctor who controls the robotic system during surgery.

Name: _____ | Mark

Match each internal force to its correct definition.

Robot-Assisted Surgery	❑ Tiny cuts made in the body during surgery.
Surgeon	❑ The time it takes a patient to heal after surgery.
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Name: _____ | Mark

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Small Incisions	❑ A type of surgery that uses robotic tools controlled by a surgeon.
3D Camera	❑ Helps the surgeon see inside the body more clearly.
Recovery Time	❑ A doctor who controls the robotic system during surgery.

PREVIEW

Name: _____ 123

Research – Robot Surgery



Research Answer the questions below.

1) What is robot surgery?

2) W[illegible] the b[illegible] drawbacks to robot surgery?

	Drawbacks

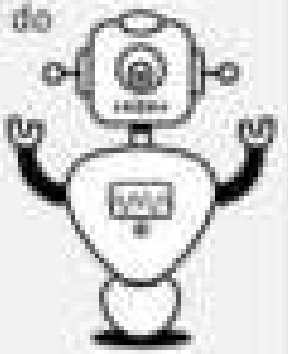
3) What surgeries are robots good at doing?

PREVIEW

Name: _____ 124

Research | Answer the questions below.

4) Imagine you broke your leg and were having a robot do the surgery. Write code below to instruct the robot what to look for and what to do when it finds it.



Ideas:
- Find the bone break
- Line up the bones
- Wrap [illegible] around the body part

Remember [illegible] statements.

PREVIEW

5) How could robot surgeries help doctors, hospitals, and people?

_____

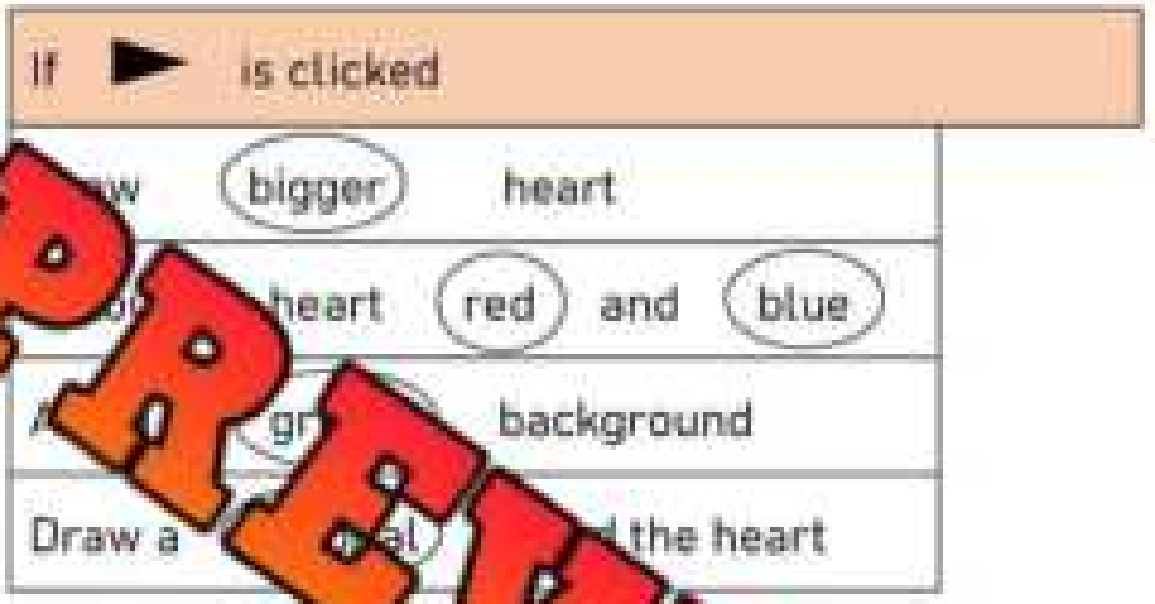
_____

_____

Name: _____ 125

Coding – Following Instructions

Directions Read the program and follow the instructions to draw the output.



PREVIEW

Original	Output
	

Name: _____ 128

Coding – Else Statements

An **else** statement works like an if statement. When an if statement is false, we can have another command, instead of nothing happening.



Player 1 is not feeling well

IF they are coughing

THEN give them medicine

ELSE

Lay down and rest



PREVIEW

Directions ...SE ...rds below with your own ideas.

My asthma is flaring up

...ca... ...

ELSE

THEN



I feel warm and sick

If my temperature is above 38° C

ELSE

THEN



Name: _____ 129

Directions Fill in the ELSE commands below with your own ideas.

