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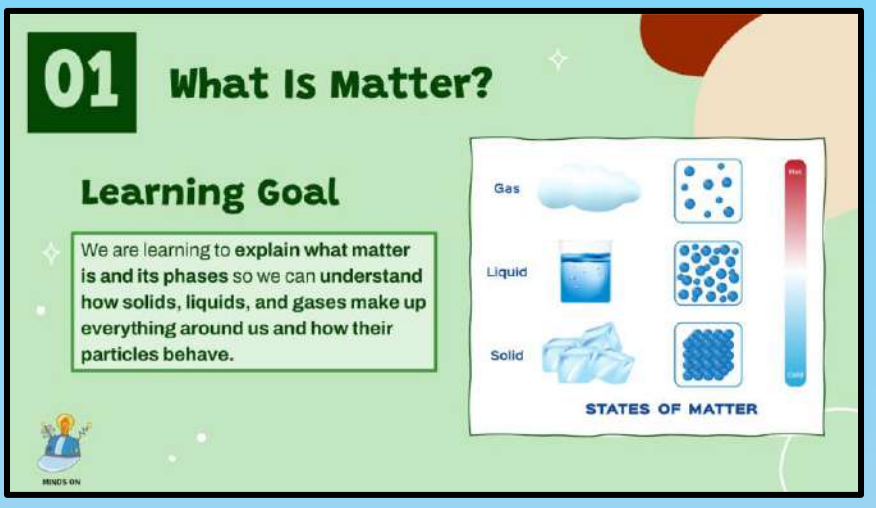
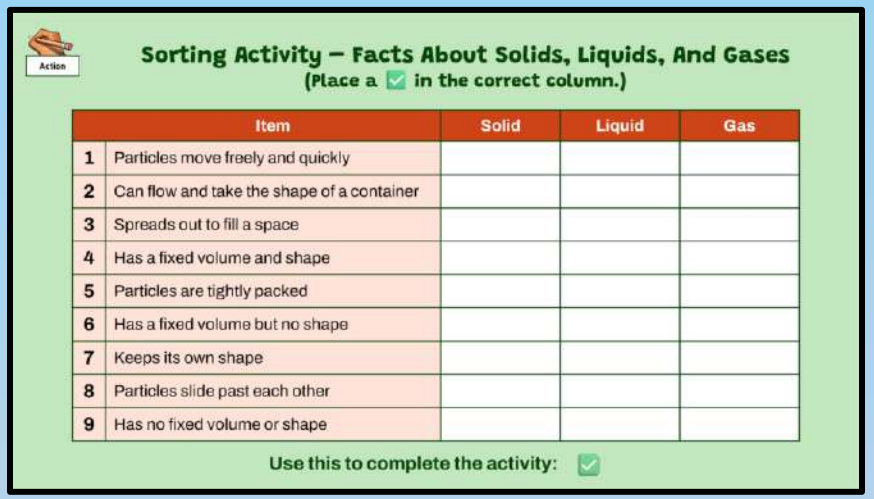
Alberta Science Matter Unit – Grade 5

3-Part Lesson Format

Part 1 – Minds On!

- Learning Goals
- Discussion Questions
- Quotes
- And More!



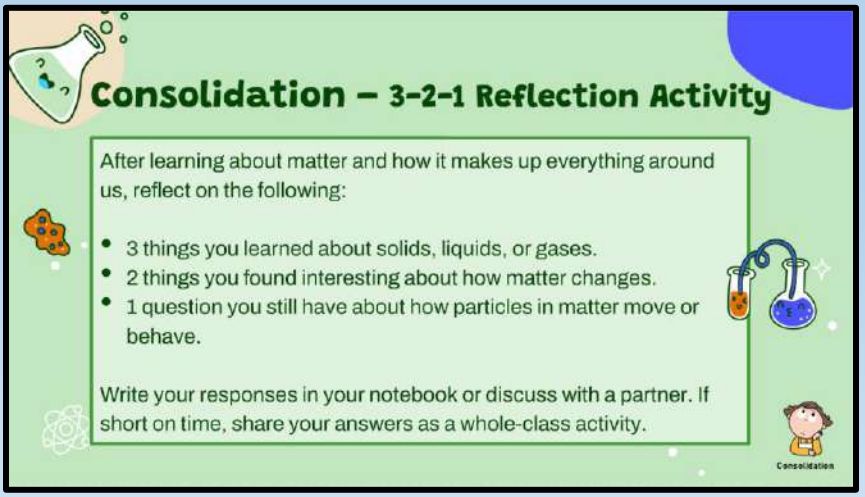


Part 2 – Action!

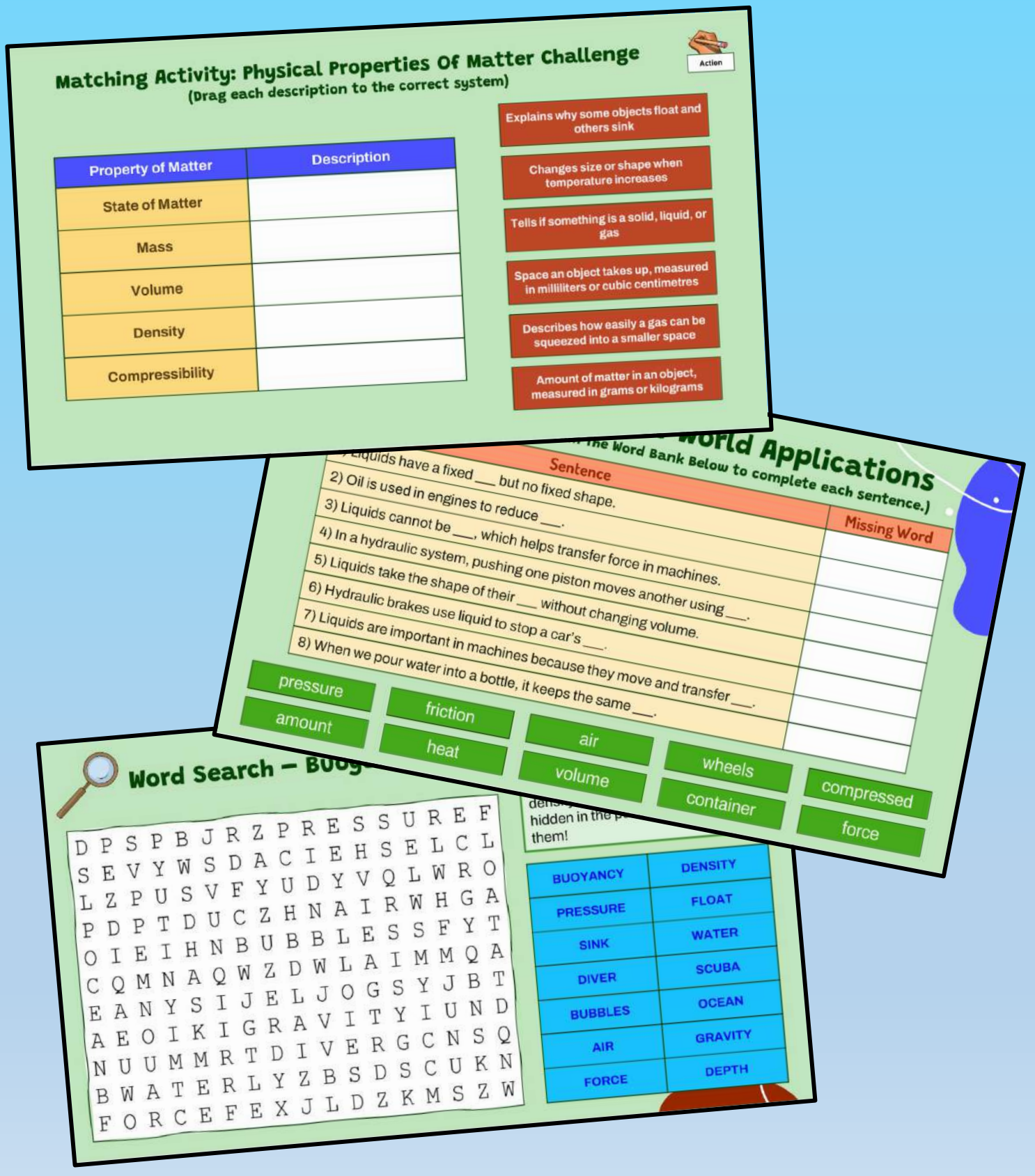
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

Part 3 – Consolidation!

- Exit Cards
- Quizzes
- Reflection
- And More!



Alberta Science Matter Unit – Grade 5



Alberta Science Matter Unit – Grade 5

Action

Sorting Activity – Facts About Compressibility: Water Vs Air

(Place a ✅ in the correct column.)

	Item	Water	Air
1	Particles are packed very close together		
2	Easily changes volume when squeezed		
3	Keeps almost the same volume under pressure		
4	Particles have lots of space between them		
5	Used in balloons because it can compress		
6	Hard to squish because particles can't move closer		
7	Expands again when pressure is released		
8	Found in objects that need flexibility, like tires		
9	Particles are packed very close together		

Use this to complete the activity: ✅

Action

Cause And Ef

Instructions: Drag the letter of each Effect t… match its corresponding Cause.

	Air is squeezed tightly inside a compressor.
	When you stomp on the air bladder of a stomp rocket.
	Compressed air is released quickly through a hose.
	A pneumatic paint sprayer uses air pressure.
	A jackhammer is powered by compressed air.
	Air tools are used instead of electric tools.
	The air compressor is turned off.

B
C
D
E
F
G
H

hard su…

B. The air rushes out, pushing th… the air.

C. Nothing happens because no pressure is built up.

D. Compressed air makes sound waves travel faster.

E. The paint sprays out smoothly and evenly.

F. It creates stored energy that can be used later.

G. They are safer in wet places and easier to control.

H. It moves fast and produces a strong burst of force.

…uids – Multiple Choice

…ct letter (A, B, or C) in the Answer column

A B C

Question	A	B	C	Answer
1) What does a **piston** do in a hydraulic system?	Stores extra water	Pushes liquid to move objects	Measures pressure	
2) Why are **liquids** better than air in hydraulics?	They don't compress easily	They're lighter than air	They move faster	
3) What happens when pressure is added to water in a **closed system**?	The pressure spreads evenly	The liquid disappears	The water freezes	
4) Which machine uses **hydraulics** to work?	Wind turbine	Bicycle chain	Car brake	
5) Why can't water be easily **compressed**?	It changes shape quickly	Its particles are tightly packed	It contains air bubbles	
6) What is **hydraulics** the study of?	Liquids in motion	Air pressure	Sound waves	

Workbook Preview

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Grade 5 – Science Unit

Organizing Idea: Matter: Understandings of the physical world are deepened by investigating matter and energy

