

# Part 1 Matter, Phase Change

Name: \_\_\_\_\_

## Part 1 Lesson 1 Matter

Matter : Anything that has \_\_\_\_\_ and takes up \_\_\_\_\_.

**What's the difference between mass and weight?**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Element: A substance that cannot be \_\_\_\_\_ into smaller parts or changed into another substance.

An element is made of \_\_\_\_\_ type of atom.

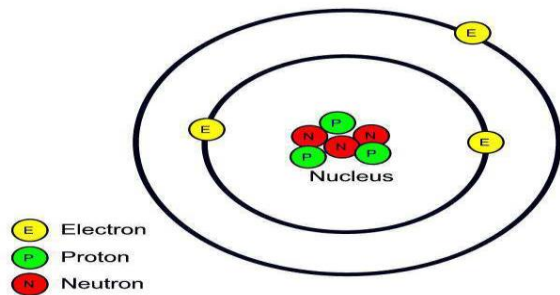
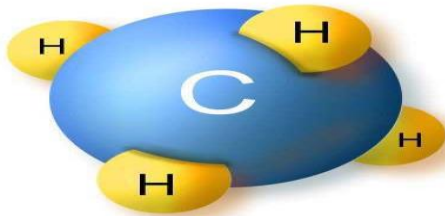
The basic part of an element is an atom which contains \_\_\_\_\_, neutrons, and electrons.

Each element is distinguished by the \_\_\_\_\_ of protons in its \_\_\_\_\_ which is its atomic number

Compound: Made up of \_\_\_\_\_ or more elements bonded together.

Mixture: When two or more pure substances are together but not \_\_\_\_\_.

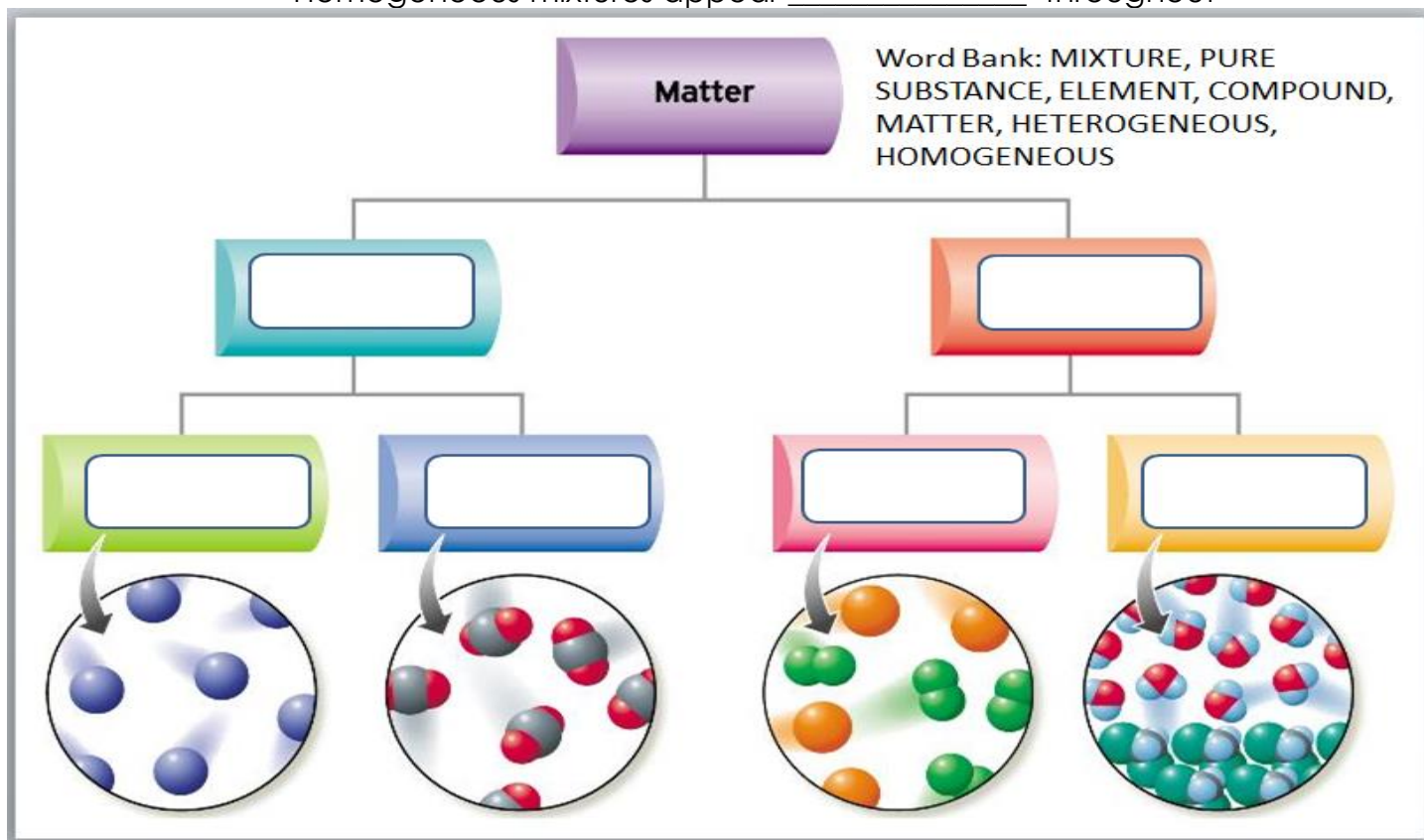
Which of the following drawings are of an element, and which is of a compound? Describe your reasoning in the spaces around each picture.



Mixtures: They may vary in proportion.

Heterogeneous have visually \_\_\_\_\_ components.

Homogeneous mixtures appear \_\_\_\_\_ throughout



Homogeneous mixture: \_\_\_\_\_ molecules throughout.

Heterogeneous: A mixture of \_\_\_\_\_ or more compounds.

Quiz Wiz! 1-10 Homogeneous or Heterogeneous.

1)	2)	3)	4)
5)	6)	7)	8)
9)	10)	*11)	

### Separating a Mixture Lab Activity

Step #1. Look at the mixture and describe what it is made of? Can you create a list? Now weigh your mixture in grams on your sheet.

Step #2. Place the magnet in the plastic bag and sweep it across the mixture to pick up as much iron filings as possible. Put Iron filings in a small cup and weigh in grams.

Step #3. You can then pour the mixture into water and collect anything that floats to the top. Place in a different cup and weigh.

Step #4. Pour the collected solution through a coffee filter to collect the sand in the filter and allow the solution to flow into a larger cup below. Put the sand in a different cup and weigh.

Step #5. Take the saltwater and carefully pour into a pot, crucible, or beaker that can be boiled on a hot plate to remove the water.

– Let cool. The salt will be left behind. Collect and place in another cup and weigh in grams.

Step #6. Weigh the parts of the original mixture separately (don't weigh the cup), see if its close to the original weight.

Sample total mass:	mass (grams)	% Composition by mass	% Percentage Error / Difference	Notes
Iron Filings				
Styrofoam Pieces				
Sand				
Salt				

$$\% \text{ Composition by mass} = \frac{\text{mass separate}}{\text{total mass}} \times 100\%$$

$$\% \text{ difference / Error} = \frac{\text{diff in mass}}{\text{original mass}} \times 100\%$$

Step #6. Other questions to consider  
Does the order of separation matter?

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What were some properties of the materials that allowed us to remove them from the mixture?

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Did you encounter any problems? How could that be fixed and be done differently? What was your % error? Why?

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## Part 1 Lesson 2 Soda Store Project

Solvent: A substance that does the \_\_\_\_\_ (usually larger amount / Water).

Solute: The substance that gets dissolved (usually \_\_\_\_\_ amount).

Solubility: How much \_\_\_\_\_ can dissolve in a substance before it becomes saturated.

Supersaturated: When no more solute will \_\_\_\_\_. (crystals become visible)

SODA STORE! Make a brand of soda for scientists. Please describe your solution using some science terminology below. Be prepared to present your soda.

Group members and Role: President, Graphic Designer, Taste Chemist, Marketer

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Name of your soda \_\_\_\_\_ Name #2 \_\_\_\_\_

Color of your soda \_\_\_\_\_ How are you going to get that color?

Taste of your soda \_\_\_\_\_

Taste of your Soda #2 \_\_\_\_\_

Ingredients (dry solute only) No pharmaceuticals etc. : Amount of Sugar in grams \_\_\_\_\_

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Your Motto / Jingle / Presentation / Your Label, Use the space below to prepare.  
You must include the word solution, solvent, solute, solubility.




How did it taste? What would you do differently next time?

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Does mixing sugar and water result in a new substance? \_\_\_\_\_

The sugar changed from a solid to a \_\_\_\_\_. This is a \_\_\_\_\_ change and not a chemical change.

When we burn the sugar in our cells, we do change its form / create a ch\_\_\_\_\_. We eat / drink sugar and breath in oxygen gas. The products of the chemical reaction are carbon dioxide gas and water vapor that we exhale.







### Part 1 Lesson 3 Law Conservation of Matter

Weigh a bag of microwave popcorn (remove from plastic) before microwaving. Predict the weight after microwaving. Will it increase, decrease, or remain constant?

Weight in grams of popcorn and before popping?	Prediction of total weight after microwaving?	Weight in gram of popcorn and bag after microwaving?

