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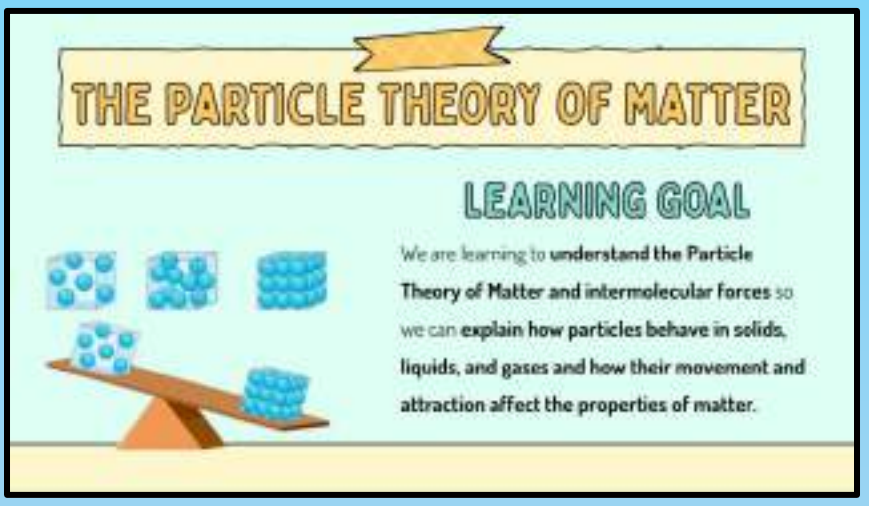
Google Slides Lessons Preview

Alberta Science Curriculum
Matter Unit – Grade 6

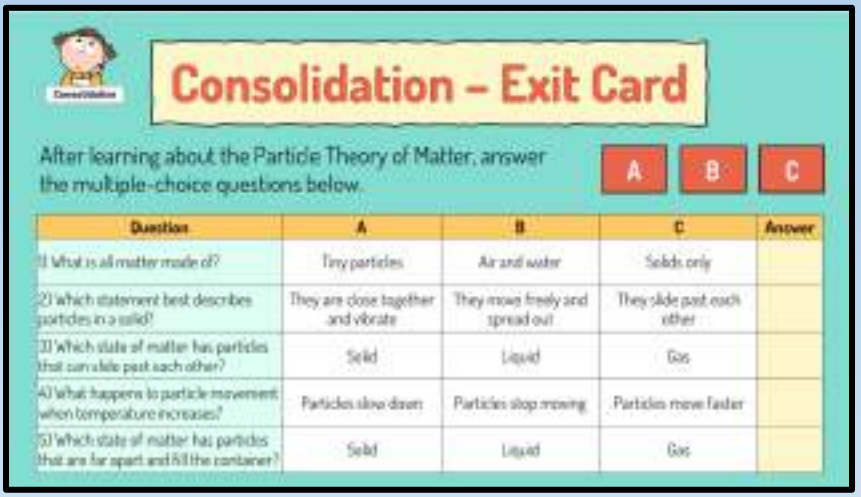
3-Part Lesson Format

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 Curriculum
Matter Unit – Grade 6

Alberta Science Curriculum
Matter Unit – Grade 6

Workbook Preview

Grade 6 – Science Unit

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

Guiding Question: How can the particles of matter be influenced by heating or cooling?

	Learning Outcome – Students investigate how particles of matter behave when heated or cooled and analyze effects on solids, liquids, and gases.	**Pages**
M.1	The particle model of matter states that heating matter causes particles to move faster. As particles move faster, the attractive forces between them weaken and the space between them increases. The particle model of matter states that cooling matter causes particles to move slower.	7 – 12
M		
M	The Celsius scale is based on the changes of state of water and defines 0°C as the melting/freezing point of water and 100°C as the boiling point of water.	
M.4	Expansion is the typical response materials have to heating. Contraction is the typical response materials have to cooling.	37 – 48
M.5	Water has the unusual property of having greater volume in solid form than in liquid form. Because of water's unusual property, it is less dense in solid form than in liquid form. The surface of a body of water freezes when the temperature of the water drops below the freezing point. The frozen surface of a large body of water forms an insulating sheet of ice that protects aquatic life.	55 – 66
M.6	A material's response to temperature change requires consideration when designing and constructing infrastructure, including sidewalks, bridges, roads	49 – 54
Computer Science:		
CS.1	Students examine abstraction in relation to design and coding, and describe impacts of technologies.	67 - 76

NAME: _____

MATTER

Name: _____ 9

Curriculum Connection
M.1

Matter - Intermolecular Forces in Particles

The Movements of Particles

The ways in which particles interact depends on intermolecular forces. **Intermolecular force** is what holds particles together. This force is different in solids, liquids and gases.

Particles make up everything we can see and touch. They can move closer or further apart, causing a change in the **volume**, or space, they occupy. No matter how they move, the total **mass**, or amount of matter, stays the same.

Solids: Strong Links and Unchanging Volumes

In solids, particles are close together due to strong intermolecular forces. Their movements are limited, they just vibrate in their own space. This results in solids keeping their shape and volume. Even if they are broken into smaller parts, the mass of each part remains the same.

Liquids: Sliding Particles and Changing Volumes

In liquids, particles can slide past each other because the forces holding them are not as strong as in solids. This allows liquids to take the shape of any container they're in. The volume of a liquid can change depending on the size of its container, but its mass stays the same.

Gases: Free Particles and Increasing Volumes

In gases, particles move freely because the intermolecular forces holding them together are very weak. They aim to fill as much space as possible, stretching to fill any container they're in. As a gas spreads into a larger container, its volume increases, but its mass doesn't change.

Name: _____ 10

Curriculum Connection
M.1

Matter - Intermolecular Forces in Particles

True or False Circle whether the statement is true or false

1) Particles only exist in solids.	True	False
2) Intermolecular forces are strongest in gases.	True	False
3) Particles in a liquid cannot move freely.	True	False
4) The volume of a gas can change.	True	False
5) In solids, particles vibrate slightly within their own space.	True	False

Def What do the terms below mean?

Intermolecular Forces	
Mass	
Volume	

Draw Draw particles in the phases and connect them to show their intermolecular forces

Gas	Liquid	Solid

Name: _____ 11

Curriculum Connection
M.1

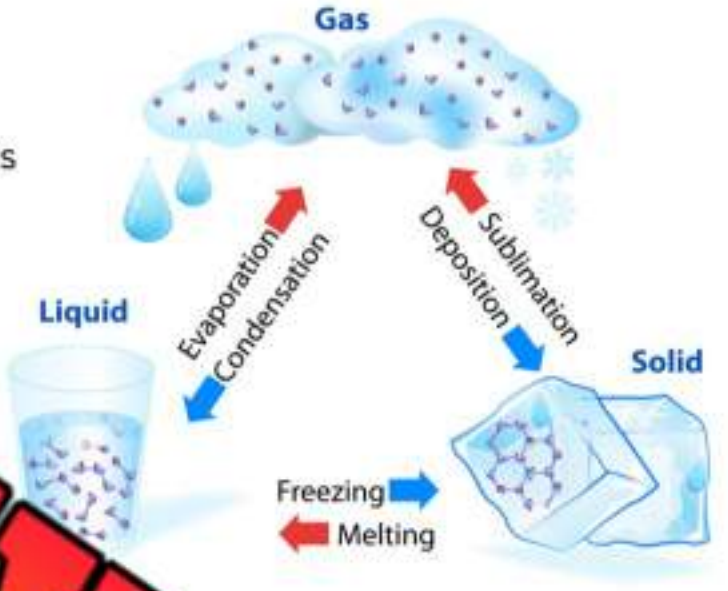
Changes in State - Physical Changes Involving Heat

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 m is the exact same.

For r has the chemi keep of n and oxygen (H_2O).

It does not m the is in liquid form, gas for form, it still has the same che hak



Changes in State Involve Heat

When matter changes state, it can be reversed ding ng heat. When matter absorbs heat, it could undergo e o evaporation, melting (fusion), or sublimation.

When matter releases heat, it could undergo the process of 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: _____ 12

Curriculum Connection
M.1

Changes in State - Physical Changes Involving Heat

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	bed		Vibrate	Slow	Fast
Vapou	se		Vibrate	Slow	Fast

Questions the q s below using evidence from the text

1) If matter is left in the sa ment t added or released), will it change states? Explain using an exam

2) What happens when heat is released by matter?