I think I felt a bone break in my arm

If the x-ray shows a broken bone

THEN

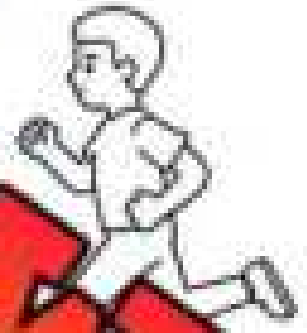
ELSE



I [illegible] my leg

If I pulled a muscle

THEN



My stomach hurts after that meal

If the meal had gluten

THEN

ELSE



PREVIEW

Name: _____ 133

Food Literacy and Mental Health

What is Food Literacy?

Food literacy means you understand how food affects your physical and mental health. When you understand how food energizes your body, you have food literacy that will allow you to live longer and be happier.



Food Literacy Main Points

There are [illegible] concepts involved with food literacy. Some key concepts are emphasized below.

1) **Food energy [illegible]** – Food is measured in calories, which is just another word for energy. If you are an active person, you will need to eat more food because you are using [illegible]. Different foods have different numbers of calories.

2) **Choose quality energy** – You can choose to fuel your body with many different foods. However, if you owned an expensive sports car, hopefully you would put the best gas in the gas tank. Well, the same applies to your body. If you put food with more vitamins and minerals, your body will perform [illegible].

3) **Better mood** – Processed food and sugars can lead to inflammation in the body and brain, and this leads to mood disorders, like anxiety and depression. Sugary foods and fast foods will make us happy in the moment but will [illegible] later. Foods high in fatty acids, like salmon, nuts, and seeds are great for your brain. Also, fruits and vegetables boost our mental health by giving us important vitamins and minerals our bodies need.

4) **Mindful Eating** – We should be thinking about how we feel when we eat and what we are eating. When we plan our meals, we do a better job at fitting in treats we like, but also important vitamins and minerals our bodies need. We also don't overeat or undereat if we are thinking while we eat. Try to avoid eating in front of the television or while doing something else!

PREVIEW

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Name: _____ 134

True or False Circle whether the statement is true or false.

1) Food is energy and is measured by calories.	True	False
2) Your body will feel the same with any type of energy you choose.	True	False
3) Eating healthy foods can cause anxiety and depression.	True	False
4) Eating affects our physical and mental health.	True	False
5) Mindful eating means not thinking while we eat.	True	False

Question Answer the questions below using evidence from the text.

1) Why is mindful eating im

2) What have you fueled you body with toda

Making Connections Do you understand food literacy? Explain.

PREVIEW

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class.

Name: _____

Vitamins	Processed Foods	Mark
Mindful Eating	Calories	

Fill in the blanks using the word bank.

1) Food gives our bodies the energy we need, measured in _____

2) Fruits and vegetables are rich in _____ that help keep our bodies healthy.

3) Eating too many _____ can have negative effects on our physical and mental health.

4) Paying attention to what and how you eat without distractions is called _____

PREVIEW

Name: _____

Fill in the blanks using the word bank.

1) Food gives our bodies the energy we need, measured in _____

2) Fruits and vegetables are rich in _____ that help keep our bodies healthy.

3) Eating too many _____ can have negative effects on our physical and mental health.

4) Paying attention to what and how you eat without distractions is called _____

Name: _____ 136

Direction Start at the top left box. Read each statement and choose TRUE or FASLE to follow the path. Keep going until you reach the FINISHED box.



PREVIEW

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Name: _____ 137

Macronutrients

Macronutrients are the main nutrients that make up our food. Macro means large, while micro means small. There are 3 macronutrients and a lot of micronutrients that are in our food. The 3 macronutrients are explained in the table below.

	Carbohydrates	Fat	Protein
Definition	Carbohydrates are the sugars, starches and fibres found in our food	Fats are a nutrient that provide our body with energy	Protein repairs cells so we can stay healthy
Purpose	ydrates are nt rces of . G d befo	Healthy fats can contribute to a healthy heart and brain.	Protein should be eaten so we can repair muscle damage that occurs from exercise
Calories per gram		9	4
Examples of foods high in each macronutrient	Breads, cereal pasta, rice, fr vegetables	ds, full fat am,	Meat, poultry, eggs, nuts, beans, legumes, cheese, milk

PREVIEW

Questions Answer the questions below using ev m th

1) Claire ate a sandwich with 28 grams of carbohydrates, 3 gr d 3 grams of fat. How many calories did she eat?