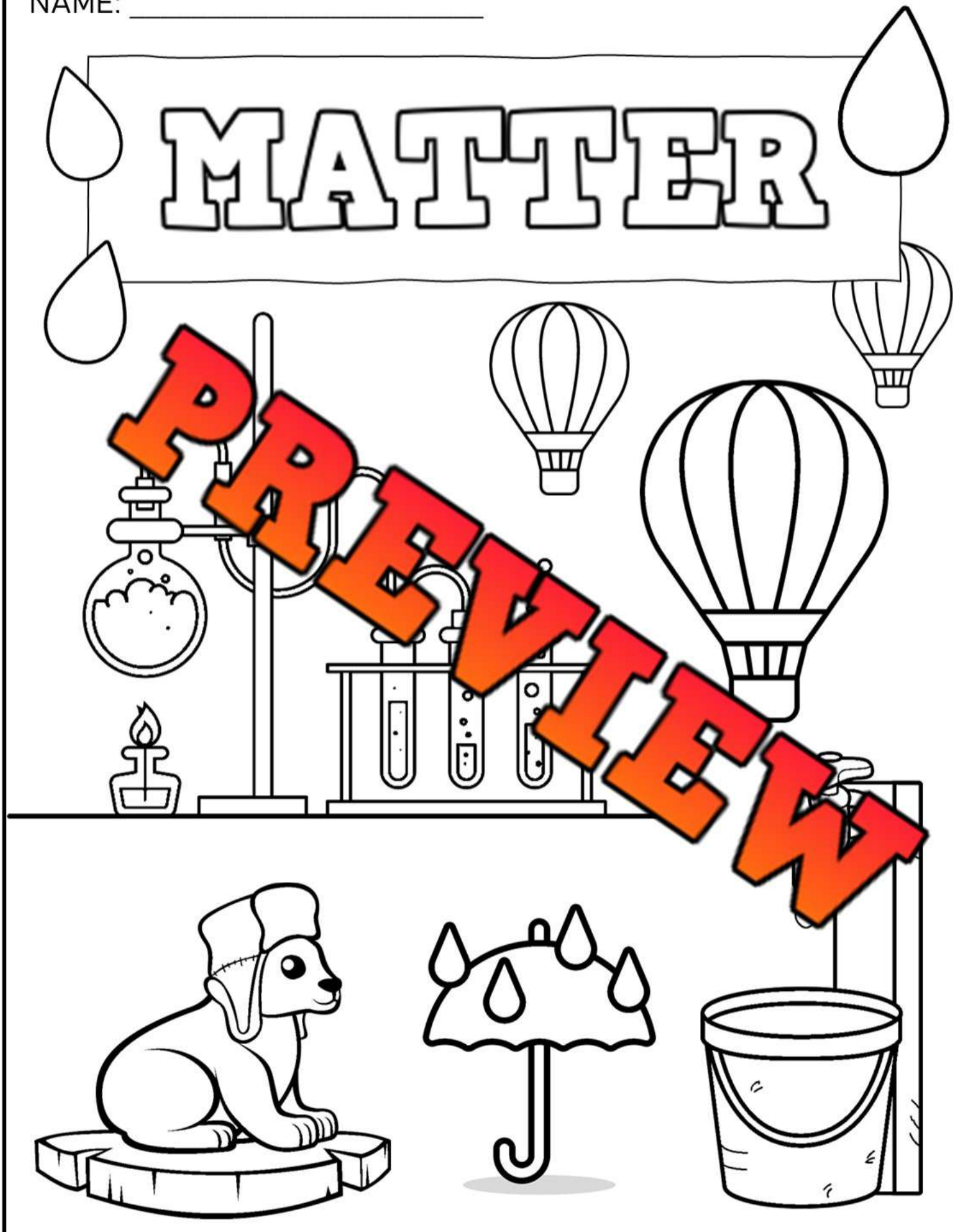
Guiding Question: How can states of matter and other physical properties be explained using the particle model of matter?

	Learning Outcome – Students investigate the particle model of matter in relation to the physical properties of solids, liquids, and gases.	**Pages**
M.1	○ Ideas represented by the particle model of matter include that: ▪ all matter is made up of small particles ▪ particles of matter are always moving ▪ particles of matter have spaces between them ○ In solids, the particles are close together and vibrate in place. ○ In liquids, the particles are separated by spaces and can slide past each other. ○ In gases, the particles are separated by large spaces and are constantly moving in all directions.	6 – 24, 40 – 47
M.		
M.	○ SI units are abbreviated for convenience, including g: grams kg: kilograms mL: millilitres L: litres	57 - 60
M.4	○ Density is a comparison of the mass of a solid, liquid, or gas to its volume. ○ The greater the mass of a solid, liquid, or gas as compared to its volume, the higher its density. ○ Density can be described comparatively using the phrases denser and less dense. ○ Density can be directly compared by determining ▪ the relative mass of objects with the same volume ▪ if a liquid sinks or floats when added to another liquid ○ A solid, liquid, or gas that is less dense than the fluid in which it is placed will float.	25 – 28, 30 – 31, 34 – 39, 48 – 49, 57 – 60, 77 – 80, 87 - 88
M.5	○ Compressibility is the ability of a liquid or gas to reduce in volume when under pressure	61 – 72
Computer Science:		
CS.1	Students apply design processes when creating artifacts that can be used by a human or machine to address a need.	29, 32 – 33, 72 – 76, 81 - 86

Preview of 100 pages from this product that contains 133 pages total.

NAME: _____

MATTER



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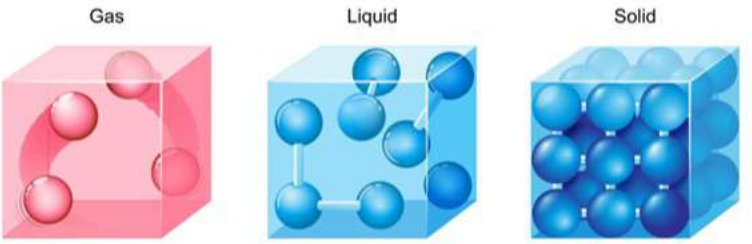
Curriculum Connection
M.1

What is Matter?

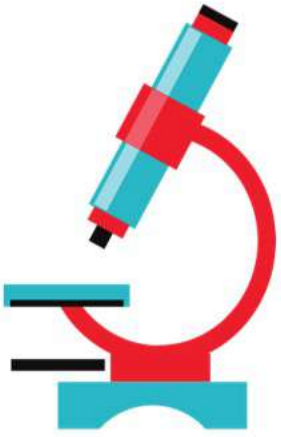
What is Matter?



Everything is made of matter. Look around. The desks in your classroom are made of matter, the air we breathe and the water we drink are all made of matter. Even our bodies are made of matter!

Matter is anything that has mass and occupies volume. Air is matter because air has weight and takes up space. We know this because a balloon that is full of air weighs more than an empty balloon. Air also takes up space because when we blow up a balloon, we put air in the balloon, expanding it.

A desk is also matter. It is solid, meaning it has mass and it takes up space. When something takes up space, we say it occupies **volume**.



Particles - Atoms

All matter is made up of particles called atoms. When you look at matter, you can't see the atoms. Even with the best light microscope, single atoms cannot be seen, but atoms are there. You are made of 7 billion billion billion atoms, or 7,000,000,000,000,000,000,000,000,000

Phases of Matter

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

PREVIEW

Name: _____ 7

Curriculum Connection
M.1

What is Matter?

Questions

Use information from the text to support your answer

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 questions 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

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Curriculum Connection
M.1

Matter - Yes or No?

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

PREVIEW

Name: _____ 9

Curriculum Connection
M.1

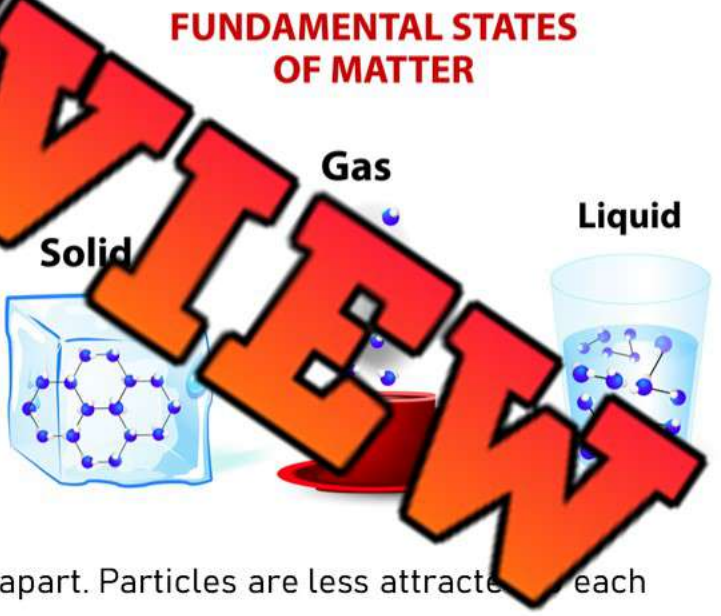
The Particle Theory Of Matter

The Particle Theory

Matter can be classified according to its physical characteristics. The particle theory of matter helps to explain the physical characteristics of matter.

1) Everything is made of particles
2) There are spaces between the particles
3) Particles are attracted to each other
4) Temperature is the speed at which particles move
5) Particles are always moving because they have kinetic energy
6) There are different types of particles, but all particles of one substance are identical

PREVIEW



Solids

In solid form particles are closer. The particles are very strongly attracted to each other. They are locked in a pattern and vibrate in place. Solids have a fixed shape and volume. The spaces between the particles are small.

Liquids

In liquid form, particles are slightly farther apart. Particles are less attracted to each other and are able to slide past each other. The spaces between the particles are larger than in a solid.

Gas

In gas form, particles are far apart and can move in any direction because the attraction forces between them are weak. Gases have no fixed shape and no fixed volume. They expand to fill their container.

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Name: _____ 10

Curriculum Connection
M.1

Particle Theory Questions

True or False

Circle whether the statement is true or false

1) All matter is made of particles	True	False
2) Temperature affects how fast particles move	True	False
3) In solid matter, particles are further apart	True	False
4) When m eats up, the atoms move slower	True	False
5) In gase expand and fill their container	True	False

PREVIEW

Part 2

Add n s) t he beakers to represent which state of matter it is

Gas **Liquid** **olid**

Explain

List the properties of each stat ter

State of Matter	Properties of the State of Matter
Solid	
Liquid	
Gas	

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Curriculum Connection
M.1

Physical Properties of Matter

Physical Properties of Matter

Matter is everything around us that has mass and takes up space. There are five physical properties of matter: state, mass, volume, density, and compressibility.

1) State of Matter

The "state" refers to whether matter is a solid, liquid, or gas. Solids have a fixed shape and volume. Liquids can change shape but have a fixed volume. Gases can change both shape and volume.

2) Mass

Mass is the amount of matter in an object. It is usually measured in grams (g) or kilograms (kg). For example, an apple may have a mass of 100 grams.

3) Volume

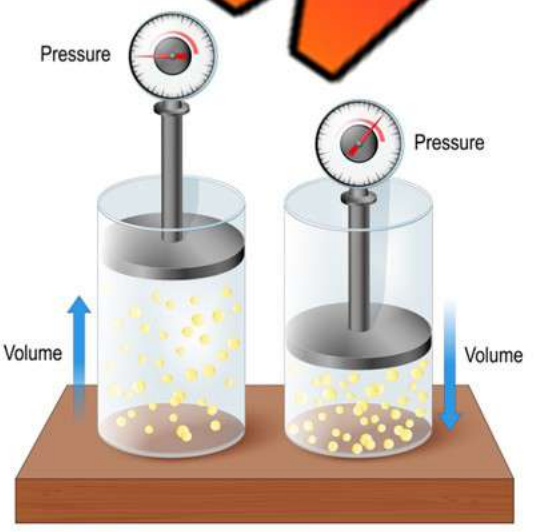
Volume tells us how much space matter takes up. It is measured in cubic units (like cubic centimeters) or in milliliters (ml) and liters (l) for liquids or substances, a bottle of juice might have a volume of 500 milliliters and a Rubik's cube could be 125 cm^3.