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

Curriculum Connection
M.3

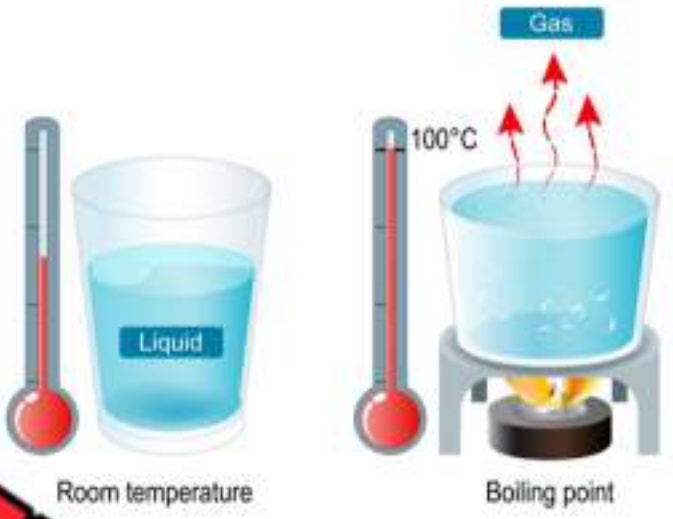
Melting Point

What is Melting?

Melting is the process of a solid changing into a liquid when heat is applied.

For e… an ice … freezer wi… remai… a solid because … is no heat added. If … you take the ice cube out of … er, … mperature is warmer, which means the ice will absorb the heat.

The heat will cause the particles in the … to … This will cause the particles to spread out and flow into the botto… …e c… …y are held in. If the ice is on a table or on the floor, it will flow and … …ss!



What is a Melting Point?

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

Room temperature is about 20 °C. This means that ice melts fast when it is at room temperature.

Did you notice that the freezing and melting points are the same? This means that liquid water will freeze at below 0 and frozen water will melt at above zero.

Name: _____ 14

Curriculum Connection
M.3

Melting Point

Fill in the Blanks

Write the missing word on the line

Word Bank				
Solid	Melting	Liquid	Temperature	Same
Gas	Boiling			

Melting ha[illegible]e[illegible] a _____ reaches a temperature warmer than its

_____ po[illegible]g it into a _____. For example, an ice cube

melts at a _____ [illegible]an 0 degrees Celsius. The melting point

is the _____ as the [illegible]g p[illegible] don't melt, however they do

have a _____ point, where they [illegible]nge sta[illegible]nto _____.

Questions

Answer the questions [illegible]w.

1) What happens when a solid reaches its melting point?

_____

_____

_____

2) When have you seen a solid reach its melting point?

_____

_____

_____

Name: ______________________ 15

Curriculum Connection
M.3

Lab Experiment - Melting

Research Question | What are we testing?

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 | Make a prediction below

Which will [illegible]? Rank (1-5) with 1 being the first to melt and 5 being the last to melt				
Contro[illegible]	**[illegible]ugar**	**Salt**	**Hot Water**	**Cold Water**

Materials | W[illegible] do [illegible] experiment?

1) Small plastic cups (mini[illegible]ps)
2) Water
3) Salt
4) Sugar
5) Muffin Tin

Method | How do we complete the experim[illegible]

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 labelling 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.

Name: _____ 16

Curriculum Connection
M.3

Lab Experiment - Melting Results

Observations | What do you notice after the times below

Step	What Happened – Which is melting the fastest? Slowest?
After 10 Minutes	
After 30 Min	
After 1	
After they have all melted	

Results | Answer the quest ow

1) What surprised you about the results? What d get w your hypothesis?

2) Why do you think the cold water melted the ice cup faster than th 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?

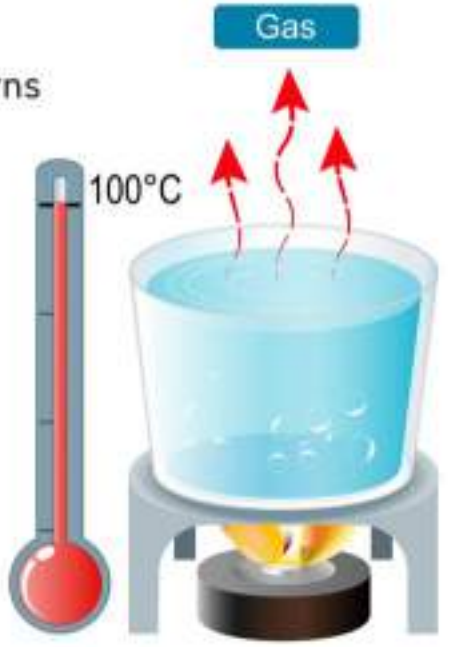
Name: _____ 17

Curriculum Connection
M.3

Boiling Point

What Does Boiling Point Mean?

The **boiling point** is the temperature at which a liquid turns into a gas. For example, water boils and turns into steam when it reaches 100 degrees Celsius.



Boiling point

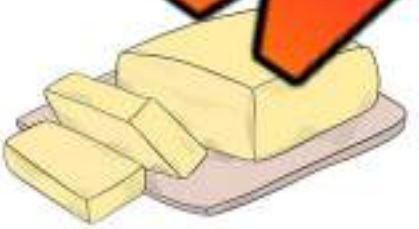
Differ iquids have different boiling points. When cook tove, it is helpful to use different temper en what you're making. For example, many co lav different boiling points, meaning y t nee some on high.

It is also helpful w an dirty water by boiling it. When we er, ful bacteria, viruses, and parasites that mi the . This means if you ever need to clean water, you can boil it to k the uns ving s in your water.

Different Boiling Points of Liquids

Depending on the liquid being heated, it will take long t th heir boiling point. Ethanol will boil at 78.5 degrees Celsius while anol until it is heated to 204 degrees Celsius.

- Water: 100 degrees Celsius
- Olive oil: 205 degrees Celsius
- Peanut oil: 165 degrees Celsius
- Coconut oil: 177 degrees Celsius
- Vegetable oil: 180 degrees Celsius
- Butter: 150 degrees Celsius
- Mercury: 357 degrees Celsius



Name: _____ 18

Curriculum Connection
M.3

Boiling Point

Questions

Use information from the text to support your answer

1) What does the boiling point of a liquid mean?

2) How i... different in different liquids?

Visualizing

Draw what you were ...reading. Explain the picture

True or False

Circle whether the statement is true or false

1) Butter will boil at a lower temperature than water	True	False
2) You will need to boil water at a higher temperature than mercury	True	False
3) All liquids boil at 100 degrees Celsius	True	False
4) Boiling water will kill bacteria, parasites, and viruses	True	False
5) The boiling point of a liquid is when it will turn into a solid	True	False

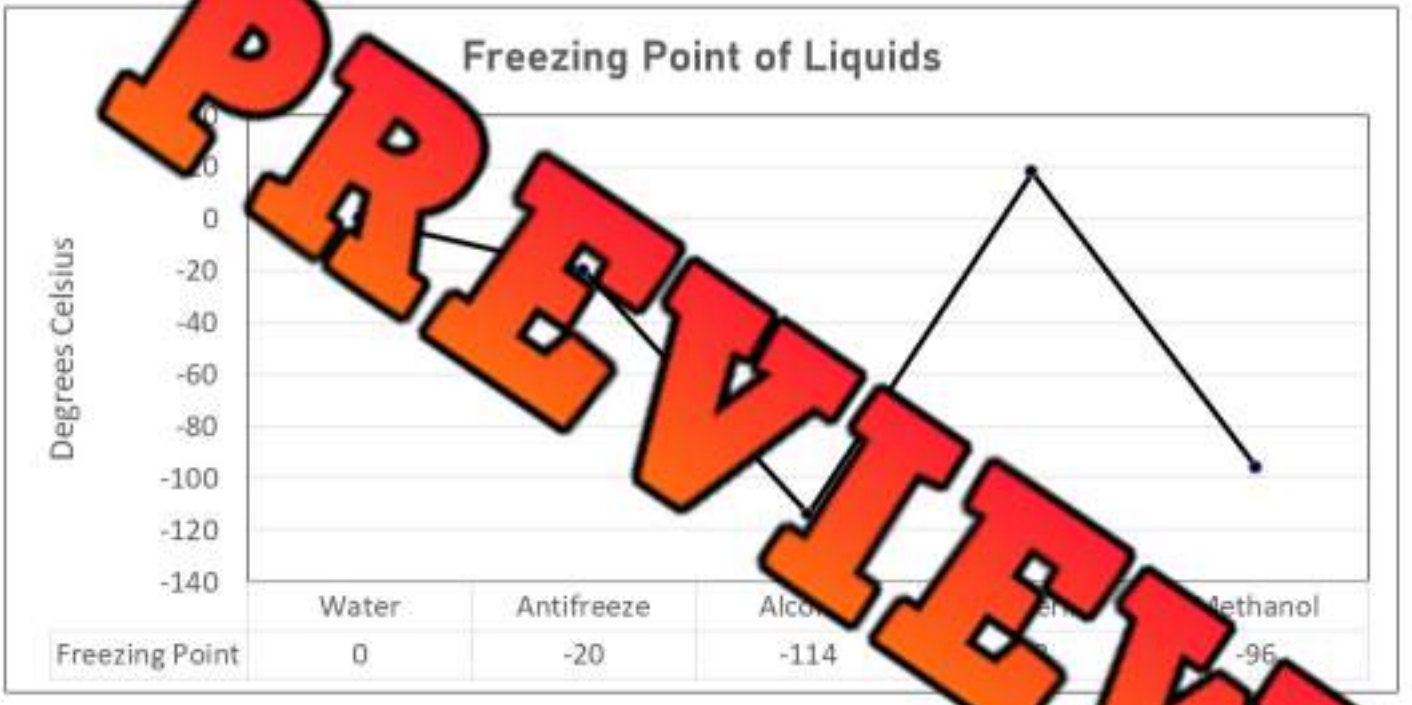
Name: _____ 19

Curriculum Connection
M.3

Freezing Point

Freezing and Freezing Points

Freezing is the opposite of melting. **Freezing** 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 liquid's freezing points.