Answer: _____

2) What food can you think of that would have a balance of all 3 macronutrients? Explain.

3) Are all fats bad for us? What kinds of foods are high in fat and are healthy?

Name: _____ 140

Question Read the following scenarios and answer the questions.

1) It's track day at your school. You're running the 400m race! Which macronutrient will you eat the morning of your race? What foods would you choose?

2) You're [illegible] baby with a rapidly growing brain. What macronutrient should your [illegible] What foods would you want?

3) Your basketball tour[illegible] over [illegible] can barely walk your legs are so tired. What macronutrient [illegible] Which foods would you choose?

PREVIEW

Multiple Choice Circle the best answer!

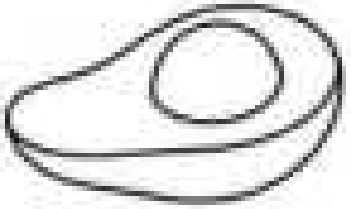
1) You ate 4 grams of healthy fat tonight. How many calories did you eat?

a) 24

b) 39

c) 36

d) 45



2) Nuts and red meats are high in which two macronutrients?

a) fat, protein

b) fat, carbohydrates

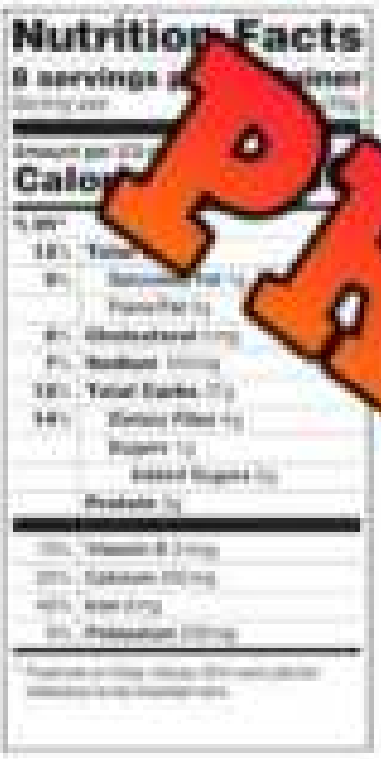
c) protein, carbohydrates

d) All of the above

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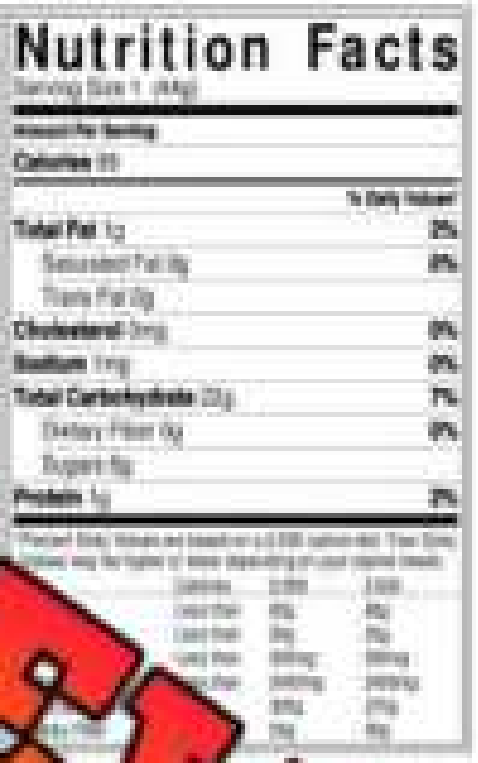
Nutrition Labels

Background
It is the law in Canada for companies to put a nutritional label on their packaged food. This allows consumers (us) to know what we are getting with their product. Review the nutritional labels below and write down what is on both labels.



What's on the Labels?

- Serving size



PREVIEW

Questions Answer the questions below using evidence from

1) Why do you think it is the law that companies have to include a nutritional label?

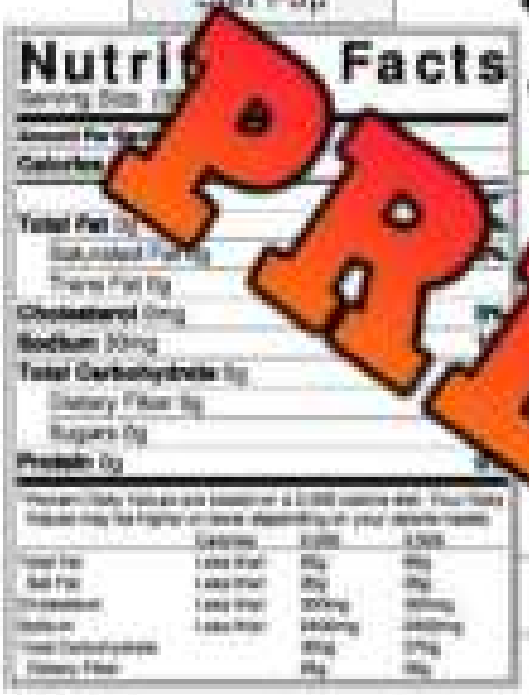
2) Based on the labels, which food do you think is healthier? Why?