Did the microwaved popcorn and bag gain mass, lose mass, or remain constant after heating in the microwave? Provide data in your response?

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Law Conservation of Matter: During any chemical or physical change the total amount of matter remains \_\_\_\_\_.

In other words, matter can be neither \_\_\_\_\_ nor \_\_\_\_\_.

Time birthday candles in minutes	Weight of candles
1 min	
2 min	
3 min	
4 min	
5 min	
6 min	
7 min	
8 min	
9 min	
10 min	
11 min	
12 min	
13 min	
14 min	
15 min	

What was the decrease in mass from the start to the finish?

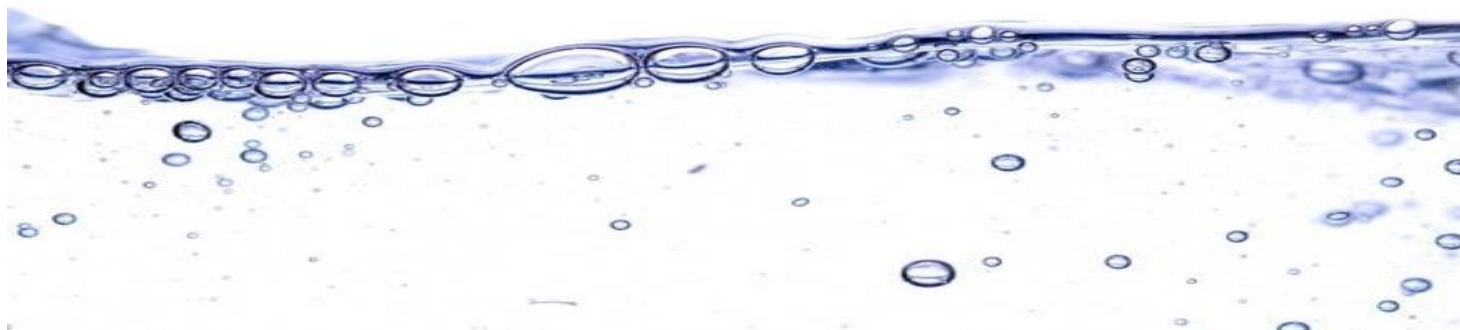
Starting Mass \_\_\_\_\_ - Final Mass \_\_\_\_\_ = \_\_\_\_\_ (Mass Lost)

Where did this mass of the candle go?

Demonstration of Law Conservation of Matter with Alka-Seltzer

- Weight of water \_\_\_\_\_ ?
- Weight of Alka-Seltzer \_\_\_\_\_ ?
- Weight together in sealed bag \_\_\_\_\_ ?
- Weight together in unsealed bag \_\_\_\_\_ ?

What happened in this demonstration?









## Part 1 Lesson 4 Kinetic Molecular Theory

Kinetic Molecular Theory:

The molecules are in constant \_\_\_\_\_.

This motion is different for the \_\_\_\_\_ of matter.

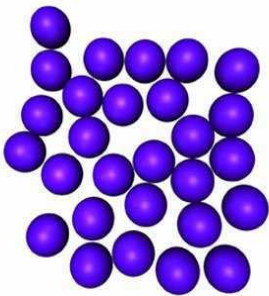
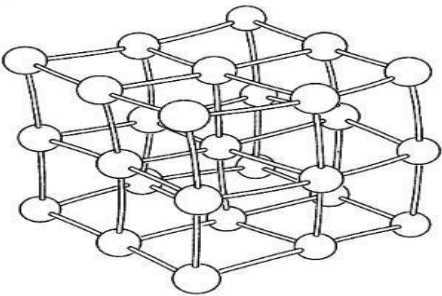
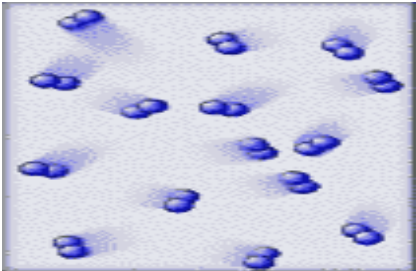
States of Matter

Solid (s) has a definite \_\_\_\_\_ and \_\_\_\_\_.

Liquid (l) Has definite \_\_\_\_\_ but not \_\_\_\_\_.

Gas (g) \_\_\_\_\_ definite shape or volume.

Name each state of matter on a molecular level. (Solid, Liquid, Gas)

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## Part 1 Lesson 5 States of Matter

4<sup>th</sup> State of Matter: Plasma (p) \_\_\_\_\_ gas that emits electrons.

BEC = \_\_\_\_\_

Quiz 1-10 Solid, Liquid, Gas, Plasma, BEC

– Note: One will be a semi solid and one will be a BEC (Bose-Einstein Condensate)

1)	2)	3)	4)
5)	6)	7)	8)
9)	10)	*11)	

## Part 1 Lesson 6 Phase Change

Physical Change

Changes form: \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_

Doesn't change \_\_\_\_\_

Hersey Kiss Demo

**SOLID**

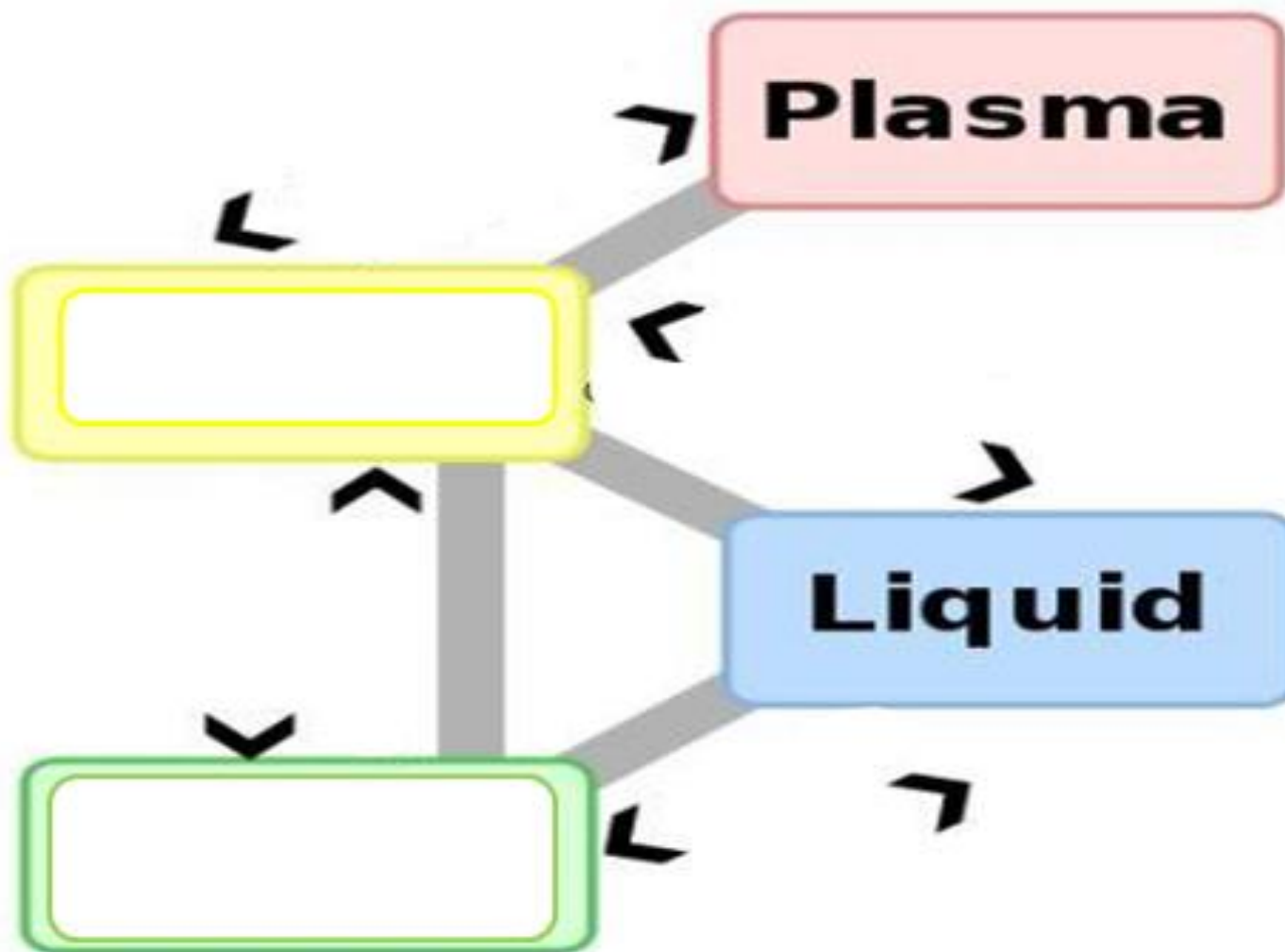


**+ENERGY**



Fill-in the blanks to complete the change diagram below with the correct terms. Can you draw a line showing energy added / removed?

Please describe the states of matter below.



Provide some properties of each state of matter.

A physical change / reaction can also occur with \_\_\_\_\_ sites.

Nucleation site: A place that acts as a nucleus for (\_\_\_\_\_), in a process of formation such as crystals, or bubbles.

What is the difference between melting and dissolving?