	Water	Antifreeze	Alco	Methanol
Freezing Point	0	-20	-114	-96

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 very cold days!

When the weather is below 0, we need to drive very carefully as water on the roads will freeze and turn into slippery ice.

Name: _____ 20

Curriculum Connection
M.3

Freezing Point

Fill in the Blanks

Write the missing word on the line

1. Liquid water will freeze when the temperature is _____ zero.
   below/above
2. Water can be a liquid or a _____.
   mud/solid
3. Different ___ have different freezing _____.
   points/places
4. Metha___ has a f___ ___int of _____ degrees Celsius.
   -20/-96
5. When the tempe___ is be___ ___here could be _____ on the road.
   ice/rain

Questions

Ans___ the ___

1) How does water freeze?

2) How can freezing water be dangerous?

Making Connections

What does this reading remind you of in your life?

Name: _____ 21

Curriculum Connection
M.3

Freezing Rain

What is Freezing Rain?

Freezing rain is rain that has changed state to a solid when it hits the ground. It goes from liquid rain to solid ice on the ground.

How Freezing Storms

Look at the diagram. Notice that way up in the sky, the temperature is colder. In the winter, precipitation starts as snow at first. Read below to learn how we get snow, sleet, freezing rain, and rain in winter.

Rain

On warmer winter days, the snow will turn to rain and fall to the ground. You can see this on the diagram. The triangle part shows warmer temperatures.

Freezing Rain

As you see on the diagram, when we get freezing rain, the snow turns to rain and then back to ice just when it hits the ground.

Sleet

The snow turns to rain for just a short time. Since it is colder at the earth's surface, the rain turns to ice and snow. This mixture of snow and rain is called sleet.

Snow

There is no warm air for the snow to turn to rain. So, we just get snow!

Dangers of Freezing Rain and Sleet

When rain changes state to solid ice, our roads and sidewalks get slippery. This can cause car accidents. People also get hurt when they slip and fall on walkways.

Name: _____ 22

Curriculum Connection
M.3

Freezing Rain

True or False

Is the statement true or false

1) It is warmer way up in the sky	True	False
2) In the winter, all precipitation starts as snow	True	False
3) When the surface is warm in the winter, we can get freezing rain	True	False
4) Sleet is ra[illegible]now mixed	True	False
5) Snow[illegible] warm on the surface	True	False

Making Connect[illegible]

Ha[illegible]ou ever seen freezing rain? Explain.

Questions

Answer the questions below using [illegible] fro[illegible]ext

1) Why does freezing rain happen?

2) What are the dangers of freezing rain?

Name: _____ 25

Curriculum Connection
M.2

Understanding Phase Changes in Matter

Understanding Phase Changes

Physical change

A phase change refers to the transition of matter from one state to another. There are primarily three states of matter: solid, liquid, and gas. These transitions occur due to changes in temperature or pressure.

Common examples include melting (solid to liq freezing (liquid to solid), evaporatio to gas), condensation (gas to li ion (solid to gas), and de as d).

Ice cubes (100g) Liquid water (100g)

Volume and Ph

When a phase ch curs, able change is in the volu f th because different states have t levels of particle arrangement and movement. For exampl id e les are tightly packed together, leading to a small volume.

On the other hand, in a gaseous particl re spread out and move freely, leading to a larger volume. Hence, a atter ges from one state to another, its volume changes.

Mass and Phase Changes

Despite changes in volume during a phase change, the th ins constant. This is because the mass is a measure of the amount o object, not the space it occupies.

In other words, no matter how much the particles of matter spr t or draw together during phase changes, the total amount of matter (and therefore mass) does not change.

Principle of Conservation of Mass

The Principle of Conservation of Mass states that the total mass of substances doesn't change during a chemical reaction. It means that matter can't disappear or be created out of nothing - it can only change forms. So, whatever mass you start with, you end with the same mass. Even if the matter changes states and its volume alters, the total amount of matter – and thus the mass – stays constant. The only way to change the mass of an object is to add or remove matter.

Name: _____ 26

Curriculum Connection
M.2

Understanding Phase Changes in Matter

Multiple Choice

Circle the best answer

1) What state is tightly packed?	Solid	Gas
2) In what state do particles move freely?	Solid	Gas
3) What remains the same in phase changes?	Volume	Mass
4) What law states matter can't be created or destroyed?	Gravity	Conservation
5) The mass of a substance changes by?	Heating	Adding Matter

Questions

Answer the questions below using evidence from the text

1) Explain why the mass of matter remains constant during a phase change, despite a change in volume.

2) What is the Principle of Conservation of Mass and how does it relate to phase changes?

Visualizing

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

Name: _____ 27

Curriculum Connection
M.2

Experiment - Mass of Solids vs Liquids

Research Question Liquid or solid? Which has more mass?

If we take an ice cube that was made from 25ml of water, does it have the same mass as 25ml of water?

Hypothesis Will the ice have the same/more/less mass than the liquid form?

Materials at y the experiment

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

Procedure Instructions – How to complete the expe ent

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, measure the mass quickly before it melts. Record the mass.

3. Measure the mass of the 25ml of water by putting it in a cup. If you are using a digital scale, use the "tear" button to minus the mass of the cup. If not, you will need to measure the mass of the cup separately and subtract it from your total mass.
4. Check your hypothesis. Which had more mass? Fill in the questions on the next page.

Name: _____ 28

Curriculum Connection
M.2

Experiment - Mass of Solids vs Liquids

Observations

How much mass does each solid or liquid have?

State of Matter	Mass
Solid – Ice Cube	
Liquid - Water	

Results

Answer the questions below

1. Was your hypothesis correct? Explain.

2. Why do you think the solid and the liquid had the same amount of mass?
   Hint: Physical or Chemical Change?

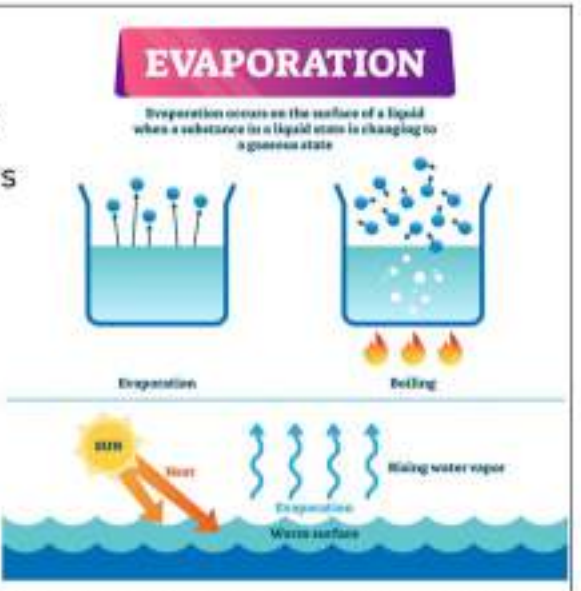
3. When a substance like water changes state, does it gain or lose mass? Explain why or why not.

Name: _____ 29

Curriculum Connection
M.2

Evaporation - Particle Movement

The Phenomenon of Evaporation



Evaporation is a fascinating process that you see every day. Have you noticed how a puddle of water disappears over time, or how your clothes dry after being wet? This is all thanks to evaporation, a process where a liquid turns i[illegible] gas.

How Pa[illegible]ve[illegible] Evaporation

Let's take [illegible]ter as [illegible]. In its liquid state, the water partic[illegible]ively [illegible] each other due to intermolecular forces. These forces act like tiny ma[illegible] hol[illegible]les together. As heat is added, such as from the Sun, the particles start [illegible]e faster. [illegible]ment increases the energy of the particles, causing the intermolec[illegible]orce[illegible].