4) Density

Density is how tightly packed the matter in an object is. It is found by dividing mass by volume. An object with high density has a lot of matter in a small space. For example, a bowling ball is dense because it has a lot of matter packed into a small space.

5) Compressibility

Compressibility is a measure of how much the volume of matter decreases under pressure. Gases are highly compressible, while solids and liquids are not. For instance, you can compress the air in a bicycle pump, but you can't compress the bicycle itself.



PREVIEW

Name: _____ 12

Curriculum Connection
M.1

Physical Properties of Matter

Definitions

What do the terms below mean?

State	
Mass	
Volume	
Density	
Compressibility	

PREVIEW

True or False

Is the statement true or false?

1) Matter only exists in a solid state		False
2) Volume tells us the weight of an object	True	False
3) A basketball has a high density	True	False
4) Liquids have a fixed shape but can change volume	True	False
5) Solids are highly compressible.	True	False
6) Gases can change both shape and volume.	True	False
7) Compressibility measures how much volume decreases under pressure.	True	False
8) An object's mass tells us how much space it takes up.	True	False

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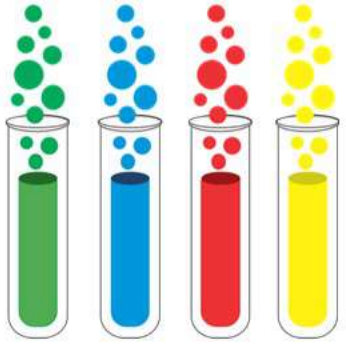
Curriculum Connection
M.1, M.3

All About Liquids

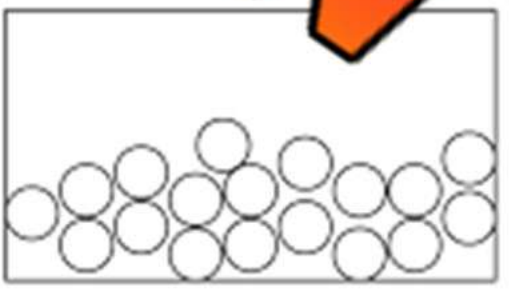
Liquids

A **liquid** is a form of matter that can be poured. When you pour a liquid, it will always take the shape of its container. W[illegible]our liquids into cups when we n[illegible]nk. The liquid will always [illegible]p[illegible]e cup you are using. [illegible]e mos[illegible]form of liquid is water.

Liquids all have [illegible]ght[illegible]k up space. Liquids have a def[illegible]ume[illegible]s if you put 1 cup of water into a bowl or into a tall glass, it takes up the [illegible]spac[illegible]space. The volume of a liquid refers to how much space the liq[illegible]takes u[illegible]

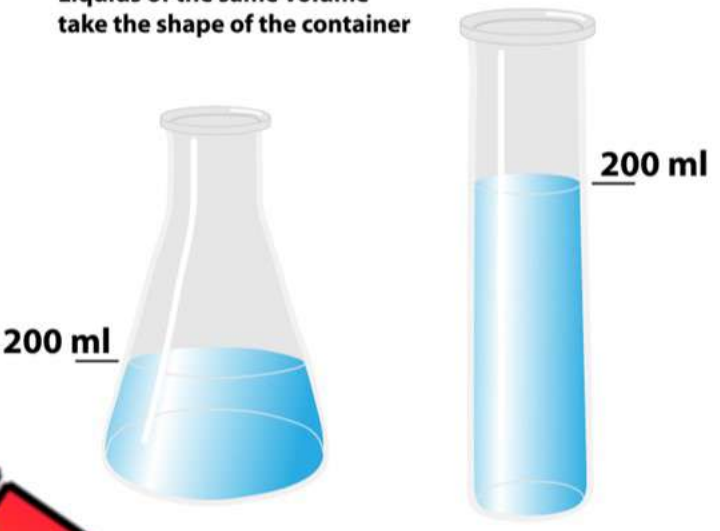


Liquids can chang[illegible]r stat[illegible]r. Liquids can be made into solids when you co[illegible]o their[illegible]ing points. Liquids can be turned into gases w[illegible]ou[illegible]their boiling point. The freezing and boiling poi[illegible]is different.



Volume

Liquids of the same volume take the shape of the container



PREVIEW

Properties of Liquids

- Do not have a definite shape
- Take the shape of their container
- Fill the bottom of a container or spread when they are not contained
- Maintain the same volume in different containers
- Are difficult to compress or squeeze because the particles are close together

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Curriculum Connection
M.1, M.3

All About Liquids

Word Search

Find the word bank words in the puzzle

D	F	R	E	E	Z	I	N	G	D	O	S	W	I	C	K
O	E	E	L	P	P	Z	Q	B	G	W	Q	D	F	D	B
N	Y	F	L	O	W	K	A	O	S	S	G	L	K	G	L
L	D	P	V	T	Z	I	T	Z	S	H	A	P	E	Z	T
W	V	A	G	N	O	C	Z	O	I	Q	R	E	S	Y	
H	N	Q			L	U	M	E	L	K	E	M	Q		
O	E				R	A	W	D	C	Q	M	P			
Z	C	Z		O			E	R	F	V	N	Y			
R	O	Y	T	E		E	R			R	E	E	Z		
P	M	T	N	L	I					E	T	M			

Word Bank	
Liquids	Shape
Container	Flow
Temperature	Matter
Freezing	Volume

PREVIEW

Fill in the Blanks

Write t sing d line

1. Liquids will always take the shape of their _____.
2. The most common form of liquid is _____
3. Liquids can change their states of _____
4. Liquids will turn into solids when they are _____ d).
5. Liquids fill the _____ of their container, not the

Making Connections

What does this reading remind you of in your life?

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Curriculum Connection
M.1

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 — What do we need for our experiment?

- Sma[illegible] plasti[illegible]
- Small candie[illegible]
- Various liquids ([illegible] soap [illegible] corn syrup, etc.)
- Stopwatch (optional)

Method — How do we comple[illegible] Experi[illegible]

1. Fill each of the cups full of the different liq[illegible]
2. Drop a candy into the first liquid. Use the stopwat[illegible] ti[illegible] how[illegible]t 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

PREVIEW

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

Most Viscous (thickest) _____

Least Viscous (thinnest) _____

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Curriculum Connection
M.1

Experiment - Viscosity - Results

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

Liquid	Prediction (seconds)	Length of time (seconds)

PREVIEW

Results Answer the quest ow

1. Was your hypothesis correct or wrong? Did an surpr

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? _____

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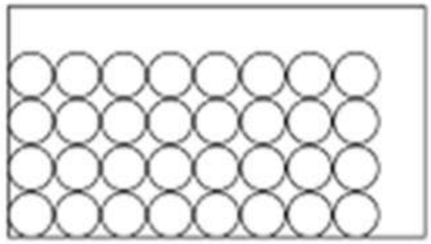
Curriculum Connection
M.1

Characteristics of Solids

All About Solids

Solids can have a lot of different characteristics. Many solids are hard like your desk, the walls and floors. Solids can also be soft, like a cotton ball. Some solids like play dough and clay can be molded so you can change their shape.

They a[illegible] all still solids. When you break a solid, it stays a soli[illegible]e than one piece. When you break a cookie, [illegible]li[illegible]es and crumbs, but it will not become a [illegible]uid.



The particles do not move or spread out to fit the container

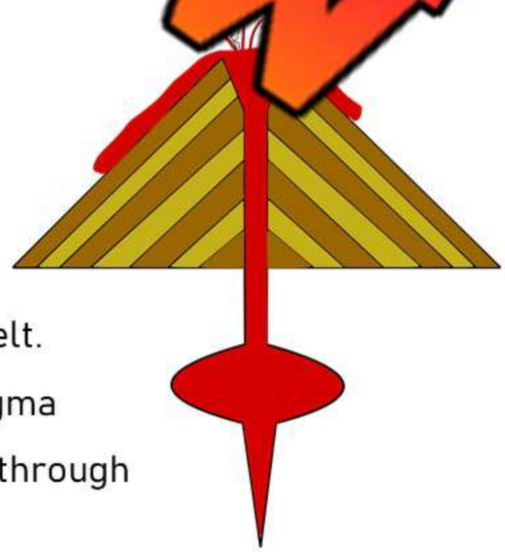
<u>Therefore, solids:</u>

- Can't be poured
- Holds their shape unless an o[illegible]side[illegible]s [illegible]it (example – cuts it)
- Has a definite shape (do not take th[illegible]ape of [illegible] co[illegible]er)
- Is difficult to squeeze as the particles are [illegible]y pac[illegible]
- Is dense because there are many particles pac[illegible] toget[illegible]
- Can be described in many ways, including hard, soft, [illegible] sm[illegible]t[illegible]und

Solids Can Melt

When a solid is heated to its melting point, it will turn into a liquid. Some solids, like ice, will change into a liquid at room temperature. Other solids, like rocks, will need to be heated at very high temperatures to melt.

Rocks will melt under the ground in magma. Magma is melted rock. When magma comes up to the surface through a volcano, it is called lava.



PREVIEW

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Curriculum Connection
M.1

Characteristics of Solids

Questions

Answer the questions below using evidence from the text

1) What does it mean that solids do not take the shape of their container? Give an example.

2) What does it mean that solids hold their shape? Give an example.

PREVIEW

Visualizing

Draw what you were reading. Explain the picture

True or False

Is the statement true or false

1) When you break a solid into pieces, it becomes a liquid	True	False
2) When a solid melts, it becomes a liquid	True	False
3) A solid takes the shape of its container	True	False
4) Solids can be strong, weak, soft, or hard	True	False
5) Rocks can melt into liquids	True	False
6) Rocks cannot melt because they are too hard	True	False

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Curriculum Connection
M.1

Using Solids - Real-World Applications

Properties of Solids

Solids have the following general properties:

- Rigid
- Fixed shape
- Fixed volume
- Cannot be compressed (squashed)

Application of Solids

Solids are used to create structures we have in our lives. We use solids because they are rigid, have a fixed shape, fixed volume, and they cannot be squashed.

Solids are **rigid**, meaning they have a certain structure that will not change shape. Solids are great to make structures because they are strong. A chair is made of rigid solids, like wood, steel, and cardboard.

Having a **fixed shape** means the solid will not change shape when you move it or apply pressure to it. A **fixed volume** means a solid takes the same amount of space. A desk has a fixed shape that does not change. This is helpful so you can work on the desk and know it won't change its shape. Your teacher appreciates that it has a fixed volume, meaning it won't expand or shrink.

Solids cannot be compressed, meaning you can't squeeze them. If you are 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

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Curriculum Connection
M.1

Using Solids - Real-World Applications

Making Connections

What does this remind you of in your life?

Questions

Answer the questions below using evidence from the text

1) What are the 4 properties of solids?