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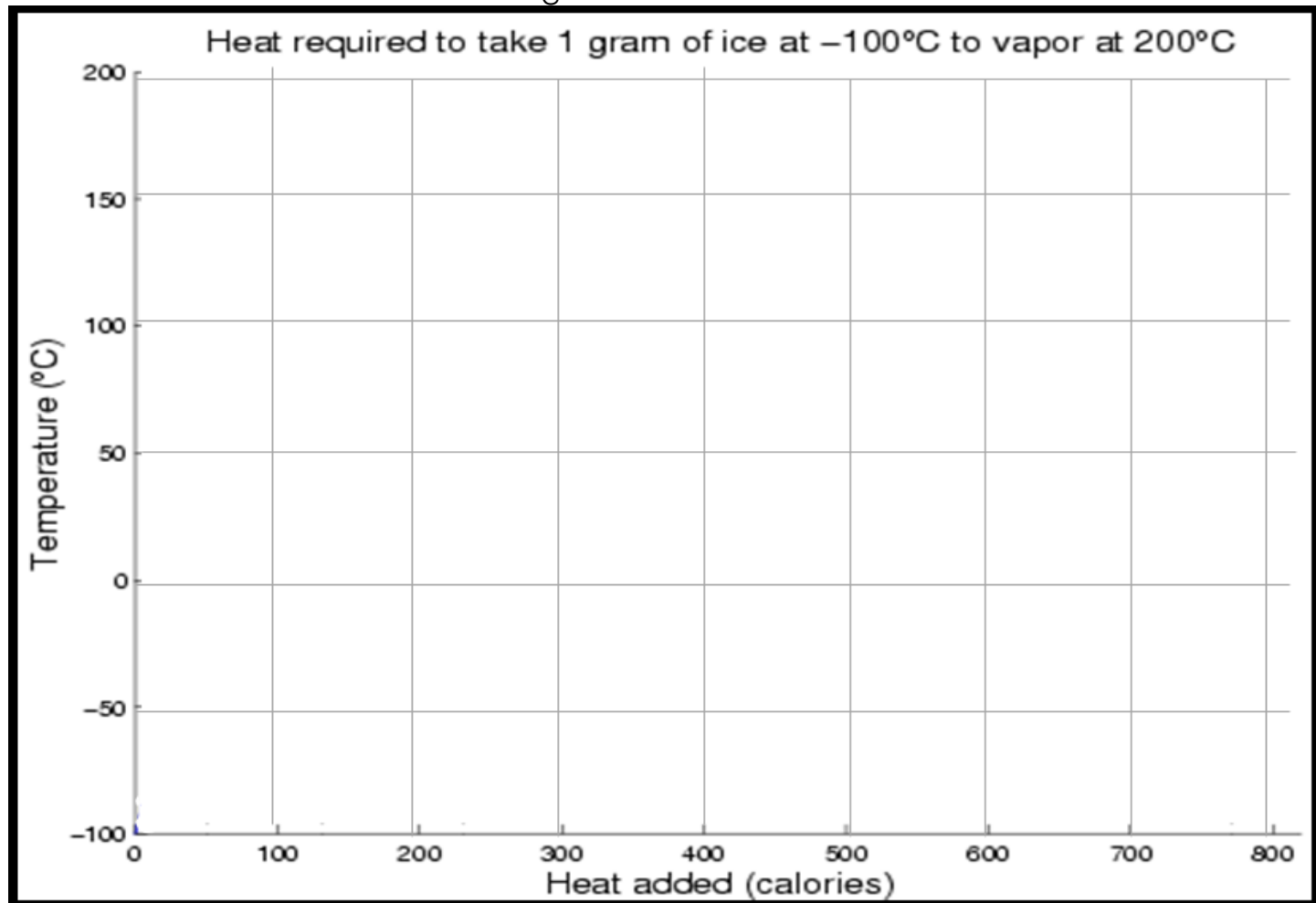
## Part 1 Lesson 7 Phase Change

Using digital thermometers and water.

-Record temperature of water every minute.

-Record observations of phase change during the minute they occur.

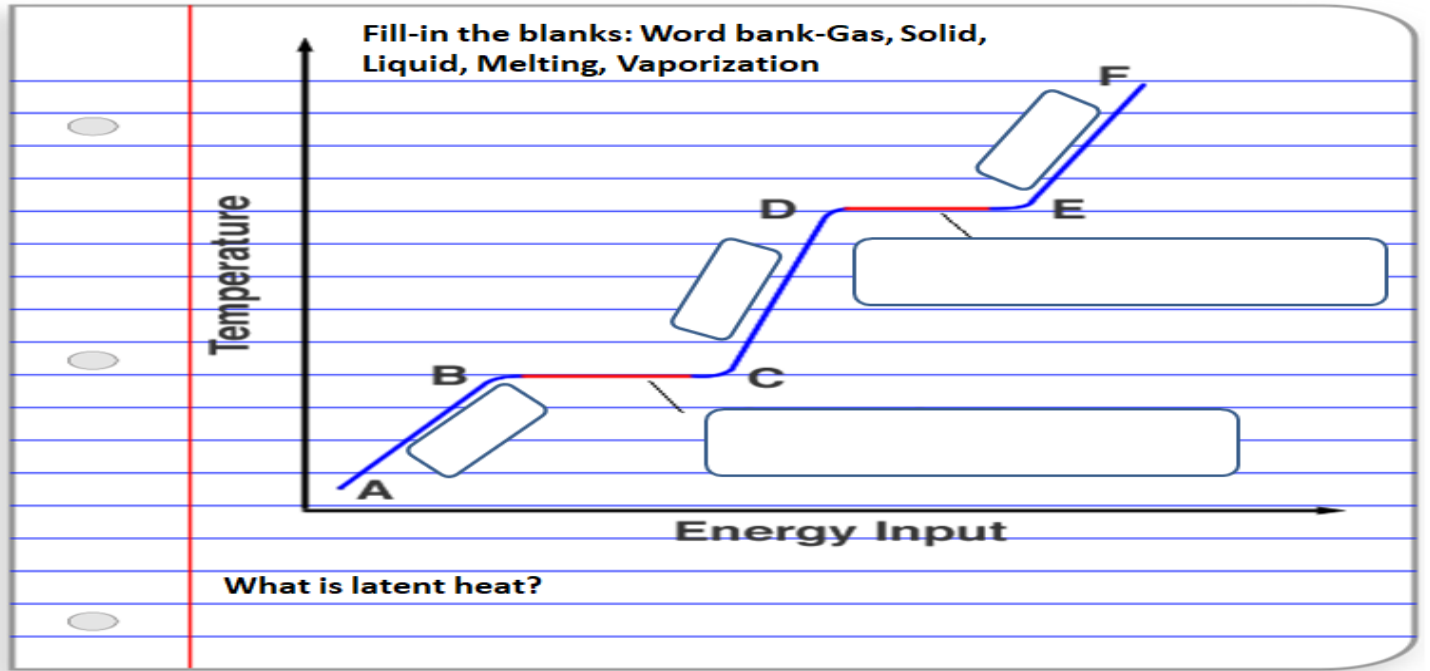
- Bubbles – Boiling starts
- Gas release – Boiling







Please label the states of matter as they occur on your graph (based on observations and use correct terms such as melting and vaporization).

What happened at 100 degrees Celsius? What trends do you see in the data?

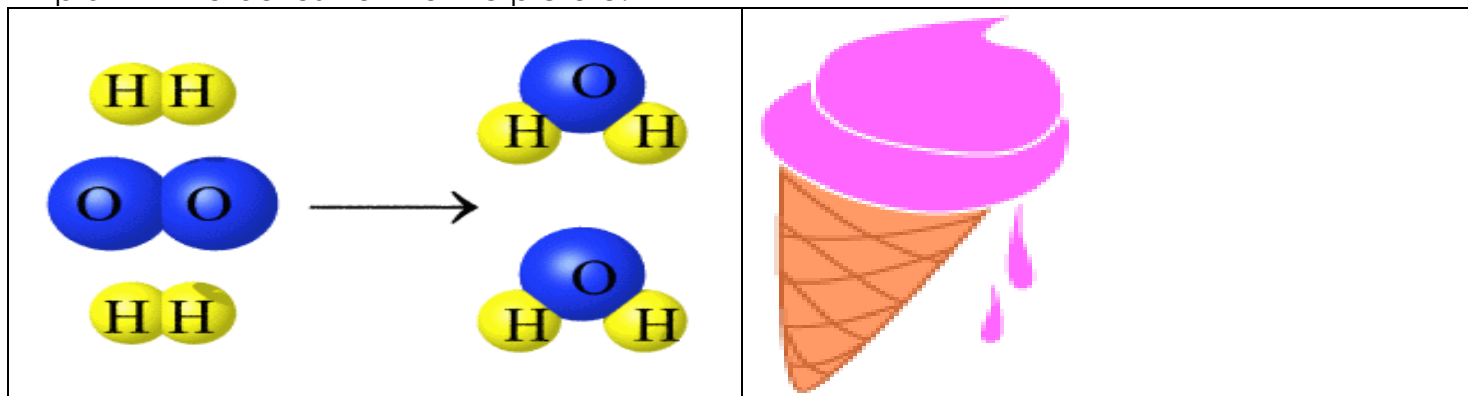
Latent Heat: The energy \_\_\_\_\_ or \_\_\_\_\_ when a substance changes its physical state.