A Shift in Volume and State

As the particles continue to absorb heat, they mo[illegible]er an[illegible]e[illegible]ntually, they spread out or expand in volume, taking up more space. [illegible]e in vo[illegible]s one of the key steps in the transformation from a liquid to a gas. The pa[illegible]ha[illegible]o[illegible]rt of a liquid are now free to move around as a gas, a state where particles [illegible] apart than in a solid or liquid.

Key Factors in Evaporation

The rate at which evaporation happens depends on several factors:

- Temperature: Higher temperatures cause particles to move faster, which speeds up evaporation.
- Humidity: In drier air, evaporation happens more quickly.
- Surface area: The larger the surface area of the liquid, the faster evaporation occurs.
- Wind speed: Evaporation happens faster when the air above the liquid is moving.

Name: _____ 30

Curriculum Connection
M.2

Evaporation - Particle Movement

Multiple Choice — Circle the best answer

1) What turns into gas during evaporation?	Solid	Liquid
2) What weakens during evaporation?	Gravity	Intermolecular Forces
3) What increases evaporation?	Wind	Rain
4) In evaporation, volume...	Decreases	Expands
5) Higher temperatures _____ evaporations.	Slows	Speeds

Question — the questions below using evidence from the text

1) How does the [illegible] particle change during evaporation?

2) Why does an increase in temperature speed up the rate of [illegible]?

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

Name: _____ 31

Curriculum Connection
M.2

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 we 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?

Materials

What you will 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

Instructions – How to 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: _____ 32

Curriculum Connection
M.2

Lab Experiment - Evaporation Results

Observations

Fill in the table below as your complete the experiment

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

Results

Answer the research questions now that you [illegible] experiment

1) What happens to water after it rains?

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

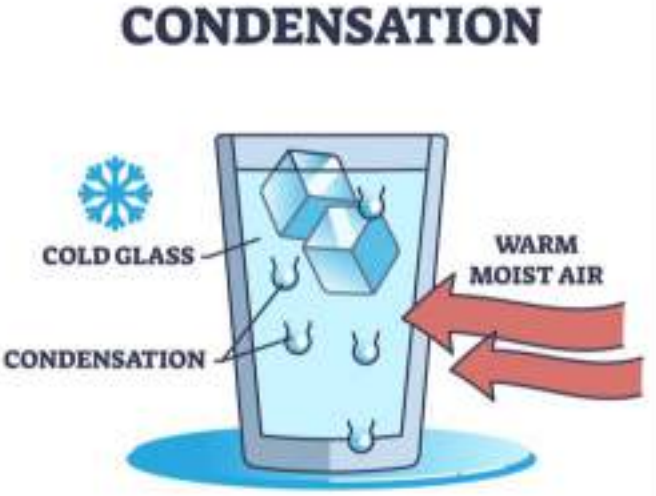
3) How does wind affect evaporation?

Name: _____ 33

Curriculum Connection
M.2

Condensation - Particle Movement

Condensation Unveiled



Condensation might sound like a complex term, but you have surely seen it in action. Remember seeing your breath on a cold day, or noticing water droplets on the outside of a cold drink? This is conde ion in action, a process where a ga o a liquid.

The Role rticles sation

Think of a cloud te ur, apous water particles. These particles are free to move around due to ak in forces holding them together. However, when these particles cool d e start down.

Strengthening Forces and Shrinking Volu

As these particles slow down with cooling, e interm lar that were once weak start to become stronger. This strengthening forc the p ser together, causing them to contract in volume. In this compact sp eous s transform into a liquid state.

Factors Influencing Condensation

The rate at which condensation occurs can be influenced by several factors:

- Temperature: Lower temperatures speed up the process of condensation.
- Humidity: Higher levels of humidity can make condensation happen faster.
- Surface: Condensation is more likely on cooler surfaces.

From the morning dew on the grass to the fog on your bathroom mirror after a hot shower, condensation is an important process in our everyday life and in the larger cycles of nature.

Name: _____ 34

Curriculum Connection
M.2

Condensation - Particle Movement

Multiple Choice

Circle the best answer

1) Condensation turns gas into...	Solid	Liquid
2) During condensation, particles...	Speed Up	Slow Down
3) Intermolecular forces during condensation...	Strengthen	Weaken
4) During condensation, volume...	Expands	Contracts
5) The colder, the faster/slower condensation happens.	Faster	Slower

Questions

the questions below using evidence from the text

1) How does the [illegible] particles change during condensation?

2) What happens to the volume of a gas during condensation?

Making Connections

When have you seen condensation happen?

Name: _____ 35

Curriculum Connection
M.2

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 we do the experiment

1) Will hot [illegible] evaporate and condense on a colder surface? Explain.

2) What will happ[illegible]n the [illegible] water droplets?

Materials
What you will need for the expe[illegible]

1) 1 cup per group/person (glass or see-through)
2) 1 plate per group/person
3) Approximately 5-10 ice cubes per group
4) Hot Water

Procedure
Instructions – How to 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!

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Curriculum Connection
M.2

Lab Experiment - Condensation Results

Observations

Fill in the table below as your complete the experiment

Step	What Happened To The Water Particles
After hot water was poured and the plate was placed on top	
After the ice was added to the plate	

Results

Answer the questions now that 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?

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Curriculum Connection
M.4

Thermal Expansion - Gases

Effects of Thermal Energy on the States of Matter

When matter in any state is heated, the matter will expand. The particles the matter is made up of do not expand, but the particles do spread out. They spread out because the attraction between the particles is weakened as they are heated. This means the matter now has more v taking up more space. But the m has not changed.

Thermal Expans

The particles wit are f rt because the attraction t ticles kest in a gaseous state. When we heat a gas, the heat causes the pa m the gas is not in a container, the gas will expand quickly.

For example, if you use a hair dry to heat air ur room, you won't notice the gas expanding. This is because the g mov it wants.

If the gas is in a small container, the gas won t escap example, if you heat up a can of hairspray, the gas inside will want t nd. in the gas will bounce off each other with a strong force. If you heat may not be able to hold the moving gas inside and it could explode. This s the can couldn't hold the gas anymore because of the thermal energy of the gas inside.

Another example you may have noticed involves a basketball. The gas inside a basketball will expand and make the ball bouncier on a hot summer day. On the other hand, if you leave your ball in the car in the winter, the ball will look like it has less gas, but once the ball warms up, it will bounce well again.

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Curriculum Connection
M.4

Thermal Expansion - Gases

Questions

Answer the questions below using evidence from the text

1) Why do gases expand when they are heated?

2) Why doe[illegible]ave more bounce in the summer?

Making Connections

W[illegible]mind you of in your life?

True or False

Circle whether the statement is true or false

1) It is safe to heat up a can of gas	True	False
2) If you heat a can of gas, it could explode	True	False
3) Gases do not expand very much	True	False
4) Gases expand more than solids	True	False
5) A basketball will have more bounce in a warm temperature	True	False

Name: _____ 39

Curriculum Connection
M.4

Experiment - Thermal Expansion

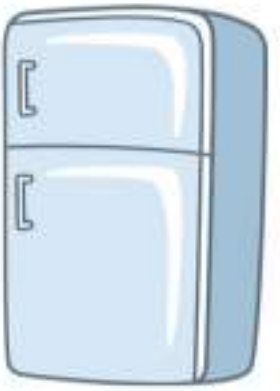
Research Question

What are we learning about?

Will cold air shrink or expand? Will warm air shrink or expand? Will anything happen to air in a bag if it is heated and cooled?

Materials

What you will need for the experiment



1) Pl
2) Free
3) Heat sourc w dr t water

Method

you ete the experiment

1) You could do one demonstration o s or le do their own.
2) First, blow up a plastic sandwich bag. Try up th h as you can.
3) Seal the bag so no air can get out
4) Place the bags in the freezer. If all students are doing it, hav bag before blowing into it.
5) Leave the bag in the freezer for at least 10 minutes.
6) Take it out and notice if the bag is bigger or smaller than it was before you put it in the fridge.
7) Next, take the cold bag and heat it up. You can do this by running hot water over the bag or by carefully blowing hot air on it. Be careful not to melt the bag.

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Curriculum Connection
M.4

Experiment - Thermal Expansion

Observations

Describe how the bag looks at each point in time

	Describe the Bag
Before putting the bag in the freeze	
Aft the ba of the freezer	
After heating the bag up	

Results

What happened? Answer the ons b

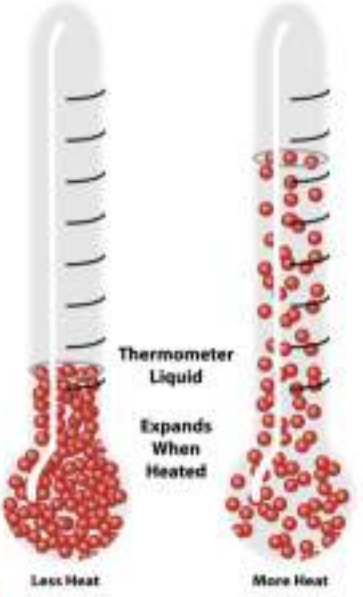
1) Why did the bag shrink after it came out of the freeze

2) What happened to the bag when it was heated? Why did it happen?