2) How would life be different if solids were not rigid / did not have 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

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Curriculum Connection
M.1

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

...the experiment

1. 25ml of water (or other liq... form
2. 25ml of other liquid (juice, pop, etc.)
3. Measuring cup
4. Jug of water
5. Weight scale

Procedure

Instructions – How to complete the exper...

1. Make ice by pouring 25ml of water into ice cube trays. Put tray in th...er. You could also make ice from other liquids to compare different substan...
2. Once the ice is made, weigh it quickly before it melts. Record 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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Curriculum Connection
M.1

Experiment - Weight of Solid vs Liquid

Observations

How much does each solid or liquid weigh?

State of Matter	Weight
Solid – Ice Cube	
Liquid - Water	

PREVIEW

Results

Answer the questions below

1. Was your hypothesis correct or incorrect?

2. Why do you think the solid and the liquid weigh the same?
   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).

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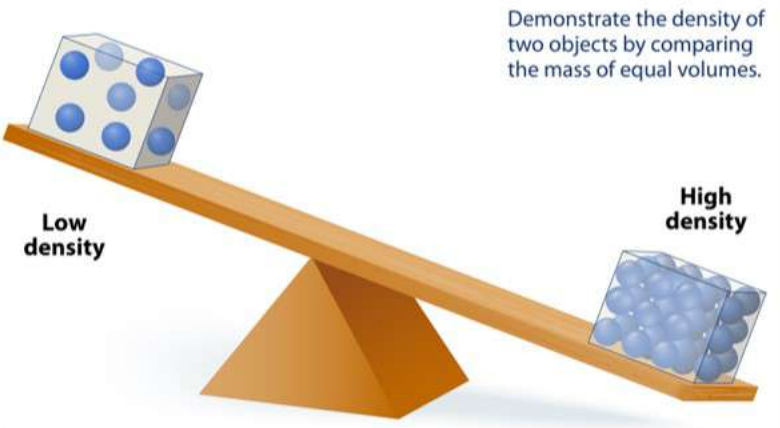
Curriculum Connection
M.4

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 example, sand will sink in water. This is good if sand floated, our bea[illegible]ss!



PREVIEW

Density of Solid

Solids will sink or f[illegible] caus[illegible]sity. Remember that solids are made of particles. **Density** is how ti[illegible]acked th[illegible]les are. A highly dense solid has very tightly packed particles, like a [illegible] ni[illegible] heavy compared to their size.

A solid with a low density has loo[illegible]cked p[illegible]s. This makes the solid light compared to its size. Examples of solids with a lo[illegible]sity a[illegible]tic water bottles, paper, leaves, feathers, and sponges.

Density of Water

Water is made of particles as well. So, water has a density too. Wat[illegible]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** (BOY + UNT). A piece of Lego is buoyant. A brick is not buoyant.

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Curriculum Connection
M.4

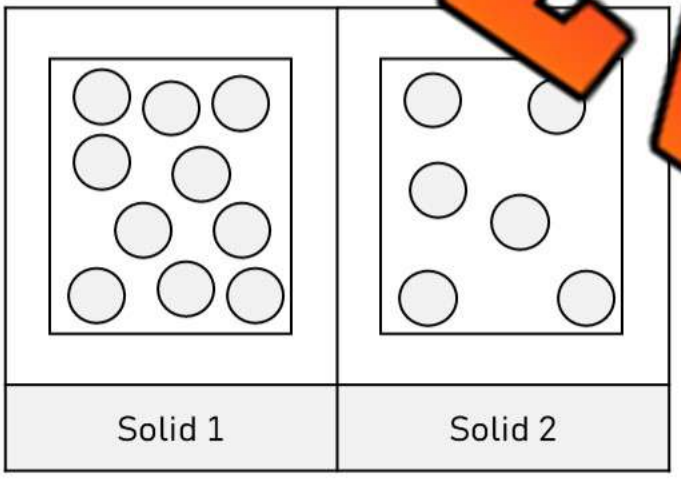
Buoyancy - Density of Solids

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

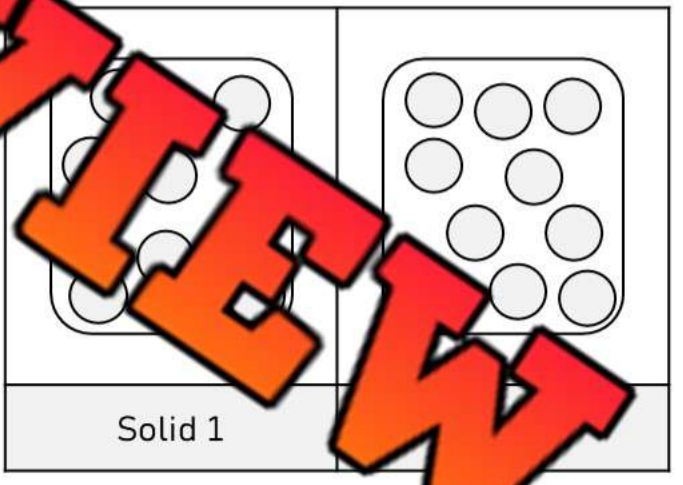
1) Ice is buoyant in water	True	False
2) Ice has a higher density than water	True	False
3) Ice is not buoyant in water	True	False
4) Really bi[illegible]ubes will sink in water	True	False
5) One cu[illegible] more than one cup of water	True	False

Density [illegible]ject has a higher density?

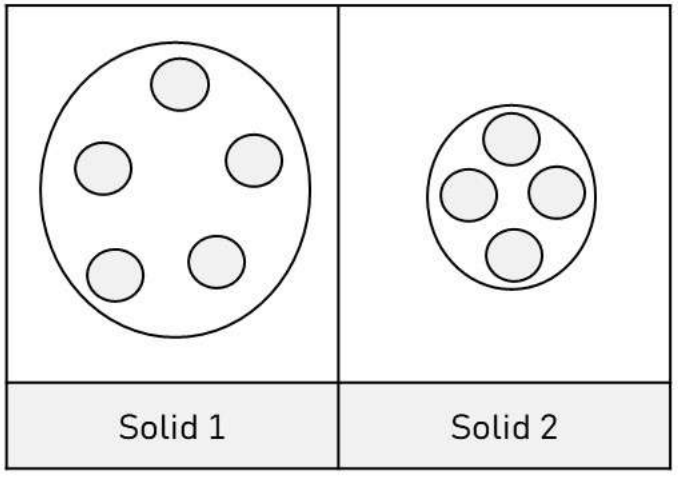
The particles in the [illegible]s bel[illegible]. Circle which solid has a higher density.



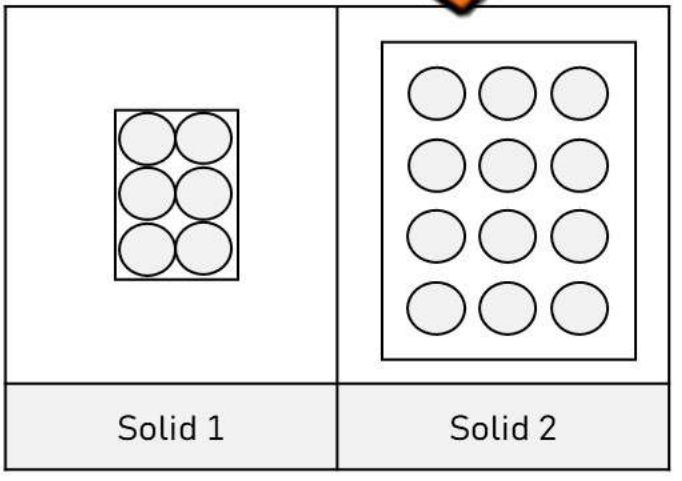
Solid 1 | Solid 2



Solid 1 | [illegible]



Solid 1 | Solid 2



Solid 1 | Solid 2

PREVIEW

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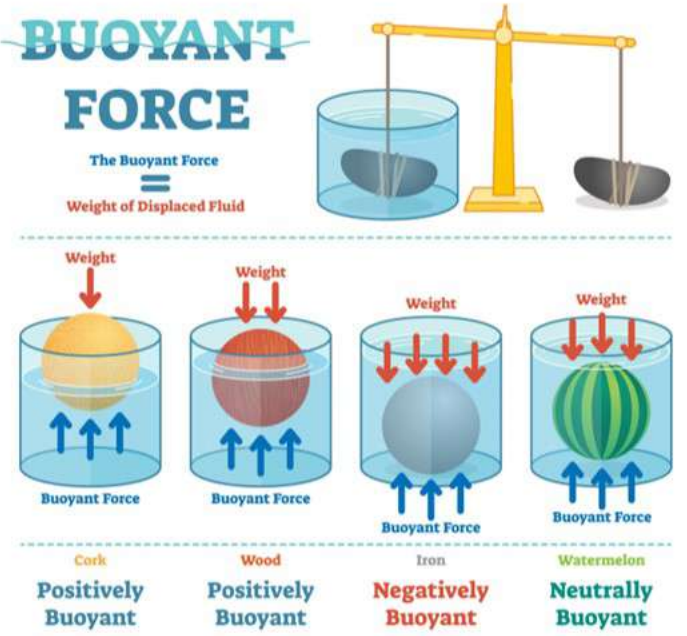
Curriculum Connection
M.4

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 into a fluid, like water. All objects in water have some buoyant force pushing up against the gravity that is pulling the object down. If the buoyant force is not strong enough to push the object out of the water, it will sink.



PREVIEW

Types of Buoyant

Positively Buoyant

An object, like cork, is positive[illegible]t if [illegible]s less than the fluid it is in. The result will be that the object floats [illegible]he f[illegible]m, cork is more positively buoyant than wood, but both float in the w[illegible]meanin[illegible]t the surface because their density is less than the water. They are both [illegible]be po[illegible]oyant.

Negatively Buoyant

An object is negatively buoyant if it sinks in water. This means [illegible]obj[illegible] density than the fluid, it will be negatively buoyant. Negatively buoyan[illegible] meaning some negatively buoyant objects will take time to sink, while other[illegible]ively 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.

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Curriculum Connection
M.4

Buoyancy

Questions

Use information from the text to support your answer

1) Define the buoyancy terms below.

Positively Buoyant	
Negatively Buoyant	
Neutrally Buoyant	

2) How does density affect the buoyancy of an object?

_____

_____

_____

Examples

What objects are positively, negatively or 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

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Curriculum Connection
M.4

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 Und[illegible]er: Descending Slowly

Divers nee[illegible]lowly when they start their dive. One re[illegible]dies to adjust to the increasing pressu[illegible]im[illegible]tantly, it helps protect their ears. [illegible]ur ear[illegible]ir-filled spaces that need to have the same pressure as the water o[illegible]

This is why divers often [illegible]ing down, which is a way of letting more air in to balance the pressure. By de[illegible]slo[illegible] divers give their ears a chance to adjust g[illegible]ally.

The Dangers of Rising Quickly: Decompression Sickn[illegible]

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

However, if a diver comes up too quickly, the pressure around them d[illegible]eases 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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Curriculum Connection
M.4

Scuba Diving Safely

Questions

Answer the questions below using evidence from the text

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

2) Why do scuba divers have to come up slowly from a deep dive? What do they do?