Ice Cream Questions.

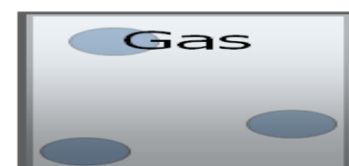
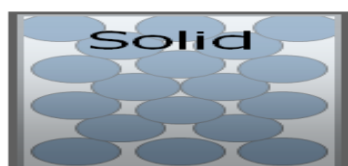
<p>What was added to the ice to cause it to melt?</p>	<p>How cold did the bag get?</p>
	
<p>Why did the ice cream turn from a liquid to a solid?</p>	<p>Why is salt put on the roads to prevent icing?</p>
	

Which of the following pictures is a chemical change, and which is a physical change?  
Explain in the boxes next to the picture.



Please create an arrow showing how the effort (energy) needed to compress the three states of matter below,

### Effort Needed to Compress



### Part 1 Lesson 8 Physical Properties

Physical Property: A characteristic that can be observed or measured without \_\_\_\_\_ the identity of the substance.

What are some differences between a metal and plastic spoon? Describe them below.

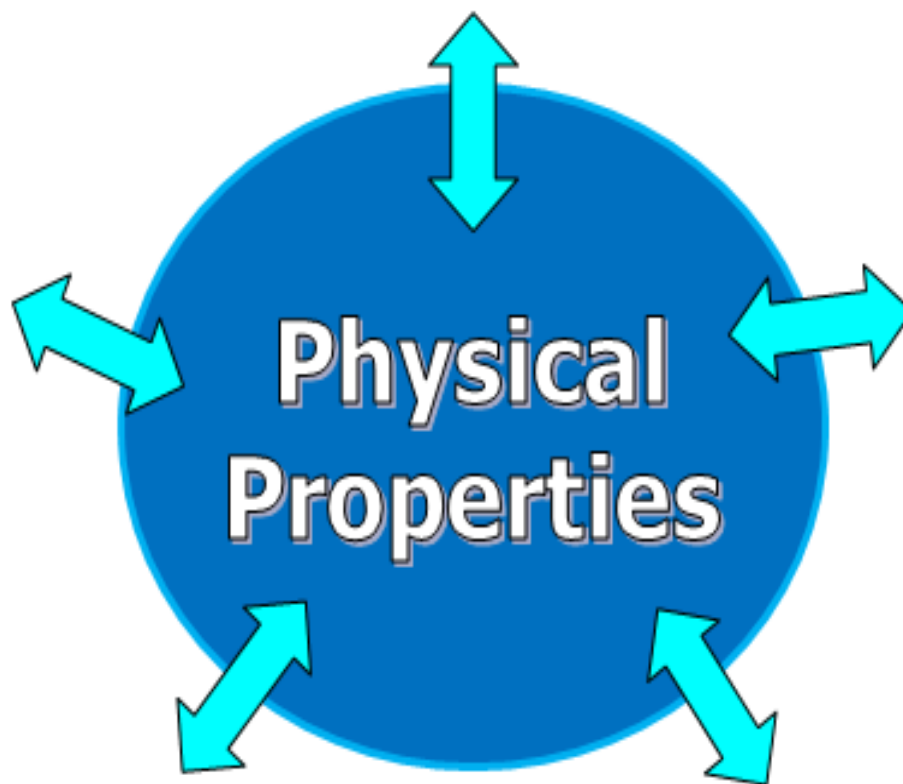


Handwriting practice lines for describing the differences between the metal and plastic spoons.

Take a guess. What is inside the mystery boxes?

1	2	3
4	5	6

Please list as many physical properties as you can in the circles.



Intensive physical properties \_\_\_\_\_ change with the a \_\_\_\_\_ that you have.

– Examples... Density, melting point, freezing point, hardness

Extensive Physical Property: Mass and Volume are extensive physical properties. The amount of m \_\_\_\_\_ or v \_\_\_\_\_ depends on the amount of matter that you are measuring.

Describe the differences in physical properties (Freezing and Boiling Point) between two different solvents. Questions below.

**Table 1. Molal Freezing Point and Boiling Point Constants**

Solvent	Formula	Freezing Point (°C)	K <sub>f</sub> (°C/molal)	Boiling Point (°C)	K <sub>b</sub> (°C/molal)
Water	H <sub>2</sub> O	0.0	1.86	100.0	0.51
Acetic acid	CH <sub>3</sub> COOH	17.0	3.90	118.1	3.07
Benzene	C <sub>6</sub> H <sub>6</sub>	5.5	4.90	80.2	2.53
Chloroform	CHCl <sub>3</sub>	-63.5	4.68	61.2	3.63
Ethanol	C <sub>2</sub> H <sub>5</sub> OH	-114.7	1.99	78.4	1.22
Phenol	C <sub>6</sub> H <sub>5</sub> OH	43.0	7.40	181.0	3.56

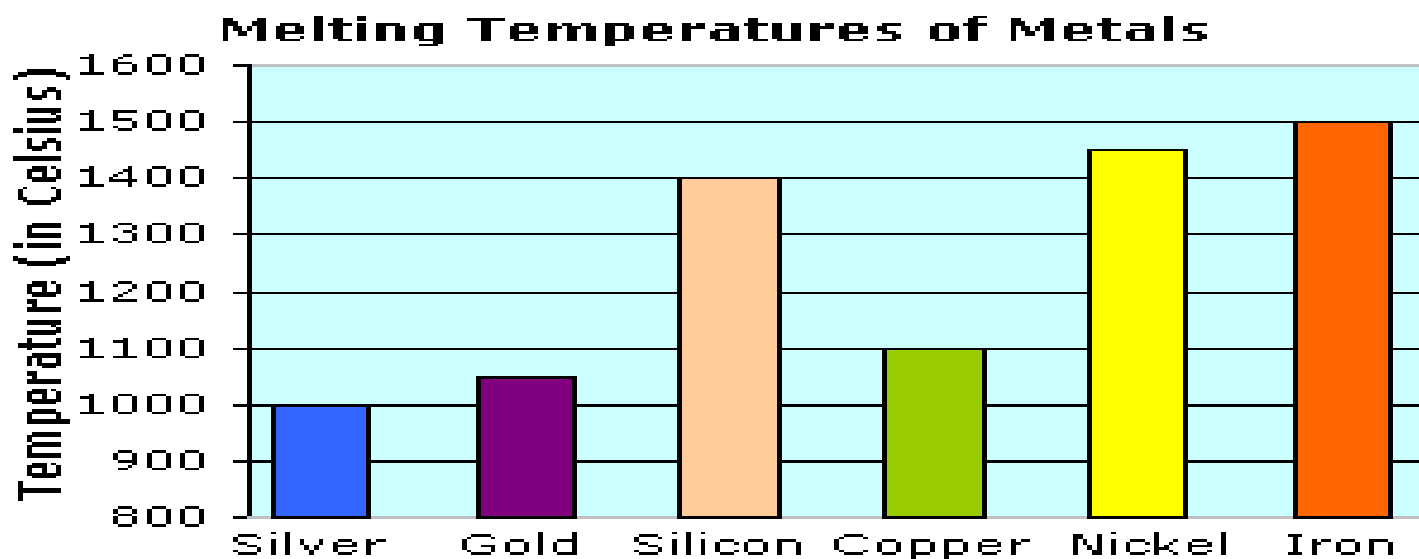
What temperature in degrees °C does water freeze? \_\_\_\_\_

What temperature in degrees °C does ethanol freeze? \_\_\_\_\_

Which has a higher boiling point... Acetic Acid or Water? \_\_\_\_\_

Which has a lower freezing point, Phenol or Ethanol? \_\_\_\_\_

Use the graph below to answer the questions.



Which element has the highest melting point? \_\_\_\_\_

What is the temperature when it turns from a solid to a liquid? \_\_\_\_\_

Which element has the lowest melting point? \_\_\_\_\_

What is the temperature when it turns from a solid to a liquid? \_\_\_\_\_

Which has a higher melting point, Silicon or Copper? \_\_\_\_\_

Which has the lowest melting point? \_\_\_\_\_

How hot in °C does it need to be for Iron to melt? \_\_\_\_\_

How hot in °C does it need to be for Gold to melt? \_\_\_\_\_

Surface tension is caused by \_\_\_\_\_ forces.

Cohesion: When hydrogen bonds hold water molecules together.


How many drops of water can you get on a penny?

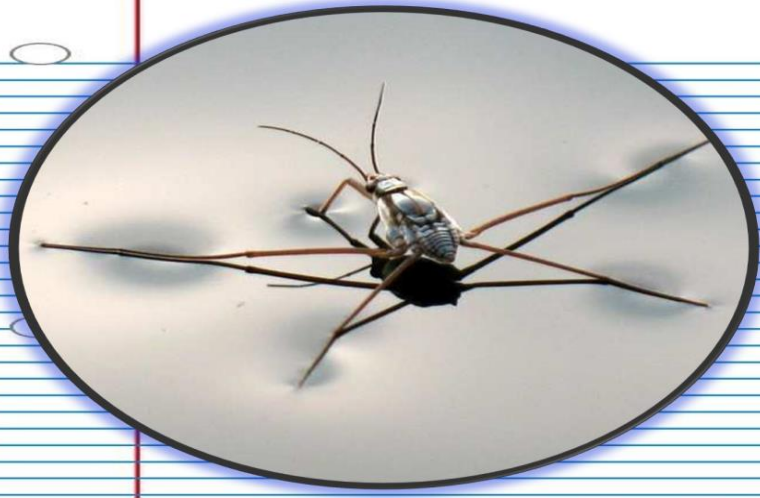
What did it look like close to your last drop?