Thermal Expansion - Liquids

Thermal Expansion of Liquids

The particles in a liquid are further apart than a gas but closer than a solid. When we heat a liquid, the particles move faster and take up more space. Check out the examples of how liquids expand below.



Thermomet

A thermom cause of thermal expansion. Therm side, usually mercury or alcohol. These liq nd shrink (contract) when they are he oled.

To use a thermom you want to know the temperature of. be tub, boiling water, or the air in you acky these liquids or air come in contact with ermom rmal energy either heats or cools the liquid in the thermometer. This the liquid will lose some attraction and they will spread out, incre atter. Since the liquid is contained in a container, we will see it rise up om

If it is hot, the mercury or alcohol will expand, and rise up the t hotter it is, the more it will rise. If it is cold, the liquid mercury or alco act, moving down the thermometer.

Sea Levels Rising

As our planet gets warmer, our sea levels are rising more. One reason sea levels rise is because of thermal expansion. Our oceans are being heated by the sun, making the particles in the ocean water move faster and expand. This is making the sea levels rise. Sometimes sea levels rise over land causing flooding!

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Curriculum Connection
M.4

Thermal Expansion - Liquids

Questions Answer the questions below using evidence from the text

1) How does a thermometer work?

2) Why

Visualizing Draw what you wer ctur re reading. Explain the picture

True or False Circle whether the statement is true or false

1) Liquids do not expand when heated	True	False
2) The particles in liquids move more when heated	True	False
3) When a thermometer is heated, the liquid expands up	True	False
4) When a thermometer is cooled, the liquid expands up	True	False
5) Sea levels are rising because there is more thermal energy on Earth	True	False

Name: _____ 43

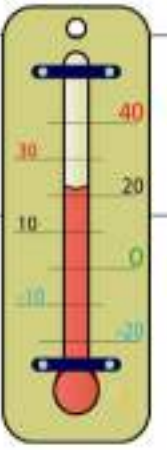
Curriculum Connection
M.4

Experiment - Homemade Thermometer

Research Question

What are we learning about?

To create a simple tool that measures temperature changes based on the expansion and contraction of a liquid.



Materials

What you will need for the experiment

1) Cl plastic or glass bottle
2) C a few drops of food colouring to tap water)
3) Drinking str
4) Modeling c
5) Marker
6) Ice water and war

Method

How yo e experiment

1) Fill the bottle about 1/4 full with the colo ater
2) Insert the straw into the bottle, but don't let it o ottom
3) Seal the neck of the bottle with modeling clay so th tra ce but isn't squeezed. Make sure it's airtight!
4) Mark the current level of the water on the straw with a marker. T your room temperature mark.
5) Place the bottle carefully in a bowl of warm water. Observe what happens to the level of colored water in the straw.
6) Mark the new level of the water in the straw. This is your warm temperature mark.
7) Now place the bottle in a bowl of ice water and observe what happens. Mark the new level of the water. This is your cold temperature mark.

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Curriculum Connection
M.4

Experiment - Homemade Thermometer

Observations	What happened?

1) What happened to the coloured water when you placed the bottle in warm water? Why do you think this happened? Explain the movement of the particles.

2) What happened to the coloured water when you placed the bottle in cold water? Why do you think this happened? Explain the movement of the particles.

Results	Answer the questions below

1) How did the change in temperature affect the volume of the liquid in the bottle? Can you explain why?

2) How could you improve your homemade thermometer to make it more accurate?

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Curriculum Connection
M.4

Thermal Expansion - Solids

Thermal Expansion of Solids
Solids are characterized by their tightly packed particle arrangement, which provides them with definite shape and structure. The structure's strength and stability stem from the strong intermolecular forces that bind the particles together. Unlike liquids or gases, these particles vibrate in fixed positions, maintaining a similar volume.

When heated, these particles receive an energy boost, causing them to vibrate more in their fixed position. They do not move freely like gases and liquids because of the strong intermolecular forces holding them together. As a result, the volume expansion is small.

Solids tend to be strong, so even the smallest expansion can cause problems. Rigid structures can crack and break if they are heated too much because of thermal expansion.

Examples of Solids Expanding

Railway Tracks
When railway tracks are assembled, a small gap between track sections is made. As the tracks absorb heat from the sun, their internal particles vibrate more intensely, leading to an overall expansion of the tracks. The gap allows room for the tracks to expand in the summer, but it is not big enough to cause a derailment in the winter.

Glass
It's always advisable to exercise caution when handling hot glassware straight out of the dishwasher. The heat from the dishwasher causes the glass's particles to vibrate more rapidly, leading to thermal expansion. If you add cold water into the hot, expanded glass, the glass will contract quickly as the glass particles slow down their vibration. This quick shift in volume can be too much for the glass, causing it to crack or shatter.

Doors
In the summer, doors might seem slightly harder to open or close. This is because under the high temperatures, the particles in the door vibrate more and cause the door to expand. Consequently, the expanded door may be too big for the frame, making it more difficult to open or close.

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Curriculum Connection
M.4

Thermal Expansion - Solids

Questions

Answer the questions below using evidence from the text

1) Why are railway tracks built with a gap between?

2) Why sho ld water in a hot glass?

Making Connections

W doe mind you of in your life?

True or False

Circle whether the statement is true or false

1) Doors can expand, making them harder to open	True	False
2) It is dangerous to leave a gap between railway tracks	True	False
3) Heat will make a solid expand	True	False
4) Glass will break if it is heated and then cooled fast	True	False
5) A solid will expand because its particles spread out	True	False

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Curriculum Connection
M.4

Thermal Expansion and Contraction

Explain How are the pictures below examples of thermal expansion or contraction?

1)

2)

3)

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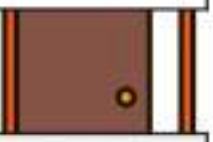
Curriculum Connection
M.4

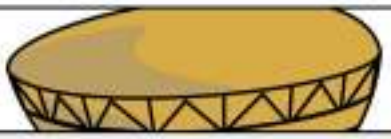
Thermal Expansion and Contraction

Explain Why might the situations below happen? Explain.

1) Shane filled up his engine coolant last night before he went to bed. He just checked the levels before he left in the morning and it has overflowed. What happened?



2) The door in Abby's hou[illegible] to op[illegible]e summer than in the winter. It feels like it is sticking or hitting on the [illegible]e. W[illegible]



3) Melanie just broke a ceramic bowl. She took it out of the fridge and removed the food from it. Then she tried washing it with really hot water. Unfortunately, the bottom of the bowl fell right through! What happened?

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Curriculum Connection
M.6

Material Importance in Building

Material Importance in Building

In any construction project, choosing the right material is crucial. This decision becomes even more vital in regions experiencing high temperatures. Let's explore how common construction materials react to heat.

Responses of Materials to Heat

- Steel: Steel is a widely used construction material, starts expanding at 20°C. It expands more as the temperature rises, making it a material to think about before using it for construction in hot climates.
- Concrete: Concrete is relatively resistant to heat. Its expansion begins at a higher temperature, around 30°C, making it a more suitable choice for hot environments.
- Wood: Wood's expansion depends on its type. It begins to expand at 30°C. Keep in mind, expansion across the grain can be significant at high temperatures.
- Asphalt: A common material for roads, asphalt can start to soften and expand at around 50°C, which makes it somewhat resilient to heat but can become problematic in extremely hot climates.

- Aluminum: Aluminum begins expanding at a lower temperature, around 15°C, and expands more than steel, concrete, and glass, making it a less favorable choice in extremely hot places.

The Heat Factor

Knowing the local temperature range is fundamental when choosing construction materials. For high-temperature zones, materials like concrete that start expanding at higher temperatures are usually better suited to maintain the integrity of the structures.

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Curriculum Connection
M.6

Material Importance in Building

Questions

Answer the questions below using evidence from the text

1) Which material begins to expand at the highest temperature and why is that important?

2) Why [illegible] the best choice for extremely hot environments?

Draw

Draw a picture of a [illegible]se. [illegible] of the house with the material you think would b[illegible] or a h[illegible]ironment and explain why.

True or False

Circle whether the statement is true or false

1) Steel starts expanding at 20°C.	True	False
2) Wood expands the same way in all directions.	True	False
3) Aluminum expands less than steel.	True	False
4) The choice of materials doesn't matter in hot environments.	True	False
5) Concrete expands the most among all materials mentioned.	True	False

DuSable Bridge in Chicago

The Heat is On: DuSable Bridge on a Hot Summer Day

The DuSable Bridge, formerly known as the Michigan Avenue Bridge, is an iconic double-deck, bascule-style bridge in Chicago. It's a marvel of engineering, serving both pedestrians and vehicles, but even such a well-designed structure has its challenges. One such event occurred on a particularly hot summer day, when the bridge began to thermally ex due to the high temperatures.