PREVIEW

Questioning

Write 2 questions you have about this text

1)	
2)	

True or False

Is the statement 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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Curriculum Connection
CS.1

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

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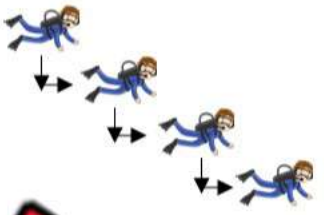
Curriculum Connection
CS.1

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 diagonal through the grid.



Loop
Move fo
Coll t treas

Example Codes

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

PREVIEW

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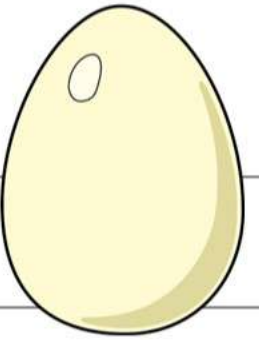
Curriculum Connection
M.4

Experiment - Buoyancy of Water

Materials
What will you need for the 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
- ❑ Water
- ❑ Spoon t[illegible]h



PREVIEW

Proced[illegible]
H[illegible]u complete the experiment

1) Fill the 3 cu[illegible]ater
2) Label the cups o[illegible]ing labels – saltwater, control, and sugar water
3) Put the 8 tablespoons of [illegible]o th[illegible]ed saltwater. Stir well to dissolve the salt into the water.
4) Put the 8 tablespoons of sugar int[illegible] cup la[illegible] water. Stir well to dissolve the sugar into the water.
5) Put the egg in the control glass of water a[illegible]ord[illegible]d. Is the egg buoyant in the water?
6) Put the egg in the sugar water and record what happ[illegible]s t[illegible]nt in the sugar water?
7) Put the egg in the saltwater and record what happened. Is th[illegible]nt 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	Buoyant	
Water	Yes	No
Sugar Water	Yes	No
Saltwater	Yes	No

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

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Curriculum Connection
M.4

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

Answer the questions below

1) Was y... s... ct? Did anything surprise you? Explain.

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

3) Could someone using the same amount of salt and sugar but differe... ...er 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.

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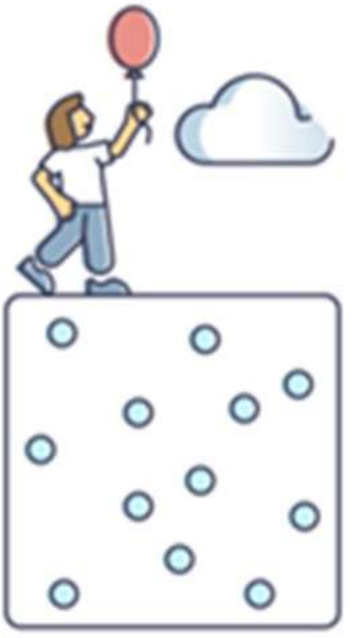
Curriculum Connection
M.1

All About Gases

All About Gases

Matter can take the form of a gas. A gas is an invisible form of matter. The air in the room you are in is a gas. We cannot see the air, but we can feel it when we swing our hand back and forth.



GAS

The sp[illegible]between gas particles are very big, which gives the p[illegible]oom to move around quickly. This is becaus[illegible]ery little attraction between them. The particl[illegible]o m[illegible]e in all directions.

PREVIEW

As a result, gases:

- ☑ do not have a definite [illegible]
- ☑ take the volume and shape [illegible]eir [illegible]read when not contained
- ☑ are easily compressed because the[illegible] less [illegible]s the space they are in
- ☑ are often low density because there are no[illegible] part[illegible]large space

Transforming a Gas

A gas will commonly transform into a liquid through the pr[illegible]ss [illegible]. Condensation occurs naturally in our environment when water v[illegible]our glasses or when vapour forms water droplets on the glass of a cold dr[illegible]

A gas can also transform directly into a solid through the process of deposition. An example of this is frost. Frost happens when water vapour from humid air turns directly to ice.

Examples of Gases

Oxygen is one of the many gases in the air we breathe. Carbon dioxide is a gas we breathe out. Helium is a gas we use to fill balloons so they can float.

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Curriculum Connection
M.1

All About Gases

Yes/No Circle the best answer

1) Can we see gases?	Yes	No
2) Can gases hold their shape?	Yes	No
3) Do gases flow?	Yes	No
4) Do gase[illegible] faster than liquids?	Yes	No
5) Is air a[illegible]	Yes	No

Question Us[illegible]on from the text to support your answer

1. Why will a gas t[illegible] shar[illegible] tainer or spread when not contained?

2. Why can gases be compressed? Have you ev[illegible]rd of[illegible]ssed air?

Questioning Write 3 questions that you are wondering about gases

1)	
2)	
3)	

PREVIEW

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Curriculum Connection
M.1

Does Air Have Any Weight

Research Question

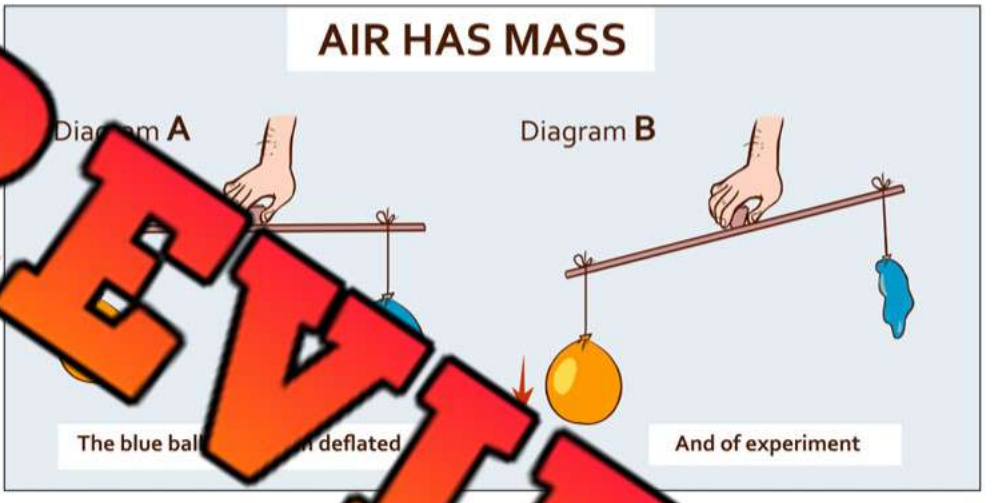
What are we testing?

Does air have any weight?

Materials

What do we need for our experiment?

- 2 ba ns
- A metre st
- String that is about 1 metre long



PREVIEW

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

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Curriculum Connection
M.1

Does Air Have Any Weight

Hypothesis

What do you think will happen?

Results

Answer the questions below

1) Which balloon is more

The Popped Balloon

Blown-Up Balloon

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

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

PREVIEW

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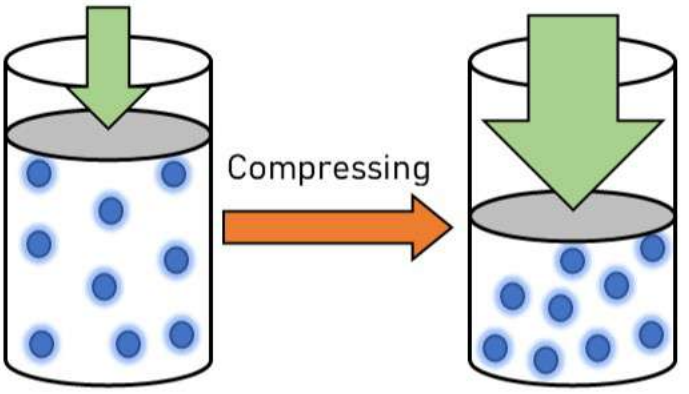
Curriculum Connection
M.1

Using Gases - Real-World Applications

Properties of Liquids

- Not rigid
- No fixed shape
- No fixed volume
- Can be compressed (squashed)



Compressed

Gases can [illegible] which allows humans to use them to their advantage.

Compre[illegible]gas is [illegible] has had its pressure increased by the reduction of its volume. Compr[illegible] stor[illegible] strong containers that can support the pressure created by [illegible] volume of the gas.

The diagram shows [illegible] can be [illegible] so that the particles of the gas are forced to occupy a smal[illegible] volu[illegible] compressive forces. Gas can be compressed because its particles a[illegible] ead ou[illegible] mpressed gas is stored, it will create a force when it is released[illegible] part[illegible] will move quickly to expand all over their new co[illegible]

PREVIEW

Applications of Gases

- Carbon Dioxide in Soda – Carbon dioxide is compressed inside soda cans to give the delicious acidic flavour and fizz. It is st[illegible] 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.

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Curriculum Connection
M.1

Using Gases - Real-World Applications

Questions Answer the questions below using evidence from the text

1) What are the 4 properties of a gas?

2) What is [illegible]as? How does it create a force?

3) How does a hairspray bottle use gas?

PREVIEW

Making Connections What does this remind you of in your [illegible] draw

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Curriculum Connection
M.2, M.3, M.4

Relationship Between Mass, Volume, and Density

Understanding Mass and Volume

Let's start with mass and volume. The mass of an object tells us how much matter it contains, usually measured in grams (g) or kilograms (kg). The volume of an object tells us how much space it takes up, typically measured in cubic centimeters (cm^3), milliliters (ml), or liters (l).

Imagine you have a large pillow and a small iron weight. Even though the pillow is bigger (has more volume), it has less matter (mass) inside than the iron weight.

The Density Equation

Next, we have density, which is determined by the equation:

Density = $\frac{mass}{volume}$ or $p = \frac{m}{v}$ where p equals density, m equals mass, and v equals volume.

Demonstrate the density of two objects by comparing the mass of equal volumes.

High and Low Density Examples

To better understand, let's consider some examples. A cork and a rock may have the same volume, but the rock has more mass. Why? Because the matter in a rock is packed tightly together, so it has a higher density. The cork, however, has less mass because its matter is spread out more - making it less dense.

- High-Density Solid: Lead is an example of a high-density solid. It has a density of 11.34 g/cm^3, which means there's a lot of mass packed into a small volume.
- Low-Density Solid: Balsa wood, used for light models, is a low-density solid, with a density of about 0.16 g/cm^3.

High Density Objects	Steel	Brick	Hard Rubber
Low Density Objects	Sponge	Basketball	Cork

PREVIEW

Name: _____ 49

Curriculum Connection
M.2, M.3, M.4

Relationship Between Mass, Volume, and Density

Questions

Answer the questions below using evidence from the text

1) What is the relationship between mass and volume?

2) Which co[illegible] ha[illegible] a higher density? Explain.
a) A la[illegible] bo[illegible] me of 4000 cm^3) with 20 cookies in it
b) A sm[illegible] ookie b[illegible] e of 2000 cm^3) with 20 of the same cookies in it

PREVIEW

Draw

Draw circles to add mass[illegible] boxes[illegible] ave the same volume

Low Density	Medium Dens[illegible]	[illegible] Density

Brainstorm

Write 5 examples of high-density objects and low-density objects

Low Density Objects	High Density Objects

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Curriculum Connection
M.2

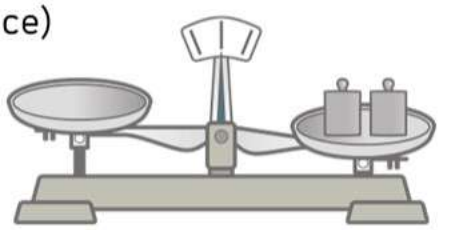
Measuring Mass Activity

Background — What is a pan balance?