Surface tension: Water molecules tend to \_\_\_\_\_ to themselves instead of the air.

- This creates a small film over the water.

Swirly Milk! What Happened? Sketch It	Drops on a Penny			
	Trial	1	2	3
	Water			
	Soapy Water			
	Rubbing Alcohol			





## Part 1 Lesson 10 More Properties Volatility

Volatility: The tendency for a liquid to \_\_\_\_\_ at normal temperatures.

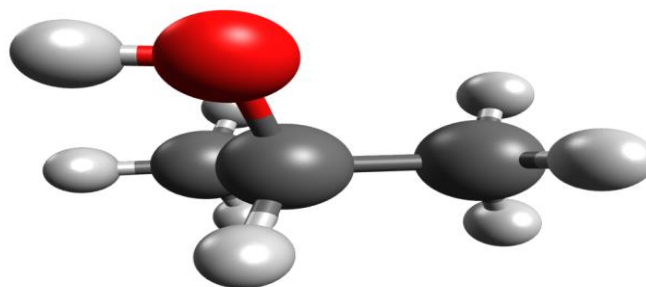
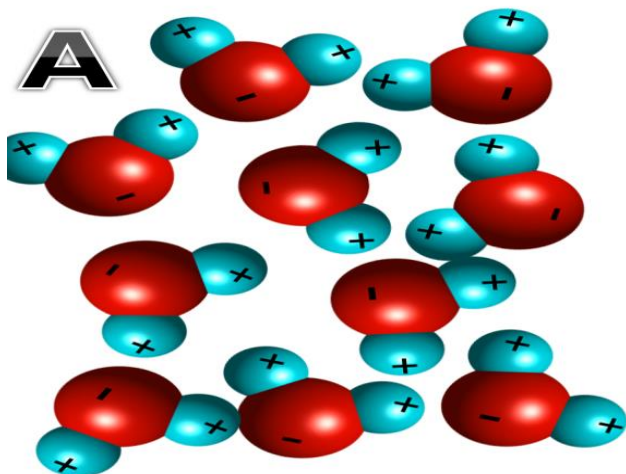
Evaporate is to turn from a liquid into a \_\_\_\_\_

Activity! What evaporates faster / more volatile? Water or Rubbing Alcohol

- Place a sheet of brown paper towel on your table.
  - Place 20 drops of water on the paper towel next to 20 drops of rubbing alcohol.
    - If you can do it at the same time that would create a fair test.
  - Record the time it takes for the wet mark made by the drops to disappear on the towel.

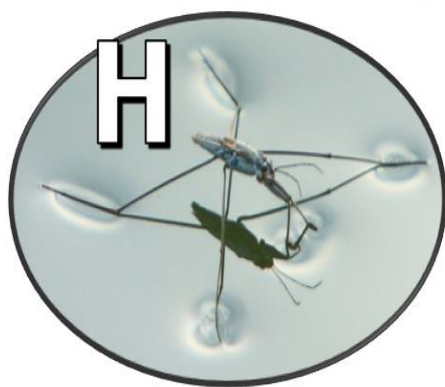
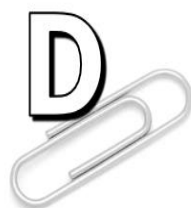
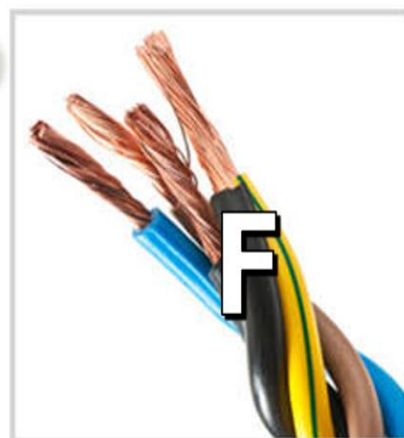
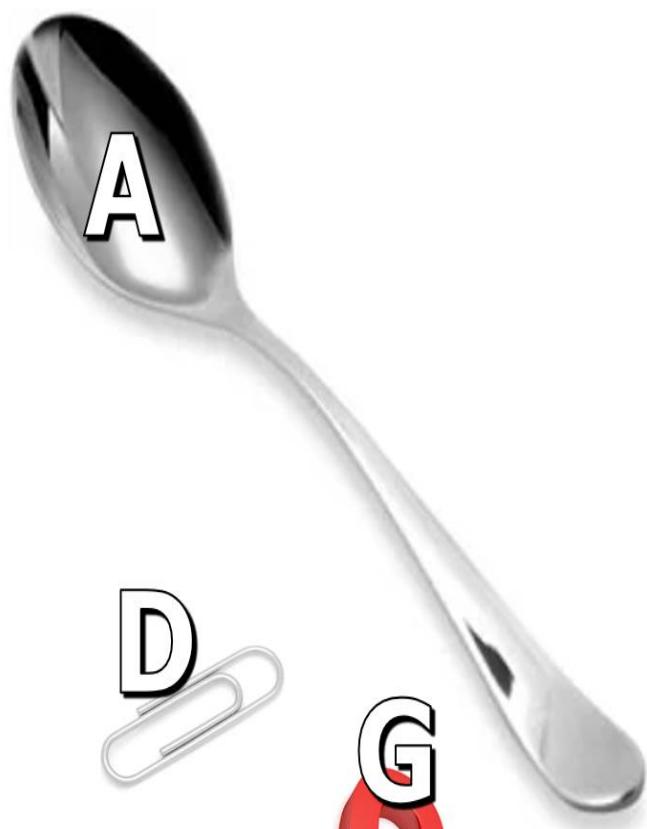


Which is water and which is rubbing alcohol? Which one was more volatile?



Name a physical property for A-J

A=	B=	C=
D=	E=	F=
G=	H=	I=
J=		



Chemical Change: The change of substances into other substances through a \_\_\_\_\_ of the atoms. -We'll learn more about this in chemistry

**Across**

3. Law \_\_\_\_\_ of Matter: During any chemical or physical change the total amount of matter remains constant
6. The substance that gets dissolved
7. \_\_\_\_\_ Property: A characteristic that can be observed or measured without changing the identity of the substance.
10. No definite shape or volume
12. Matter cannot be created or \_\_\_\_\_.
14. Anything that has mass and takes up space
16. Type of mixture with the same molecules throughout
20. \_\_\_\_\_ heat is energy released or absorbed, by a body or a thermodynamic system, during a constant-temperature process
21. Type of mixture with of two or more compounds.
23. Ionized gas that emits electrons.
25. \_\_\_\_\_ is the change of the physical state of matter from the gas phase into the liquid phase, and is the reverse of vaporization.