Therm ering Challenge

Like many materi tha akes up much of the DuSable Bridge ex hen it n this hot day, the steel parts of the br hat they started to expand. This expans ted ability to open and close properly, a critica func bas bridge to allow ships to pass underneath.

Cooling Down the Giant: A Unique Solution

To deal with this situation, the Chicago Department of Tran ca with an unusual solution: they decided to hose down the bridge with wat to allowed the steel to contract, returning the bridge to its normal opera na

Benefits of This Cooling Method

Hosing down the bridge with water provided a quick solution for a few reasons:

- Quick Heat Transfer: Water can absorb and carry away heat faster than air, making it an efficient cooling agent.
- No Damage: This method didn't cause any damage to the bridge structure.
- Immediate Effect: The effects were immediate, allowing the bridge to resume its regular operation quickly.

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Curriculum Connection
M.6

DuSable Bridge in Chicago

Questions

Answer the questions below using evidence from the text

1) How did thermal expansion affect the DuSable Bridge? What was the result?

2) Why [illegible] ridge with water an effective solution?

Think

How would you [illegible] ridge? Draw and explain.

True or False

Circle whether the statement is true or false

1) The DuSable Bridge is located in Chicago.	True	False
2) The DuSable Bridge is a suspension bridge.	True	False
3) The bridge was hosed down with water to cool it.	True	False
4) Water caused damage to the bridge structure.	True	False
5) The bridge couldn't open and close properly due to expansion.	True	False

Curriculum Connection
M.6

Potholes - Thermal Expansion/Contraction

The Asphalt Battlefield

Asphalt, a common material used for roads, is in a constant battle against weather changes. The repeated cycle of freezing and thawing takes a toll on it, leading to the formation of something we all dread - potholes.

Freeze: The [illegible]ap

When temp[illegible]rop, water that seeps into tiny cracks [illegible] As this happens, the water mo[illegible]les sl[illegible]d arrange themselves into a crystallin[illegible]f[illegible] which [illegible]n more space than liquid water. This expansion applies pressure from [illegible]in th[illegible]ing the cracks to widen.

Thaw: The Weakening Phase

When the temperature rises, the ice melt[illegible]into w[illegible]ater molecules move faster and come closer together, reducing their vo[illegible]nd le[illegible]hind a larger space within the asphalt.

This area is weakened and under the weight of veh[illegible]ng o[illegible]he asphalt eventually gives way, creating a pothole. Potholes happen mo[illegible]the freeze and thaw events.

Pothole Formation: The Final Blow

The continuous cycle of freezing and thawing further erodes the asphalt, widening the pothole over time. Here's a simple list outlining this process:

- Water seeps into cracks in the asphalt.
- The water freezes and expands, widening the cracks.
- The ice thaws, leaving behind a larger space within the asphalt.
- The asphalt weakens and gives way under the weight of vehicles, forming a pothole.

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Curriculum Connection
M.6

Potholes - Thermal Expansion/Contraction

Summarize Why do potholes happen? Summarize the reading.

Draw Draw a three-step illu freeze-thaw cycle. Label each step: water seeping in, freez ing and contraction.

True or False Circle whether the statement is true or false

1) Water expands when it freezes.	True	False
2) Potholes form due to the freeze-thaw cycle.	True	False
3) Water molecules slow down when they freeze.	True	False
4) Ice melting into water causes expansion.	True	False
5) Asphalt is weakened by the weight of vehicles.	True	False

Name: _____ 55

Curriculum Connection
M.5

Properties of Water: Solid vs. Liquid

The Marvel of Water's Volume and Density

Water, a substance we encounter every day, has a unique and fascinating property. It behaves differently than most other substances when it changes from a liquid to a solid state. Incredibly, water expands and takes up more space when it freezes and becomes ice, making it less dense in its solid form than in its liquid form.

Understandi ty

To unde need to know about density. Density is a measure of how much 'stuff', o s, is pa certain amount of space, or **volume**. For most substances, the solid form is the form. This happens because particles pack together more close solid a liquid state. However, water is different!

Expansion During Freezing

When water freezes, it forms a hexagona hat a lot of empty space between its particles. This pattern results ce havi arge me than the same amount of liquid water. Since the mass stays the ut th reases, the density of ice becomes lower than that of water. This ats on

Water's Freezing Point

The transformation from liquid water to solid ice happens at a specific temperature known as the freezing point. For pure water, this is 0 degrees Celsius or 32 degrees Fahrenheit. Below this temperature, water will start to freeze, beginning at the surface of the body of water.

The Effect of Water's Unusual Property

The unique properties of water have significant effects:

- Ice floating on water forms an insulating layer, protecting aquatic life in winter.
- The expansion of freezing water can crack pipes and rocks, shaping our environment.

Name: _____ 56

Curriculum Connection
M.5

Properties of Water: Solid vs. Liquid

Questions

Answer the questions below using evidence from the text

1) What happens to water's volume and density when it freezes?

2) Why [illegible]?

Visualizing

Draw what you wer[illegible]ctur[illegible] [illegible]re reading. Explain the picture

True or False

Circle whether the statement is true or false

1) Ice has more volume than liquid water	True	False
2) Ice has a hexagonal pattern	True	False
3) Solid water is denser than liquid water.	True	False
4) Water's freezing point is 0 degrees Celsius.	True	False
5) Ice on water insulates the water beneath.	True	False

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Curriculum Connection
M.5

Ice as Nature's Blanket

The Magic of Ice Formation

As winter takes hold and temperatures drop, a transformation takes place in our lakes, ponds, and rivers. Water at the surface reaches its freezing point and turns into a solid: ice. This process starts at the top because cold air affects the surface water first. Gradually, a frozen sheet of ice forms acros[illegible]ntire surface of the water body, leaving the [illegible]derneath still in its liquid form.

Ice as an [illegible]lator

You may wonde[illegible]n't th[illegible] body of water freeze solid?" The an[illegible]s tha[illegible]on top acts like a blanket, providing ins[illegible]sulati[illegible]down heat loss, which means the wate[illegible]eath[illegible] lose heat to the cold air as quickly. This p[illegible]helps [illegible]e water underneath the ice layer warmer than it would be without the ice, and a[illegible] freez[illegible]perature.

Protecting Aquatic Life

This insulation effect is crucial for the survival of aquatic life [illegible]g the[illegible] Fish and other underwater creatures rely on the liquid environment t[illegible] ice that forms on the surface of a body of water provides a few significant [illegible]s:

1) It keeps the water from freezing solid, providing a habitat where fish and other creatures can survive.

2) The ice layer reduces water exposure to cold air, preserving the water's temperature and preventing it from getting too cold.

3) The formation of ice limits the water's contact with the cold wind, reducing the cooling effect of the wind on the water body.

Name: _____ 58

Curriculum Connection
M.5

Ice as Nature's Blanket

Questions Answer the questions below using evidence from the text

1) How does ice act as an insulator on a body of water?

2) What are [illegible]efits of the ice layer to aquatic life during winter?

Draw Draw and label a [illegible] showi[illegible] insulates a body of water in winter.

True or False Circle whether the statement is true or false

1) Ice forms on the surface of water bodies during winter.	True	False
2) The entire body of water usually freezes solid.	True	False
3) Ice acts as an insulator on a body of water.	True	False
4) An ice layer reduces the water's contact with cold wind.	True	False
5) An ice layer keeps the water underneath habitable for aquatic life	True	False

Name: _____ 59

Curriculum Connection
M.5

Experiment - Insulating Properties of Ice

Research Question — What are we learning about?

To visualize and understand how a layer of ice insulates and preserves heat in the water beneath it during the winter months.

Materials — What you will need for the experiment

1) Tw[illegible]ainers (of the same size)
2) Wa[illegible]room [illegible]re
3) Ice cubes
4) Thermomet[illegible]
5) Freezer
6) Timer or clock

Method — How you will co[illegible]e the e[illegible]ent

1) Fill both containers with the same amoun[illegible]om [illegible]er [illegible]water.
2) In one of the containers, create a layer of ice cube[illegible] top [illegible] water. This will represent a frozen body of water in winter.
3) Place a thermometer in each container, ensuring that the tip of th[illegible] thermometer is in the water, but not touching the container's side[illegible] bottom.
4) Place both containers in the freezer.
5) After 30 minutes, carefully remove both containers from the freezer, making sure not to disturb the layer of ice.
6) Immediately read and record the temperature of the water in each container.
7) Repeat steps 5 and 6 every 30 minutes for a total of 2 hours, noting the temperature each time.