We can use a pan balance to measure the mass of an object. A **pan balance** allows us to compare the mass of one object to the mass of another object. If we know the mass of the one object, we can find out the weight of the other object.

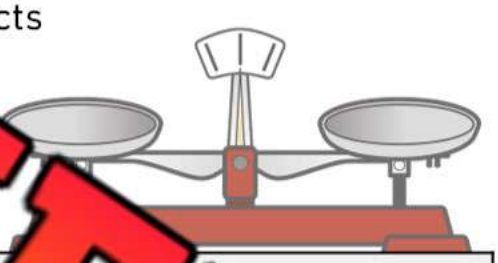
Materials — What do we need?

- Pan bala -pan balance and/or regular pan balance)
- 8 objec
- Rec



Method — e experiment?

1. Write your estim bel bjects from heaviest to lightest
2. Use the pan balance t the m the objects
3. Record the mass of the gr
4. Answer the questions



Observations — What happened?

Object	**Estimate** – Rank Heaviest (1) to Lightest (8	ss How m ams?

PREVIEW

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Curriculum Connection
M.2

Measuring Mass - Grams

In Canada, we use the metric system. The metric system has 3 main units that we use to measure the mass of objects.

Milligram (mg)	Gram (g)	Kilogram (kg)
Measure light weights	Measure average weights	Measure heavy weights

PREVIEW

Part 1 Use the information above to decide which unit you would use to measure

1) A basketball		6) A grain of sand	
2) A book		7) A pencil	
3) A chocolate bar		8) A feather	
4) A car		9) An olympic	
5) A TV		10) A ball	

Part 2 Write something that you would weigh using the unit

1) Milligram		5) Milligram	
2) Gram		6) Gram	
3) Centigram		7) Centigram	
4) Kilogram		8) Kilogram	

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Curriculum Connection
M.2

Measuring Mass - Grams

Milligram (mg)	Gram (g)	Kilogram (kg)
1000 mg = 1g 	1000g = 1kg 	1kg = 1000g 

Part 1

Fill in the tables below

mg	
1000	1
2000	2
	3
4000	
5000	
	6
	7
	8
9000	
10000	

mg	g
	1.5
	2.5
	3.5
4500	
5500	
	6.5
	7.5
	8.5
9500	
10500	

g	kg
1000	1
	2
3000	
4000	
	5
6000	
8000	
10000	

g	kg
1500	1.5
2500	
3500	
	4.5
	5.5
6500	
7500	
	8.5
	9.5

PREVIEW

Part 2

Convert the units of measurement below

1) 1g	_____mg
2) 3g	_____mg
3) 5000mg	_____ g
4) 2000g	_____kg

5) 5kg	_____ g
6) 3000mg	_____ g
7) 10 000mg	_____ g
8) 3kg	_____ g

9) 5.5g	_____mg
10) 7500mg	_____ g
11) 8.5kg	_____ g
12) 3500g	_____kg

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Curriculum Connection
M.2

Estimating Mass

Questions Circle which mass fits the description

1) A pencil

a) 500g
b) 1kg
c) 5mg
d) 5g

2) A computer

a) 200g
b) 2kg
c) 50mg
d) 1000mg

3) A car

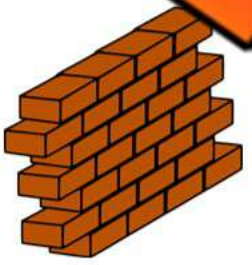
a) 900
b) 100kg
c) 500mg
d) 1000mg

4) A cup

a) 500kg
b) 5kg
c) 50g
d) 1000mg

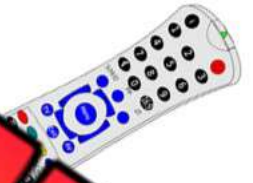
5) A brick

a) 100g
b) 2kg
c) 3000mg
d) 100kg



control

a)
b)
c)
d)



7) An apple

a) 20kg
b) 1kg
c) 100g
d) 200mg

8) A pill of medicin

a) 400mg
b) 2kg
c) 20g
d) 100g

9) Piece of paper

a) 500g
b) 5g
c) 5kg
d) 5mg

10) A toothpick

a) 900g
b) 100mg
c) 1kg
d) 3kg

PREVIEW

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Curriculum Connection
M.2, M.3, M.4

Calculating Density

Calculating Density

To calculate the density of matter, we need to know the mass and volume of the matter. We can use the following formula with a gas, liquid, or solid to determine its density.

$$\text{Density} = \frac{mass}{volume}$$

For example, if a phone has a mass of 200 g and a volume of 50 cm^3, we input these values into our equation to determine the volume.

$$\text{Density of phone} = \frac{200}{50} = 4\ g/cm^3$$

Calculat Calculate the density using the formula above

		Volume	Density
1)		100 cm^3	
2)	120	cm^3	
3)	500 g		
4)	975 g	cm^3	
5)	550 g	110 cm	
6)	900 g	225 c	
7)	100 g		^{3}
8)	300 g		
9)		200 cm^3	3 g
10)		250 cm^3	4 g/cm^3

PREVIEW

Word Problem Answer the questions below

A plastic toy car has a mass of 200 grams and a volume of 800 cm^3.	
What is the density of the toy?	

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Curriculum Connection
M.2, M.3, M.4

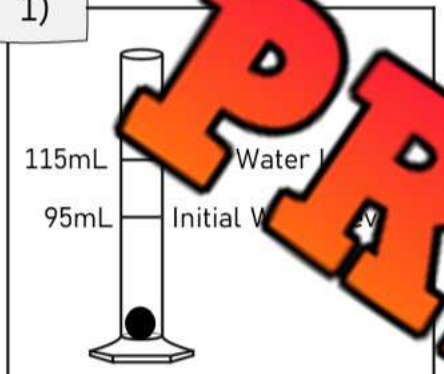
Calculating Density and Volume

Calculating Volume and Density
To calculate the volume of an irregular object, we can put it into water to see how much water is displaced. We do this by measuring the initial water level and subtract it from the water level after the object has been placed. Every 1 mL of water equals 1 cm^3 of volume.

Calculate Calculate the density using the information given

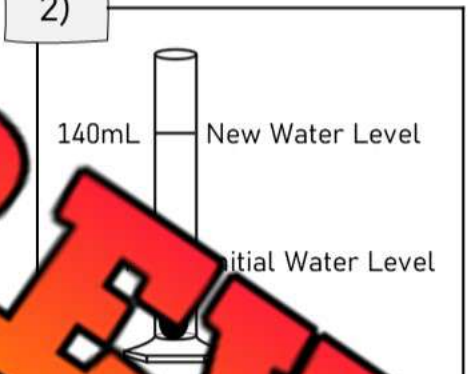
PREVIEW

1)



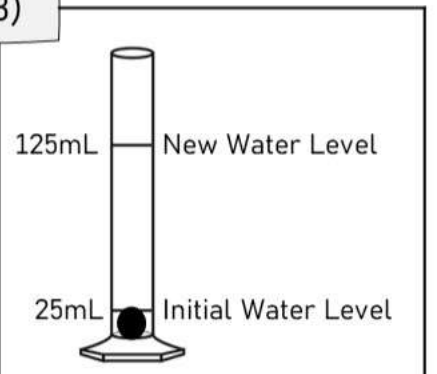
Volume	
Mass	40 g
Density	

2)



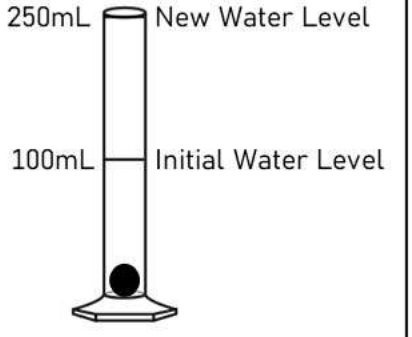
Volum	
Mass	140
Density	

3)



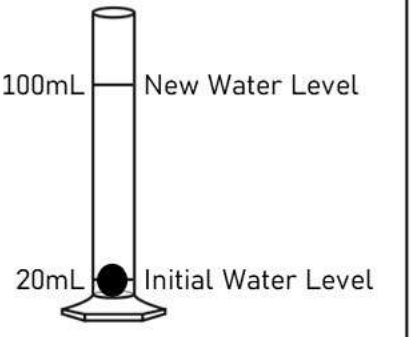
Volume	
Mass	400 g
Density	

4)

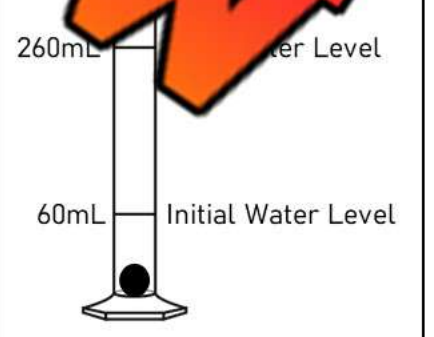


Volume	
Mass	
Density	2 g/cm^3

5)



Volume	
Mass	
Density	4 g/cm^3



Volume	
Mass	
Density	5 g/cm^3

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Curriculum Connection
M.2, M.3, M.4

Experiment - Calculating Density

Objective

What are we learning more about?

To understand the concept of density by measuring the mass and volume of different objects and calculating their density.

Materials

What do we need for our experiment?

- Up to [illegible] objects like plastic toys, marbles, or stones that all sink
- A measuring cup [illegible]
- A scale for measuring mass – digital or pan balance
- Paper and pencil for recording [illegible] of this page

PREVIEW

Method

How do we complete the experiment?

1. Measure the mass of the object using the scale. Write down the mass in grams.
2. Fill the measuring cup with a known volume of water and note the volume.
3. Carefully drop the object into the measuring cup.
4. Measure the new volume of the water with the object in it. The volume of the object is the change in water volume.
5. Now you have the mass and the volume of the object. Use the formula for density (Density = mass/volume) to calculate the density of the object.
6. Take the object out and repeat the steps again for the other objects

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Curriculum Connection
M.2, M.3, M.4

Experiment - Calculating Density

Observations Fill in the table below

Object Name	Mass (g)	Known Volume of Water	New Volume of Water	Volume of Object	Density (g/cm^3)

PREVIEW

Results Answer the questions below

1) Order the objects from densest to least dense.

2) Did the bigger objects have the most density? Explain

_____

_____

_____

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Name: _____ 61

Curriculum Connection
M.5

Compressibility - Water Versus Air

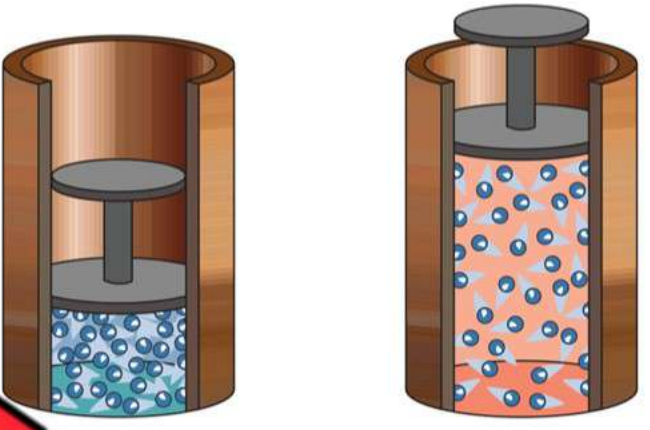
What is Compressibility?