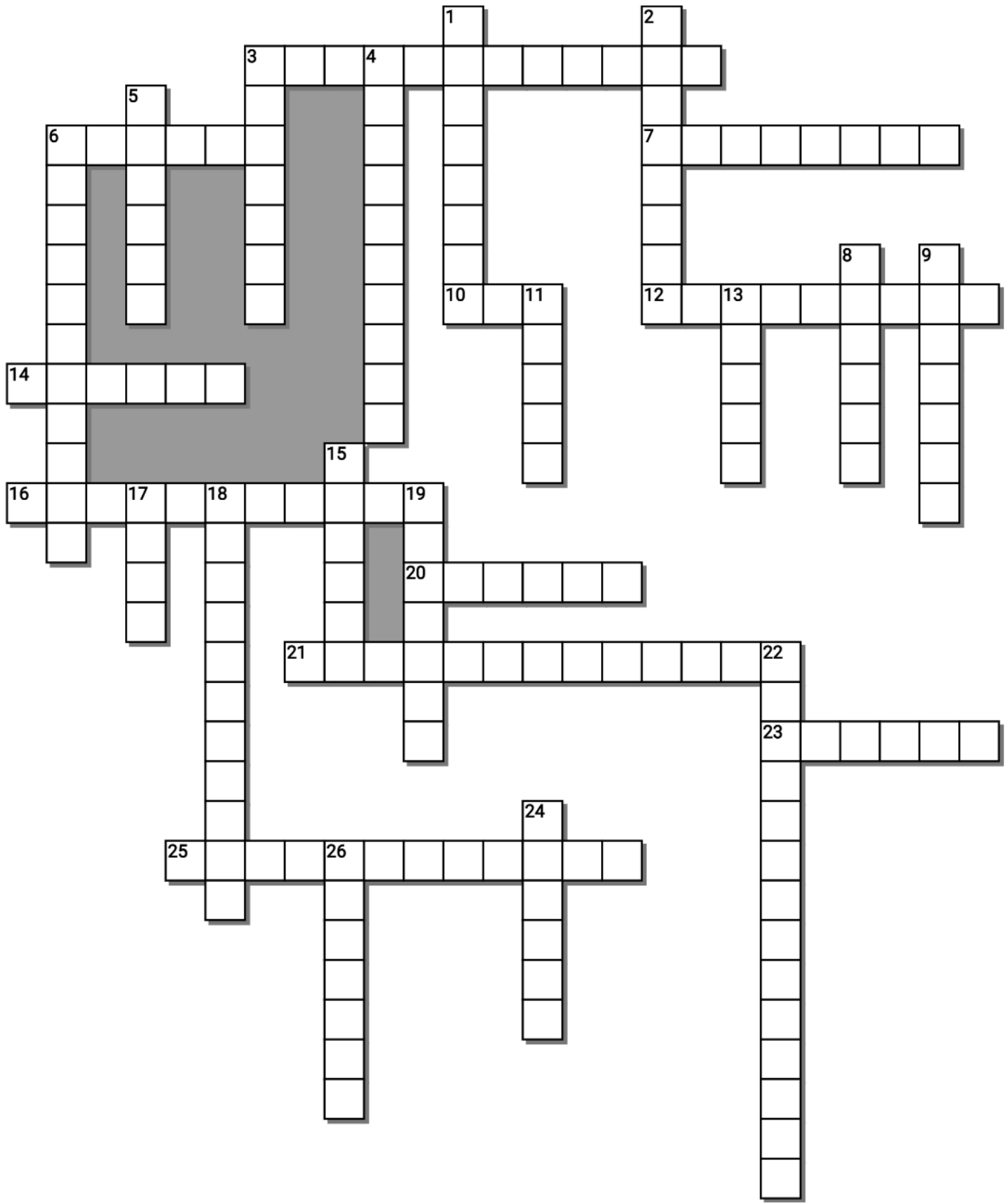
**Down**

1. A phase transition where a liquid turns into a solid
2. Made up of two or more elements bonded together.
3. Matter cannot be \_\_\_\_\_ or destroyed
4. How much solute can dissolve in a substance before it becomes saturated.
5. A \_\_\_\_\_ system is a type of system where mass is conserved
6. The transition of a substance directly from the solid to the gas state, without passing through the liquid state
8. Molecules are in constant state of \_\_\_\_\_.
9. The \_\_\_\_\_ point is the temperature at which a solid changes into a liquid
11. Solid (s) has a definite \_\_\_\_\_ and volume.
13. Liquid (l) Has definite volume but not \_\_\_\_\_.
15. Solid (s) has a definite shape and \_\_\_\_\_.
17. A \_\_\_\_\_ system is a type of system in which mass or energy can be added or removed from the environment.
18. \_\_\_\_\_ is a type of vaporization that occurs on the surface of a liquid as it changes into the gas phase
19. A substance that does the dissolving
22. When no more solute will dissolve.
24. Physical Change Changes form: Solid > \_\_\_\_\_ > Gas > Plasma
26. A substance that is made entirely from one type of atom

-----Teacher can remove this word bank to make more challenging-----

**Possible Answers**

COMPOUND, CONDENSATION, CONSERVATION, CREATED, DESTROYED, ELEMENT, EVAPORATION, FREEZING, GAS, HETEROGENEOUS, HOMOGENEOUS, LATENT, LIQUID, MATTER, MOTION, OPEN, PHYSICAL, PLASMA, SHAPE, SHAPE, SOLUBILITY, SOLUTE, SOLVENT, SUBLIMATION, SUPERSATURATED, VOLUME, CLOSED , MELTING



# Part 1 Matter Review Game

1-20 = 5 pts **Part 1 Lesson 11**  
 \*20-\*25 \* = Bonus + 1 pt,  
 (Secretly write owl in correct space +1 pt)  
 Final Question = 5 pt wager

Name: \_\_\_\_\_  
 Due: Today

Score \_\_\_\_ / 100

IT DOES MATTER	MATTER OF FACT	STATES OF MATTER	STATES OF MATTER II	NAME THAT STATE Bonus round 1pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

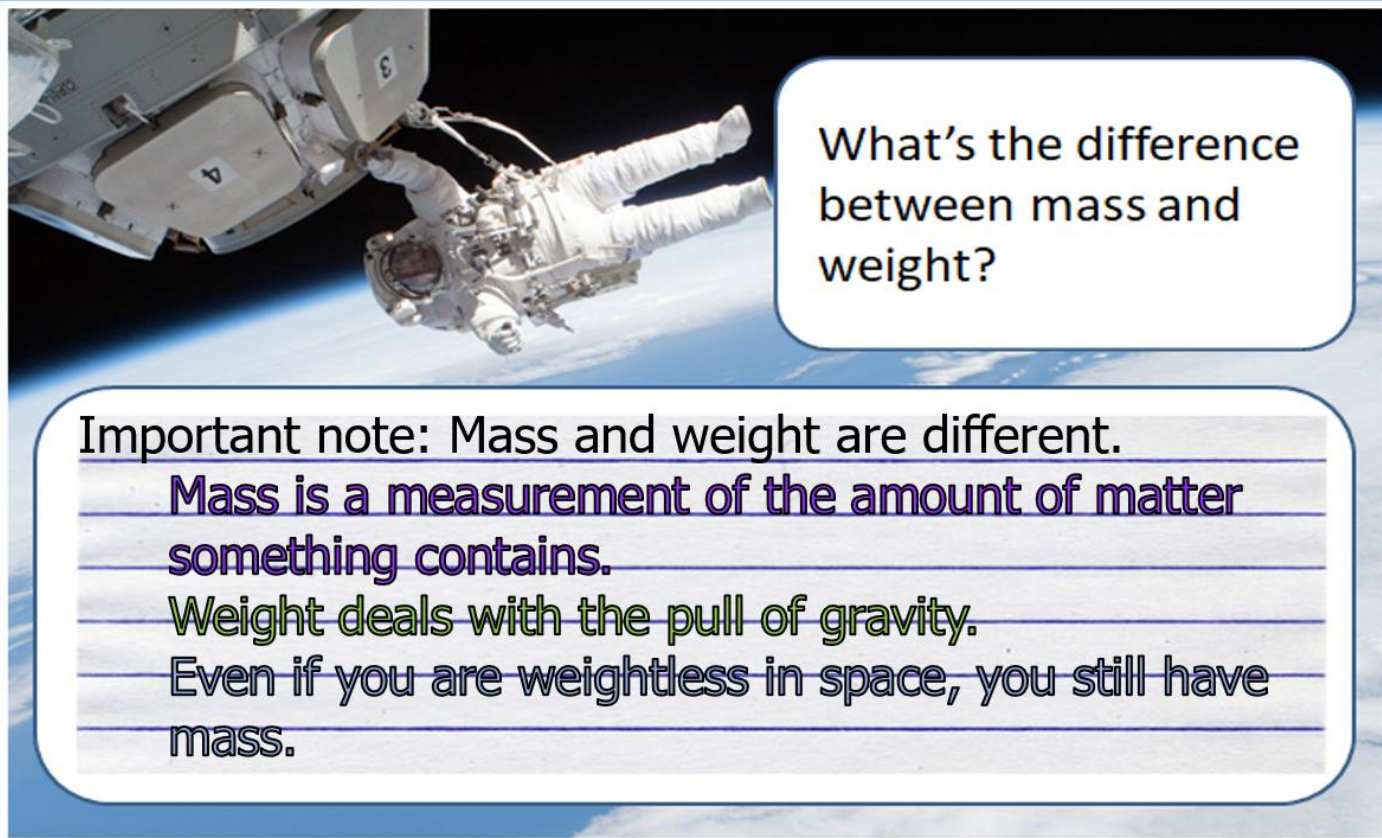
Final Question Wager \_\_\_\_ /5 Answer: \_\_\_\_\_

# Part 1 Matter, Phase Change

Name:

## Part 1 Lesson 1 Matter

Matter : Anything that has **mass** and takes up **space**.



What's the difference between mass and weight?

**Important note: Mass and weight are different.**

**Mass is a measurement of the amount of matter something contains.**

**Weight deals with the pull of gravity.**

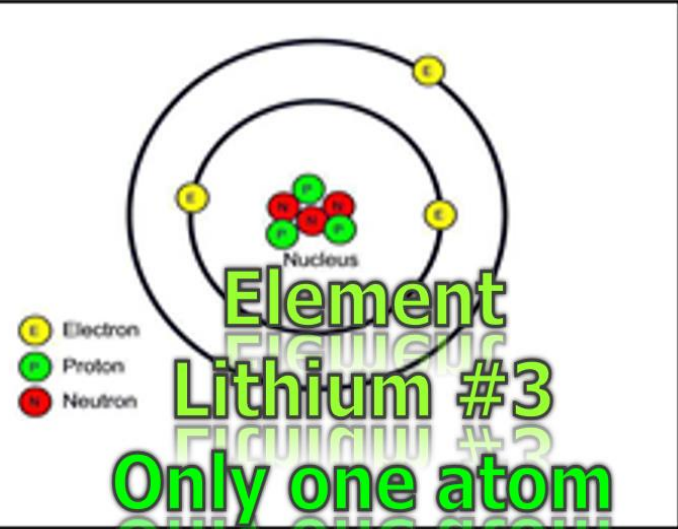
**Even if you are weightless in space, you still have mass.**

Element: A substance that is made entirely from one type of **atom**.

Compound: Made up of **two** or more elements bonded together.

Which of the following drawings are of an element, and which is of a compound? Describe your reasoning in the spaces around each picture.