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Ingredient List

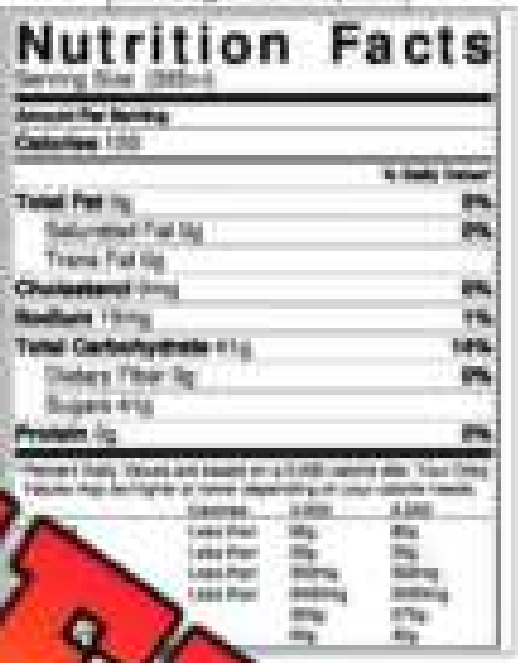
Did you know?
Companies must also include an ingredient list on their food products. The ingredient list is the secret to finding healthy food because sometimes the nutritional label can be misleading.

Diet Pop



Which one is healthier? Why?

Regular Pop



PREVIEW

The diet pop looks like the better option, however, take a [illegible] Which pop do you think is the healthier option? (no pop is always [illegible]

Diet Pop
Ingredients: Carbonated Water, Colour (Caramel E150d), Acids (Phosphoric Acid, Citric Acid), Flavourings (including Caffeine), Sweeteners (Aspartame, Acesulfame K), Acidity Regulator (Sodium Citrate), Preservative (Potassium Sorbate), Contains A Source Of Phenylalanine.

Regular Pop
Ingredients: carbonated water, high fructose corn syrup, caramel colour, sugar, phosphoric acid, caffeine, citric acid, and natural flavours

Which pop do you think is healthier? Why?

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Unit Test – Human Organ Systems

Multiple Choice Circle the best answer. Only choose 1 answer!

1) This system controls your blood flow. a) Respiratory b) Circulatory c) Nervous d) Digestive	2) This system controls your breathing – flowing oxygen in and carbon dioxide out. a) Respiratory b) Circulatory c) Nervous d) Digestive
3) Which system [illegible] muscles allowing you to [illegible] a) Muscular b) Skeletal c) Nervous d) Digestive	4) The biceps and triceps belong to which system? a) Muscular b) Skeletal c) [illegible]vous d) Digestive
5) The lungs belong to which system? a) Muscular b) Circulatory c) Respiratory d) Digestive	6) The [illegible] belongs to which system? a) [illegible]atory b) [illegible] c) Ner[illegible] d) Digestive
7) The Femur belongs to which system? a) Muscular b) Skeletal c) Nervous d) Digestive	8) Which system con[illegible] a) Respiratory b) Skeletal c) Nervous d) Circulatory
9) The intestines belong to which system? a) Muscular b) Skeletal c) Nervous d) Digestive	10) Which blood vessels take blood away from the heart to the rest of the body? a) Veins b) Arteries c) None of the above d) Both of the above

PREVIEW

Diseases Fill in the table below about diseases affecting our body systems.

Disease	Life System Affected	How the Disease Affects the Body
Stroke		
Epilepsy		
Asthma		

PREVIEW

Short Answer Answer the questions below. Each question is worth 3 marks.

1) What is the main job of the heart?

2) How do the lungs and heart work together to get oxygen to our cells?

3) How do our systems work together to allow us to move our bodies?

Long Answer Answer the questions below – Each question is worth 5 marks.

1) How does the digestive system work? Explain how food enters the system and how it gets digested.

2) How does the circulatory system interact with other systems? Be specific and make sure to include 5 interactions in your answer.

PREVIEW