Compressibility is all about how much a substance can be squished or compressed. The more compressible a substance, the more it can be squished into a smaller space.

The Particle Theory

The particle theory tells us that everything is made up of tiny particles that are:

- Always moving
- Attracted to each other
- Have spaces between them



Compressibility of Water

Water is seen as incompressible. This means that even when we apply pressure, the particles of water don't really get any closer together. Why?

- Water particles are already very close together
- The attraction between water particles is strong

So, when you try to squeeze a filled water bottle, the water inside resists being compressed. The shape of the bottle might change, but the volume of water stays the same.

Compressibility of Air

Unlike water, air is highly compressible. When we apply pressure to air:

- The particles, which already have a lot of space between them, are forced closer together
- Once the pressure is released, the particles move apart again

This is why your lungs can take in a large amount of air and compress it. When you let out your breath, the air returns to its normal volume.

PREVIEW

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Curriculum Connection
M.5

Compressibility - Water Versus Air

Questions

Answer the questions below using evidence from the text

1) What is compressibility and how does it relate to particle theory?

2) Explain [illegible] considered incompressible and provide an example.

PREVIEW

Making Connections

Have you ever com[illegible]d) something filled with air?

True or False

Is the statement true or false?

1) Compressibility is about how much a substance can expand.	True	False
2) The particle theory says particles are always still.	True	False
3) Water particles are far apart from each other.	True	False
4) Applying pressure to water makes its particles come closer.	True	False
5) The volume of water changes when it is squeezed.	True	False

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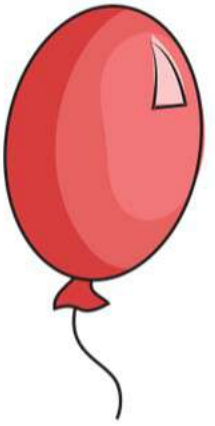
Curriculum Connection
M.5

Experiment - Compressibility of Water and Air

Objective

What are we learning more about?

To understand and compare the compressibility of air and water.



Materials

What do we need for our experiment?

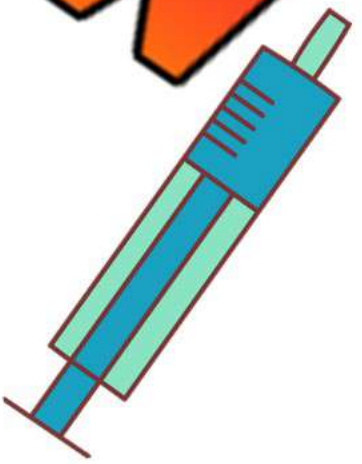
- Two [illegible]ithout needles)
- A basin [illegible]

PREVIEW

Method

How do [illegible]eriment?

1. Remove any air from one syringe a[illegible]t with[illegible].
2. Take the second syringe and fill it with air by [illegible]ing the plunger back. Make sure the volume of air is t[illegible] same as the volume of water in the first syringe.
3. Put your finger over the end of the syringe filled with air and try to push the plunger down. Notice how difficult or easy it is.
4. Do the same with the syringe filled with water. Put your finger over the end of the syringe and try to push the plunger down.



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M.5

Experiment - Compressibility of Water and Air

Observations

Answer the questions below

1) Describe how hard it was to compress the air in the syringe.

2) Describe how hard it was to compress the water in the syringe.

Results

Answer the questions

1) Which is more compressible, air or water?

2) Why do you think one was more compressible than the other?

3) If you filled a balloon with air and squeezed it, would it be hard to squeeze?

4) If you filled a balloon with water and squeezed it, would it be hard to squeeze?

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Curriculum Connection
M.5

Experiment - Air Compression

Background

Can we squeeze air and compress it?

Air is all around us. We can't see it, but it is actually a fluid that we live in. There are tiny gas particles floating around us all the time. Open your hand and grab some air. Squeeze the air in your hands. Did you feel anything? No, because the air escapes out of your hand. But can we squeeze air and compress it? Let's try!

Research Question

Can we compress air?

Can we com[illegible] air inside a reusable water bottle by squeezing the end of the bottle while the [illegible] amount of air will still be in the bottle, but the bottle will be smaller. [illegible] we release the bottle's lid?

Hypothesis

[illegible] compressed? What will happen with the lid?

Materials

What you need for [illegible] experim

- Empty plastic water bottle (reusable bottle that [illegible]

Procedure

What to do

1. Make sure the bottle is empty and o[illegible] air.
2. Tighten the lid so no air can escape. We w[illegible] make sure the air inside gets compressed, instead of escaping out of the lid.
3. Twist the bottle's larger end on the opposite side of the lid. Twist until the bottle is about half of the size that it was before
4. CAREFULLY loosen the lid. MAKE SURE NO ONE IS NEAR THE BOTTLE'S LID. DO NOT POINT THE BOTTLE AT ANYONE.
5. If nothing happened, try again by blowing air back into the bottle, inflating it again, and restarting.

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Curriculum Connection
M.5

Experiment - Air Compression

Diagram

Draw two diagrams:
1. The squeezed bottle with the lid on. Label the compressed air
2. The opened bottle. Label the lid flying, the air direction using arrows

PREVIEW

Results

What [illegible] experiment?

1) What is air compression? What does it m[illegible] compr[illegible]?

2) Was your hypothesis correct? Was the air compressed inside o[illegible]e b[illegible] know?

3) Why did the bottle lid go flying through the air? If you squeezed the bottle more, would the lid have flown further?

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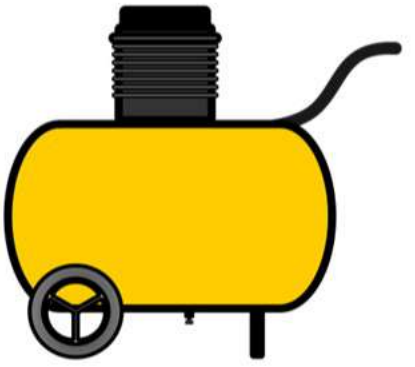
Curriculum Connection
M.5

Technologies That Use Air Compression

What is Compressibility?

Did you know that many of the machines and technologies we use every day rely on compressing air? Compressing air means pushing the air particles closer together. Let's explore three examples: air compressors, stomp rockets, and pneumatic (air-powered) tools.



Air Compr

An air [illegible]e that takes in air, compresses it by pushing the[illegible]ther, and then stores it. When the compres[illegible]s rele[illegible]the air outside, it moves quickly as the pa[illegible]d out[illegible] the volume of space outside. The movement of air makes energy[illegible]n b[illegible]wer different tools and machines.

PREVIEW

Stomp Rockets

Stomp rockets are a fun toy that also uses air c[illegible]ssion. They have a launch pad connected to an air bladder. When you stomp on the bladder, it forces the air particles inside to squish together. This increases the pressure. When the air is released, it rushes up the tube and pushes the rocket into the air.

Pneumatic Tools

Pneumatic tools, like a jackhammer or a paint sprayer, use compressed air to work. The tool is connected to an air compressor. When you trigger the tool, the compressed air rushes out. The moving air particles create a force that powers the tool.

For example, in a paint sprayer, the compressed air pushes the paint out of the nozzle. These tools make our work much easier.

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M.5

Technologies That Use Air Compression

Questions

Answer the questions below using evidence from the text

1) Explain how a stomp rocket works using the concept of air compression.

2) How does an air compressor use compressed air to power tools and machines?

PREVIEW

Diagram

Draw a diagram of a stomp rocket. Use arrows to show the movement of air.

True or False

Is the statement true or false?

1) Air compressors store compressed air.	True	False
2) Compressed air has less energy.	True	False
3) Stomping on the air bladder of a stomp rocket decreases pressure.	True	False
4) Pneumatic tools create force with moving air particles.	True	False
5) In a paint sprayer, the paint is pushed out by compressed air.	True	False

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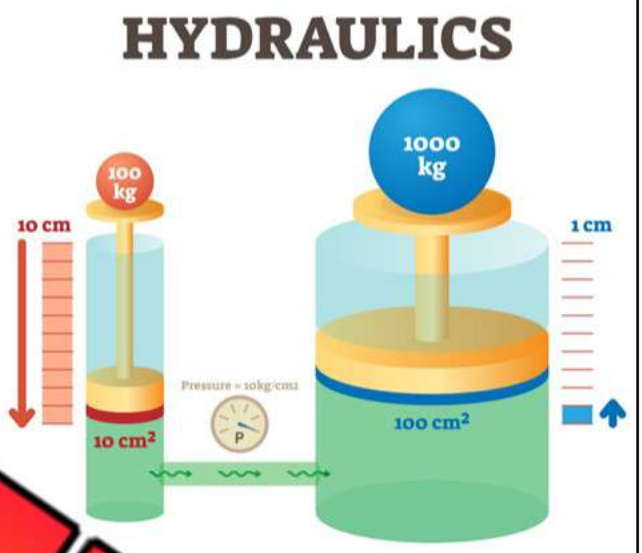
Curriculum Connection
M.5

Compressing Liquids - Hydraulics

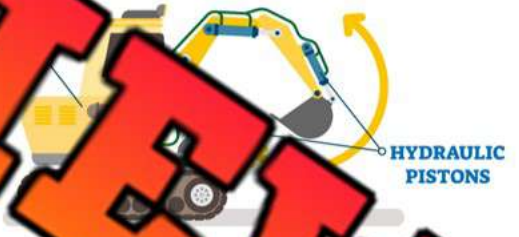
Power of Water: Hydraulic Systems

Water is an amazing substance. Not only do we need it to live, but we also use it in some interesting ways to help us do hard work. This is possible because water is almost impossible to compress.



The Power of Water in Hydraulics

Hydraulics is the science that uses the power of liquids like water to make heavy work easier. In a hydraulic system, water is placed in a closed-off area. When pressure is applied to the water at one point, that pressure is transmitted evenly throughout the water and can be used to push something else.



Example of a Hydraulic System

Imagine you have two pistons, like big plungers, connected by a tube filled with water. The pistons are different sizes – one is small and the other is big.

If you push down on the small piston, it puts pressure on the water. Because water doesn't like to be compressed, the water pushes back and transmits that pressure along the tube to the big piston. The water's pressure then pushes up on the big piston.

Even though the big piston is larger, the pressure from the water can lift it. This is because the water transmits all the force you used on the small piston to the larger one. It's like having super strength!

This hydraulic system lets us lift heavy things with less effort. It's used in lots of machines like car brakes, construction equipment, and even amusement park rides.

PREVIEW

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Curriculum Connection
M.5

Compressing Liquids - Hydraulics

Questions

Answer the questions below using evidence from the text

1) How does a hydraulic system work?

2) Why is it important that a hydraulic system uses incompressible liquids? Explain.

PREVIEW

Making Connections

What machines have you seen or that have hydraulic systems?

True or False

Is the statement true or false?