**Compound**  
**CH<sub>4</sub> Methane**  
Made of **Carbon and Hydrogen**  
**(Two Elements)**



# answer

## Matter **A**

Anything that has mass and takes up space.

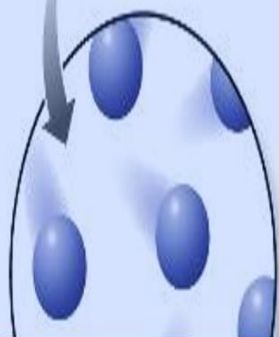
## **B** Pure substance

A substance that is a form of matter that has a constant chemical composition and characteristic properties. It cannot be separated into its several components without breaking its chemical bonds.

## **C** Mixture

An accumulation of molecules or atoms of different types.

## **D** Element



A substance made of the same type of atoms.  
Example - Hydrogen

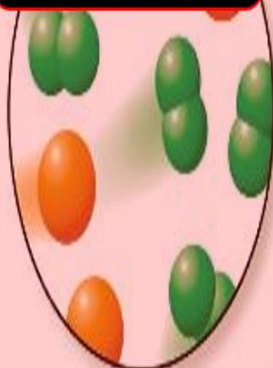
## **E** Compound



An untouched substance made of atoms or more elements chemically combined in fixed ratios. Example CO<sub>2</sub>

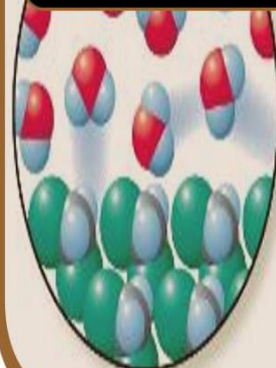
## **F** Homogeneous mixture

A mixture that has the same uniform appearance and composition throughout.



## **G** Heterogeneous mixture

A mixture is made of different materials that remain physically separate.





Homogeneous mixture: **Same** molecules throughout.

Heterogeneous: A mixture of **two** or more compounds.

Quiz Wiz! 1-10 Homogeneous or Heterogeneous.

1) Uniform throughout Homogeneous	2) Homogeneous	3) Uniform throughout Homogeneous	4) Heterogeneous Not uniform throughout
5) Heterogeneous Not uniform Throughout oil and Water	6) Uniform throughout Homogeneous	7) Uniform throughout Homogeneous	8) Heterogeneous Not uniform Throughout
9) Heterogeneous Not uniform Throughout	10) Uniform throughout Homogeneous	*11) Lord Farquaad	

### Part 1 Lesson 2 Soda Store Project

Solvent: A substance that does the **dissolving** (usually larger amount / Water).

Solute: The substance that gets dissolved (usually **the lesser** amount).

Solubility: How much **solute** can dissolve in a substance before it becomes saturated.

Supersaturated: When no more solute will **dissolve**. (crystals become visible)

SODA STORE! Make a brand of soda for scientists. Please describe your solution using some science terminology below. Be prepared to present your soda.

Group members and Role: President, Graphic Designer, Taste Chemist, Marketer

Group Members will vary	Group Members will vary	Group Members will vary	Group Members will vary

Name of your Soda? **Answers will vary** Name #2 \_\_\_\_\_

Color of your Soda? **Answers will vary** \_ How are you going to get that color?

Taste of your Soda? **Answers will vary, hopefully it tastes good**

Taste of your Soda #2? **Answers will vary**

Ingredients (dry solute only) No pharmaceuticals etc. : Amount of Sugar in grams \_\_\_\_\_

- **( $\frac{1}{2}$  to  $\frac{3}{4}$  a cup of sugar) (Less than 200 grams for 2 liter bottle)**
- **Could make a low sugar drink "less than 100 grams"**

Your Motto / Jingle / Presentation / Your Label, Use the space below to prepare.

You must include the word solution, solvent, solute, solubility.

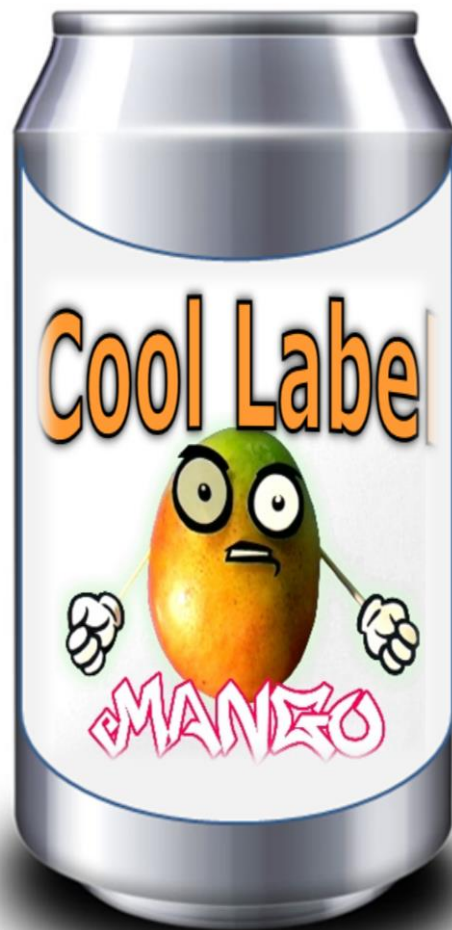
**Answers will vary**

**Solvent:** A substance that does the **dissolving** (usually larger amount / Water). For our soda, the solvent was all-natural spring water from beneath a glacier in Iceland.

**Solute:** The substance that gets dissolved (usually the lesser amount). Our Solute was pure cane sugar from a remote Island in the Pacific.

**Solubility:** How much **solute** can dissolve in a substance before it becomes saturated. 200 grams of delicious sugar was dissolved into two liters of pure water.

**Supersaturated:** When no more solute will **dissolve**. (crystals become visible). Our solution is not supersaturated because we care.



How did it taste? What would you do differently next time?

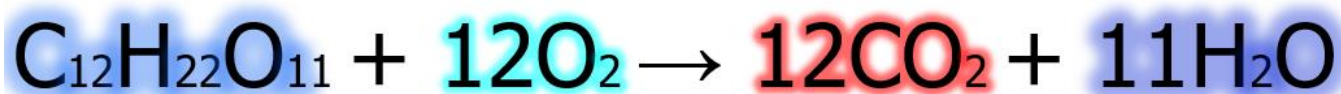
Answers will vary. The soda making project will have some successes and failures. Learning from your errors is a process and one that will lead to a better soda next time.

Does mixing sugar and water result in a new substance? In order to create a new substance you would need a chemical change.

The sugar changed from a solid to a liquid. This is a physical change and not a chemical change. A new substance was not created. When we burn the sugar in our body we do change its form / create a chemical reaction. We eat / drink sugar and breath in oxygen gas. The products of the chemical reaction are carbon dioxide gas and water vapor that we exhale.

The sugar changed from a solid to a liquid. This is a physical change and not a chemical change.

When we burn the sugar in our cells, we do change its form / create a chemical change. We eat / drink sugar and breath in oxygen gas. The products of the chemical reaction are carbon dioxide gas and water vapor that we exhale.



Sugar

Oxygen

Carbon  
Dioxide

Water

## Part 1 Lesson 3 Law Conservation of Matter

Weigh a bag of microwave popcorn (remove from plastic) before microwaving. Predict the weight after microwaving. Will it increase, decrease, or remain constant?

Weight in grams of popcorn and before popping?	Prediction of total weight after microwaving?	Weight in gram of popcorn and bag after microwaving?
Answers will vary but the weight before popping should be a few grams more	Prediction's will vary but a good prediction would recognize that the steam came from the bag and the steam is matter	Answers will vary but the weight after popping should be a few grams less

Did the microwaved popcorn and bag gain mass, lose mass, or remain constant after heating in the microwave? Provide data in your response?

The popcorn weighed \_\_\_\_\_ grams less after using the microwave. It might weigh less because I noticed steam rising out of the bag at the end. The microwave and bag also had water on the sides. I think the popcorn weighed less after popping because the kernel lost water and water has mass.

Law Conservation of Matter: During any chemical or physical change the total amount of matter remains constant.

In other words, matter can be neither created nor destroyed.

Time birthday candles in minutes	Weight of candles
1 min	
2 min	
3 min	
4 min	
5 min	
6 min	
7 min	
8 min	
9 min	
10 min	
11 min	

12 min	
13 min	
14 min	
15 min	

What as the decrease in mass from the start to the finish?

Starting Mass \_\_\_\_\_ - Final Mass \_\_\_\_\_ = \_\_\_\_\_ (Mass Lost)

Where did this mass go?

Because the candle which was a solid turned into a gas during combustion. The gas was not collected to be measured. The gas escaped into the room which we could smell, and the smoke disappearing was observable.

Demonstration of Law Conservation of Matter with Alka-Seltzer

- Weight of water \_\_\_\_\_ ?
- Weight of Alka-Seltzer \_\_\_\_\_ ?
- Weight together in sealed bag \_\_\_\_\_ ?
- Weight together in unsealed bag \_\_\_\_\_ ?

What happened in this demonstration?

The Alka-Seltzer reacted with the water and released a gas (carbon dioxide). The weight of the tablets and water combined was the same as them apart. This is because once the bag was sealed, it became a closed system where no mass could enter or leave.