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Curriculum Connection
M.5

Experiment - Insulating Properties of Ice

Observations | What happened?

Time	Container	Temperature
0 Minutes (Before Freezing)	No Ice Layer	
	Ice Layer	
After 30	No Ice Layer	
	Ice Layer	
After 1 Ho	No Ice Layer	
	r	
After 1 Hour 30 Minutes	e La	
	Lay	
After 2 Hours	No Ice L	
	Ice Layer	

Results | Answer the questions below

1) What happened? Did one container cool the water faster? Explain t

2) Why do you think the water didn't cool at the same rate?

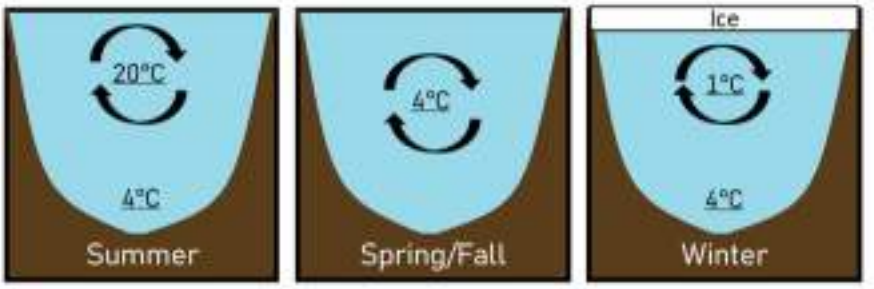
Name: _____ 61

Curriculum Connection
M.5

Density of Water - Lake Turnover Effect

Understanding the Density of Ice

Ice floats because it's less dense than water. Density is a measure of mass per unit volume, and when water freezes into ice, its volume increases, but its mass remains the same. This leads to a decrease in density, making the ice float on water.



The La[illegible]

The lake [illegible]over is [illegible]henomenon seen in many lakes around the world. It refers to a process tha[illegible] water [illegible]ake, ensuring that nutrients and oxygen are distributed evenly thr[illegible]out t[illegible]ffect is crucial for the survival of aquatic life.

The Four Seasons of Lake Turnov[illegible]

- Summer: During the summer months [illegible]mperat[illegible]e lake's surface water increases due to the warm weather. This warmer [illegible]er is [illegible]se and thus floats on top of the colder, denser water. At the same [illegible]the [illegible]water, which is around 4°C, sinks to the bottom. Water at 4°C is th[illegible]es[illegible]water
- Fall: As temperatures start to drop during fall, the lake's sur[illegible]ce w[illegible] whole lake starts to equalize to around 4°C. The colder water from [illegible]e [illegible]ses and mixes with the warmer water above, leading to what we call a "lake [illegible]nover."
- Winter: During winter, the surface water freezes, forming ice. The ice floats on the lake's surface due to its lower density. Beneath the ice, the densest water, which is around 4°C, sinks to the bottom, while the water in between is colder.
- Spring: Similar to fall, during spring, as temperatures begin to rise, the lake water again equalizes to around 4°C. The warmer, less dense water from the bottom mixes with the colder water above, causing another turnover.

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Curriculum Connection
M.5

Density of Water - Lake Turnover Effect

Questions

Answer the questions below using evidence from the text

1) What does lake turnover mean? Why does it happen?

2) Why i[illegible]ect important for aquatic life?

Diagram

Draw a diagra[illegible]lake[illegible]one from the reading

Summer	Spring/Fall	Winter

True or False

Circle whether the statement is true or false

1) Ice is denser than water.	True	False
2) 4-degree water is the densest water temperature.	True	False
3) During winter, the warmest water is at the bottom of the lake.	True	False
4) Ice forms on the lake's surface during winter because it is less dense	True	False
5) In spring, the lake water equalizes to around 4°C.	True	False

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Curriculum Connection
M.5

Story - The Great Freeze in Fishville

The Great Freeze in Fishville

Once upon a time, in a bustling underwater city known as Fishville, the aquatic creatures lived happily, playing and exploring their vast water world. The city was vibrant and full of life, home to many species of fish, along with frogs, turtles, and many more.

Every [illegible]er, the inhabitants of Fishville waited for the arri[illegible] ice layer. They knew when the weather a[illegible]ld, a layer of ice would form on the [illegible]ac[illegible]g like a protective blanket. It kept t[illegible]ter be[illegible]le warmer, helping the aquatic creature[illegible]he [illegible] winter months.

But one year, [illegible] start[illegible]e. A wily wizard, who lived in a [illegible]ll that reversed the properties of water. The spell made solid wate[illegible]ser t[illegible] water. The wizard, having no knowledge of the impact this [illegible]ave[illegible]fe, was pleased with his trick and left to celebrate.

That winter, as the weather turned [illegible], the i[illegible]te[illegible]ming as usual. But instead of floating on the surface, it sank to the [illegible]. The [illegible]reatures watched in horror as the ice filled their homes and the se[illegible]

The colder water that was usually at the bottom [illegible]to th[illegible]nd froze, adding more ice to the floor of the lake. The fish and other [illegible]res[illegible] towards the icy surface, away from their familiar homes. Food was [illegible] many were too cold to survive in these new conditions.

A brave young turtle named Tilly decided she had to do something [illegible] journeyed to the wizard's lair and explained the consequences of his spell. Moved by Tilly's words and the plight of Fishville, the wizard immediately reversed the spell.

The ice on the lake floor began to float back up to the surface. The water near the bottom warmed up a bit, and life in Fishville started to return to normal. The aquatic creatures were able to swim back to their homes and find food again.

From that day on, the wizard vowed to never again cast a spell without understanding its impact, and Fishville continued to thrive beneath the ice each winter. This story reminds us of the vital role that water's unusual properties play in supporting life under the ice.

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Density of Water - Lake Turnover Effect

Summarize Summarize the story by including only the main details

Draw Sketch a before [illegible] picture [illegible] ville showing the changes when the ice was denser and a [illegible] sp[illegible] sed

Before the Spell	[illegible] the Spell

True or False Circle whether the statement is true or false

1) The ice layer usually protects aquatic life in winter.	True	False
2) Ice that is denser than water floats on the surface.	True	False
3) The denser ice made the aquatic creatures' lives easier.	True	False
4) The colder water usually stays at the bottom of the lake.	True	False
5) After reversing the spell, the ice started to sink.	True	False

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Story - Effects of Denser Solid Ice

What if solid water was denser than liquid water? How would that impact aquatic life? Plan your own story below by considering the positive and/or negative effects.

Plan Answer the questions below to plan your story

1) How will water become denser in solid form? Ex. A wizard casts a spell.

2) What p[illegible]es/ne[illegible] happen in your story because of the changing density?

3) What characters will be in your story? Give them names a[illegible]s t[illegible]s.

4) How will the problem be resolved?

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Story - Effects of Denser Solid Ice

_____

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Decoding Abstraction in Computer Science

What is Abstraction?

Abstraction in computer science is a method of simplifying complex systems by breaking them down into manageable parts and focusing on the most important elements. The idea is to concentrate on 'what' a system does rather than 'how' it does it.

Determining What to Keep and What to Ignore

An important aspect of abstraction is deciding which details are important and which can be overlooked. For example, when programming a digital clock, the program might include the hours, minutes, and seconds, but not the exact mechanism of the real clock's hands.

Removing Unnecessary Details

The process of abstraction also involves removing details that are not needed. If we continue with the digital clock example, details like the color or the font of the numbers may not matter to the function of the clock and can be ignored in the abstraction process.

Identifying Important Information

Abstraction requires understanding the main idea of what you're trying to achieve. For example, if you're programming a game, the important information might include the rules of the game, the players' scores, and the game's outcomes, but not necessarily the colour of the game board.

Generalizing Patterns

Finally, abstraction involves identifying patterns that can be generalized. If you find that certain lines of code are repeated multiple times in your program, you might create a function that performs that task and call that function whenever the task needs to be performed. This helps keep your code organized and easier to read.

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Decoding Abstraction in Computer Science

Questions

Answer the questions below using evidence from the text

1) What is abstraction in computer science?

2) Write a de p-by-step process for making cereal for breakfast. Use as many details as y size of bowl, spoon, amount of milk/cereal, etc.

1	
2	
3	
4	
5	
6	

3) Abstract the above by removing unnecessary det d f ssential steps.

True or False

Circle whether the statement is true or false

1) Abstraction is a method of making things more complex.	True	False
2) In abstraction, we focus on what a system does.	True	False
3) In abstraction, all details are important.	True	False
4) In programming a digital clock, the colour of numbers is crucial.	True	False
5) Abstraction involves recognizing patterns.	True	False

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Programming Flow Chart

Program Flow Chart – Basics

To represent an abstraction of how a system works, we can use a flow chart that simplifies the process. We use different shapes for different parts of the flowchart.