1) We use water in hydraulics because it's easy to compress.	True	False
2) The pressure from water can lift a larger piston in a hydraulic system.	True	False
3) Hydraulic systems can be used to make heavy work easier.	True	False
4) Hydraulic systems are only used in construction equipment.	True	False
5) A small piston and a large piston are used in a hydraulic system.	True	False

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Curriculum Connection
CS.1

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 joystick left, then the boom moves to the left. If the operator mo[illegible]e bucket down, then the bucket moves down and dumps t[illegible]

PREVIEW

Directi[illegible]ode to get the job done

1) The operator s[illegible]d of di[illegible]left. They need to lower the bucket and then scoop it up and then [illegible]it b[illegible]started.

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 [illegible]vered already, so they just need to scoop up the dirt and then dump it back where they started.

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Curriculum Connection
CS.1

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 gas takes the shape of its container	then	Move down 3 spots
4)	If a s[illegible]akes the shape of its container	then	Move right 4 spots
5)	If th[illegible] of gas is more than water	then	Move down 3 spots
6)	[illegible]se objec[illegible]articles that are spread out	then	Move left 5 spots
7)	If dense [illegible]s [illegible]teel [illegible] water	then	Move right 4 spots
8)	If water can b[illegible]pres[illegible]	then	Move down 1 spots
9)	If hydraulic systems [illegible]	then	Move up 3 spots
10)	If gas can be compressed	then	Move down 4 spots

PREVIEW

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Curriculum Connection
M.4

Swim Bladder - Buoyancy

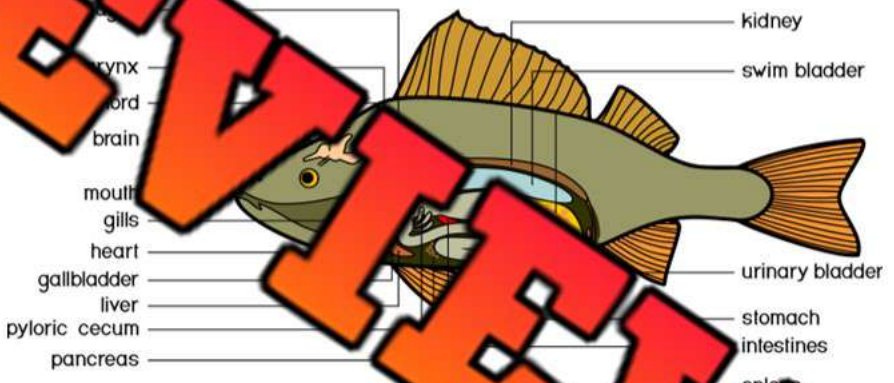
The Swim Bladder - A Fish's Buoyancy Tool
The swim bladder works like a little inflatable balloon within a fish. The bladder can be filled with gas or deflated as needed.

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 surrou water, which causes it to sink.

- Rising d to the surface, the fish fills its swim bladder with more ga ensity, making it lighter than the water around it, and it floa

- Staying Leve sh wi tay at the same depth, it can adjust the amount of gas in swim bladder to mat the density of the water. This way, the fish can maintain a steady position without sinking or floating.



This is the key concept of buoyancy: objects that are denser than the water will sink, and objects that are less d se w adjusting its density, a fish has the ability to control its position i

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.

PREVIEW

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Curriculum Connection
M.4

Swim Bladder - Buoyancy

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 [illegible] up and down in the water?

PREVIEW

Diagram

Draw diagrams of a fish a[illegible] swim b[illegible] a submarine with its ballast tanks. Explain the diagrams.

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Curriculum Connection
M.4

Experiment - Designing the Ultimate Cargo Boat

Objective

What are we learning more about?

To design, construct, and evaluate a prototype of an object that floats and can carry the greatest amount of cargo.

Materials

What you will need for the experiment

- ❑ A vari[illegible]ls like cardboard, aluminum foil[illegible]
- ❑ Sc[illegible]
- ❑ Glue or [illegible]ape
- ❑ Marbles or [illegible]cargo
- ❑ A large tub or [illegible]d wit[illegible]
- ❑ Optional - measurin[illegible]cal[illegible]rgo)

Procedure

How you will c[illegible]plet[illegible]

1) Brainstorm: In your group, discuss different d[illegible]deas f[illegible]cargo boat. Think about what shape and materials will allow yo[illegible]t to [illegible]rrying the most cargo.

2) Design: Draw a sketch of your planned boat. Make sure t[illegible]t th[illegible] materials you plan to use.

3) Construct: Using your materials, build your cargo boat prototype acco[illegible]o your design.

4) Test: Place your boat in the water and slowly start adding cargo (marbles or pennies). See how much cargo your boat can hold before it starts sinking.

5) Evaluate: Record how much cargo your boat was able to carry before sinking. Discuss what worked well and what didn't. What could you change to improve your boat?

6) Improve: Make any changes to your boat that you think will improve its cargo capacity. Then, if time, test it again to see if it can carry more cargo.

PREVIEW

Curriculum Connection
M.4

Design Draw your boat and label the materials you will use

Result e questions below

1) How much carg our b

2) How could you improve your b Drav plain the changes.

3) How does the shape and material of your boat affect its buoyancy and cargo capacity?

PREVIEW

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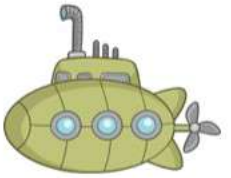
Curriculum Connection
CS.1

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

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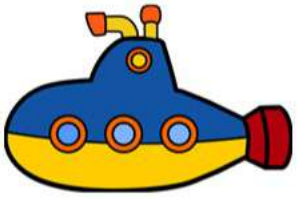
Curriculum Connection
CS.1

Coding Activity - Submarine Adventure

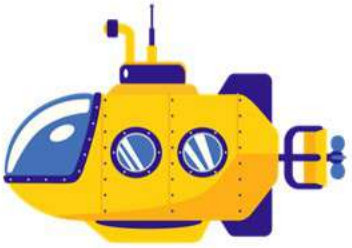
Coding Write code that gets the submarine to the different objects underwater



When you [illegible] down [illegible] write [illegible] to ha[illegible] submarine add [illegible] tanks. It will [illegible] release water to [illegible]

Example codes:

- Add water to tank
- Move down to (1, 1)
- Take picture of anchor



Code

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Question What are submarines useful for?

_____

_____

_____

_____

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Curriculum Connection
CS.1

STEM Assignment - Designing a Submarine

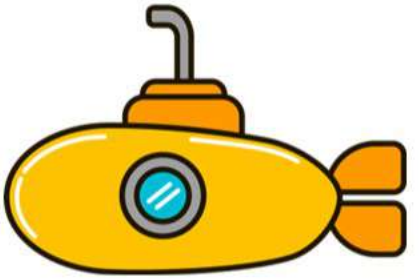
Create your own submarine that can dive deep into the ocean.

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 move anywhere in the ocean?
- Can it tra quickly?
- Can it se dark?
- Can it s on the bottom of the ocean?



What is submari ed to do?

- Will it search fo hat underground?
- Will it be use m to ople to shipwrecks?
- Will it be used t h othe naval ships?

PREVIEW

Questions	Answer the ns submarine 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?

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STEM Assignment - Designing a Submarine

Write simple If/Then statements so that the operator of the submarine can move the sub and perform the tasks it need to do.

IF the up arrow button is pressed

THEN release ballast water and add air

IF/THEN Writ 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

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STEM Assignment - Designing a Submarine

Draw	Draw your submarine. Make sure it has the tools you included in your plan

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Lighter-Than-Air Flying Devices

Lighter-Than-Air Flying Devices

A **lighter-than-air flying device** is an airship that generates lift because they use gases that are lighter than air. Most commonly, these airships use helium as the gas because its density is significantly less than air, and it is cheaper to buy than other gases.

How Airships Work – Helium Balloons

An airship c[illegible] flying altitude the same way a submarine does, through buoyancy. [illegible]ancy is the ability to float. Airships use helium to fill their [illegible]ts, making the air in these huge holding tanks less dense [illegible] the a[illegible]e of them. When the air is less dense, it rises [illegible]osphere that is heavier. This makes the airsh[illegible]ely b[illegible]d means it will rise.

When the pilot needs to go up, [illegible]ey ac[illegible]allonet. When they need to go down, they pump air into the ballonet to m[illegible]em ne[illegible]oyant. When they are at a cruising altitude, they balance the amount of air an[illegible]m in t[illegible]net to stay at the same altitude.

Hot Air Balloons

A hot air balloon is another lighter-than-air flying device that uses the same principle as the helium airships. They both need the air in the balloon to be less dense than the air outside of the balloon. This allows them to achieve buoyancy in the air, which gives them lift.

A hot air balloon uses heated air inside the balloon. Heated air is less dense than the surrounding air in the atmosphere. This is because when air is warmed, the molecules move faster and further apart. This causes the warmer air to expand and spread out, making it less dense. To go up in a hot air balloon, the pilot will heat the air using a torch. To go down, the pilot stops heating the air, which causes the air to cool.

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Lighter-Than-Air Flying Devices

Scenarios

How do you achieve the results below when flying a lighter-than-air device?

1) In an airship, you want to go down.
2) In an airship, you want to go up.
3) In a hot air [illegible] you want to go down.
4) In a hot [illegible] balloon [illegible] to go up.

PREVIEW

True or False

Ch[illegible] the s[illegible]nt is true or false

1. Helium is rarely used in airships [illegible] nd flammable	True	False
2. Air can be heated to make it less dense	True	False
3. An airship is a lighter than air flying device	True	False
4. When an airship is negatively buoyant, it will rise	[illegible]ue	False
5. To go down in a hot air balloon, you need to add ice to the [illegible]	[illegible]e	False

Questions

Use information from the text to support your an[illegible]er

1. What is a lighter-than-air flying device? How do they use buoyancy to fly?

2. How does a lighter-than-air flying device achieve lift?

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Unit Test - Matter

Multiple Choice Circle the best answer. Only choose 1 answer!

1) Which state of matter below takes the shape of its container? a) Liquids b) Solids c) Rock d) All of the a	2) Which of the following is an example of a liquid? a) Table b) Peanut Butter c) Wood d) Rock
3) Everyt… …d takes up space is… a) Particles b) Sublimation c) Matter d) Energy	4) What does "compressibility" mean? a) Heaviness b) Brightness c) …quishiness d) …ess
5) Which is easiest to compress? a) Water b) Air c) Solid d) None can be compressed	…pneu… …ools, what creates force? a) Com… …d w… b) … …ssed … c) Electri… d) Sound
7) What do fish use to control buoyancy? a) Fins b) Scales c) Swim bladder d) Eyes	8) What does a submarine… a) Lights b) Ballast tanks c) Periscope d) Sonar system
9) A coin is _____ dense than/as a feather. a) Less b) More c) As	10) Something that is denser than water will… a) Float b) Sink c) Be neutrally buoyant

PREVIEW

Definitions

What does each term mean? (1 mark each)

Term	Definition (what does it mean)
Matter	
Density	
Buoyancy	

PREVIEW

Short Answer

Answer the q[illegible]ion[illegible]e[illegible]h question is worth 2 marks

1) What is the particle theory of matter? Wh[illegible] you kn[illegible]ut [illegible]rticles in matter?

2) What is the difference between mass and volume?

3) How does a fish move up and down in water?

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