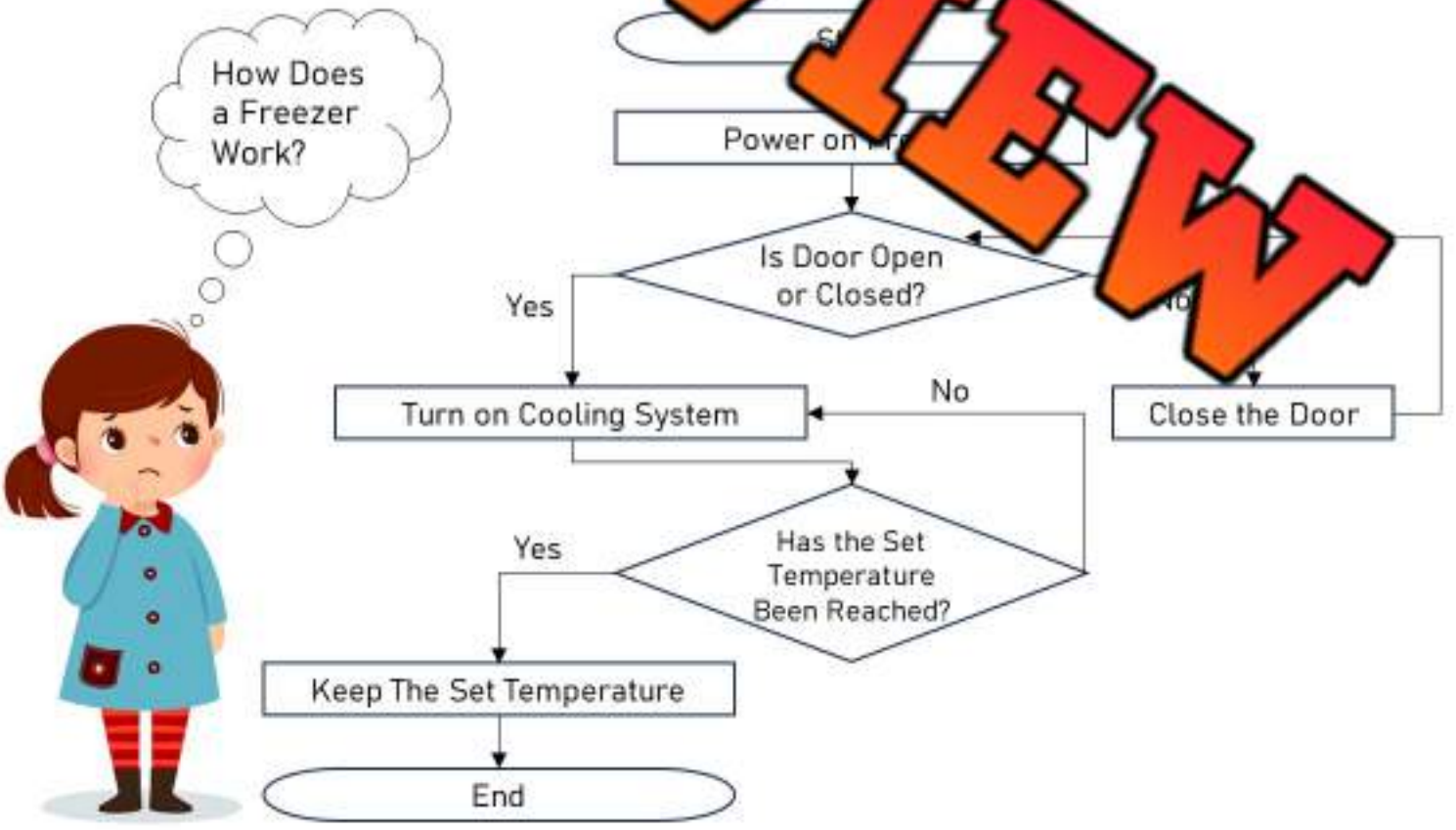
1) Start/End Symbol: This is usually represented by an oval shape. It shows where the process starts or ends. There's typically one start and one end symbol for each process.

2) Process Symbol: This is a rectangle. It represents a task or work being done. For example, 'turn the power' or 'set the temperature.'

3) Decision Symbol: This is a diamond shape. It represents a decision or a question that needs to be answered, like 'is the power on?' or 'is the door open?'

4) Arrow Symbol: These are the lines with arrows that connect the symbols. They show the direction of the process. An arrow should start from a process or decision symbol and end at another symbol.

5) Input/Output Symbol: This is also called a parallelogram. It represents information entering or leaving the system, such as user input or displaying results.



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Programming Flow Chart

Plan Make a plan so you can program a hair dryer

1) What buttons does a hair dryer have?
2) What different settings does a hair dryer have?

Program w for how a hair dryer works

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Coding - Technologies - Ice Makers

History of Ice

In the early 1900s, ice was hard to get. In warm climates, you had to buy ice from a store. This was because freezers for homes weren't invented until 1927. Instead, stores brought in ice from cold climates or from a factory with freezers. In 1927, scientists working at General Electric invented the first at-home freezer!

How Do Ice [illegible] Work?

1) Water [illegible] your freezer fills up ice trays in only 7 seconds
2) Th[illegible]-maker is below zero, so the water freezes into cubes
3) There is a th[illegible] how cold the water in the cubes are. When the water is froze[illegible]zero) [illegible]ostat turns on a heating unit
4) The heating unit hea[illegible] [illegible]ce cube tray so that the ice can fall out of the tray
5) When the heater turns on for 1[illegible] [illegible]ay is flipped upside down

Question	Who invented at home freezers? [illegible] did [illegible] people's lives?

Coding	Fill in the then statements using information from the text

1)	If you lived in the early 1900	then	
2)	If water has poured for 7 seconds	then	
3)	If the water freezes	then	
4)	If the heater is on for 10 seconds	then	

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STEM Assignment - Water/Ice Related Machine

Create your own water/ice related machine. Use the list below for ideas and consider combining ideas to make a revolutionary invention that will sell well.

Air Conditioner	Dishwasher
Ice Cream Maker	Snow Cone Machine
Water Filter	Kettle
Coffee/Espresso Maker	Soda Stream
Sprinkler System	Washing Machine

Plan ur invention below

1) What invention w reate it do?

2) What buttons does your machine have? Think of th r inp

3) What processes does your machine have? What things does it do?

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STEM Assignment - Water/Ice Related Machine

Plan | Plan your invention below

4) Write a simplified step-by-step process of how your machine will work. For example, the machine is turned on, the water is boiled, the coffee is grinded, the water is poured over the ground coffee, the spout is opened, the machine is turned off.

5) Draw your machine below. Label the different components.

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STEM Assignment - Water/Ice Related Machine

Program Draw a flow chart for how your machine works

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STEM Assignment - Water/Ice Related Machine

Questions | Answer the questions about your machine below

1) Why should people buy your machine? List 3 or more reasons.

2) Writ[illegible] social media that markets your machine.

Name of Com[illegible]

Check it out at www._____.com

3) How much does it cost to make your machine? How much will you sell it for?

Cost		**Price**	

4) If you sell 50 machines today, how much money will you make? Remember to factor in how much it costs to make your machine.

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Unit Test - Matter

Multiple Choice /10

1) What makes particles in a solid vibrate? a) Heat b) Light c) Smell d) Sound	2) What state of matter does ice belong to? a) Solid b) Liquid c) Gas d) Plasma
3) What cha… …ater evaporates? a) Mass b) Volume c) Colour d) Taste	4) What state does water become when it condenses? a) Solid b) Liquid c) Gas d) Plasma
5) When does the surface of a lake f… a) Below 0°C b) Above 0°C c) Below 100°C d) Above 100°C	…eeps aquatic life safe under a frozen a) Liquid b) Su… c) Fis… d) Ice
7) Which is the most dense? a) Ice b) Water vapour c) Liquid water d) Air	8) A basketball wi… …our… a) Hot b) Cool c) Frozen d) It will always be the same
9) Which phase of matter expands the most? a) Solid b) Liquid c) Gas d) Plasma	10) Which material expands the easiest? a) Steel b) Concrete c) Asphalt d) Wood

Definitions – What does the term mean (1 mark each) /3

Term	Definition (what does it mean)
Thermal Expansion	
Density	
Boiling Point	

Short Answer Questions (2 marks ea

1. What is the particle theory of matter?

2. Why are train tracks not joined together? Why is there a gap between meta

3. Describe the movement of particles in liquid water when they are cooled beyond their freezing point?

Long Answer

Answer the long answer questions. Each question is 5 marks

1) How does a thermometer work? Explain using the particle theory of matter. Give examples of how it works.

2) What happens to a lake or river in the winte[illegible]plain wh[illegible]t to the aquatic life in these bodies of water.