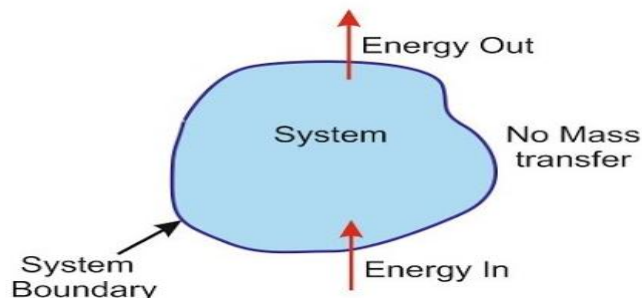
A closed system is a type of system where mass is conserved.

No mass is let out, and no mass is let in.

Energy can freely enter or exit the system.

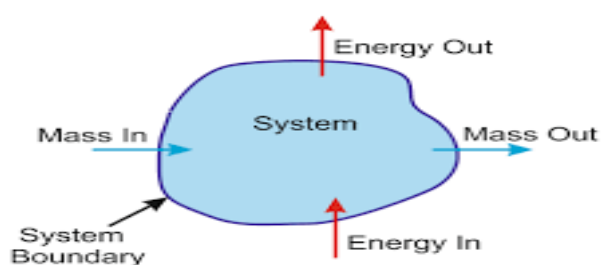
A open system is a type of system in which mass or energy can be gained or lost from the environment.

Is this a closed system or open system?



A closed system is a type of system where mass is **conserved**. No mass is let **out**, and no mass is let **in**. Energy can freely **enter** or exit the system.

Is this a closed system or open system?



A **open** system is a type of system in which mass or energy can be **gained** or **lost** from the environment.



Earth is considered a closed system. Energy can enter and leave but mass is conserved.



Matter in the form of steam can leave the system. Microwave popcorn would be an example of a closed system

100 grams of Baking soda was added to 100ml of vinegar weighing 125 grams. A balloon was placed on top to prevent any gas from escaping. Use the picture below to predict the weight after the reaction. Why?

The reaction occurred in a closed system. No matter could escape. The mass should be 225 grams.

Matter cannot be created or destroyed.

Vinegar (liquid) reacted with baking soda (solid) to create carbon dioxide (gas).

Matter In = Matter Out.

Some Energy could enter and leave.



Destroy this plastic toy! Can you? Describe on the right.

Destroy this plastic toy! Can you? Describe on the right.



We could melt this plastic toy, but the matter that makes it up cannot be destroyed. Matter can change form through physical and chemical changes, but through any of these changes matter is conserved. The same amount of matter exists before and after the change—none is created or destroyed. This concept is called the Law of Conservation of Mass.

### Part 1 Lesson 4 Kinetic Molecular Theory

Kinetic Molecular Theory:

The molecules are in constant state of motion.

This motion is different for the state of matter.

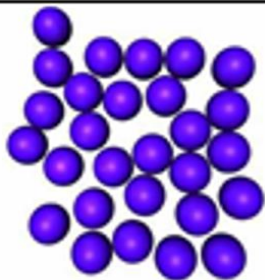
States of Matter

Solid (s) has a definite shape and volume.

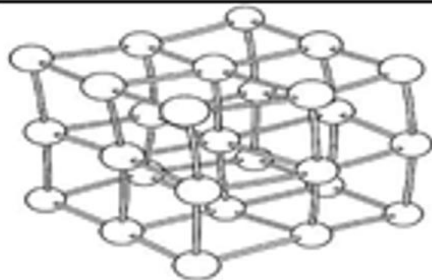
Liquid (l) Has definite volume but not shape.

Gas (g) No definite shape or volume.

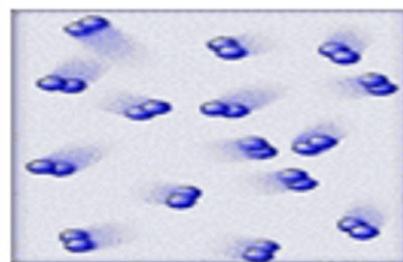
Name each state of matter on a molecular level. (Solid, Liquid, Gas)



**Liquid**



**SOLID**



**Gas**

## Part 1 Lesson 5 States of Matter

4<sup>th</sup> State of Matter: Plasma (p) **Plasma** gas that emits electrons.

BEC = **Bose-Einstein condensate (BEC)**

Quiz 1-10 Solid, Liquid, Gas, Plasma, BEC

- Note: One will be a semi solid and one will be a BEC (Bose-Einstein Condensate)

1) GAS	2) SOLID	3) GAS	4) GAS
5) PLASMA	6) Liquid	7) BEC	8) Semi-SOLID
9) PLASMA	10) GAS	*11) Chadwick Boseman	

## Part 1 Lesson 6 Phase Change

Physical Change

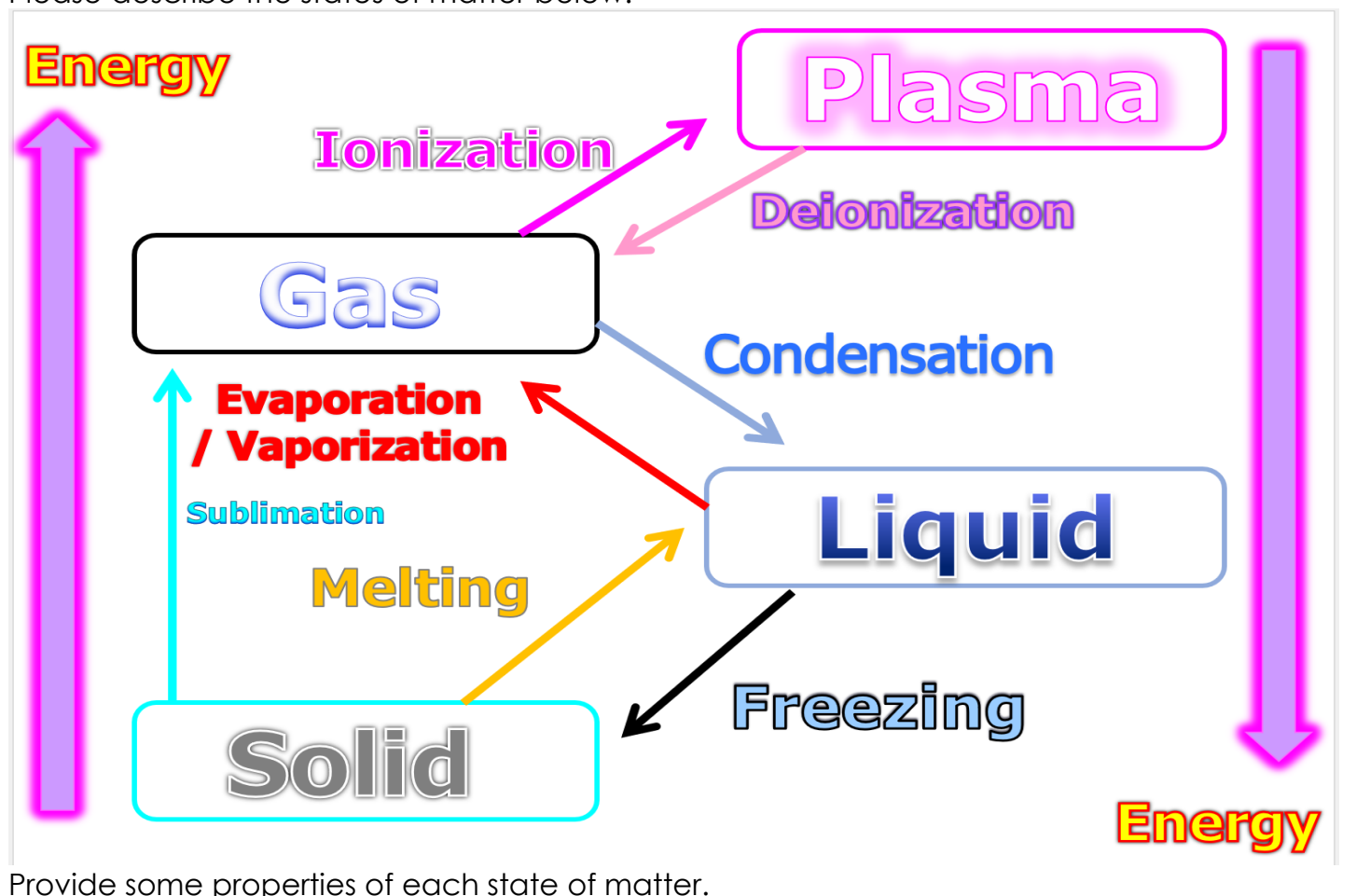
Changes form: **solid > liquid > gas > plasma**

Doesn't change **identity**

Hersey Kiss Demo **The Chocolate went from a solid to a liquid. The energy that was added to make the phase change came from your body heat.**

Fill-in the blanks to complete the change diagram below with the correct terms. Can you draw a line showing energy added / removed?

Please describe the states of matter below.



A physical change / reaction can also occur with nucleation sites.

Nucleation site: A place that acts as a nucleus for (starting point), in a process of formation such as crystals, or bubbles.

What is the difference between melting and dissolving?

In melting only one substance is involved and the liquid and solid are the same material. Heat is needed for melting to occur. Dissolving involves two materials; the resulting solution is a mixture of both. The dissolved substance is still present in the solution even though it can't be seen.

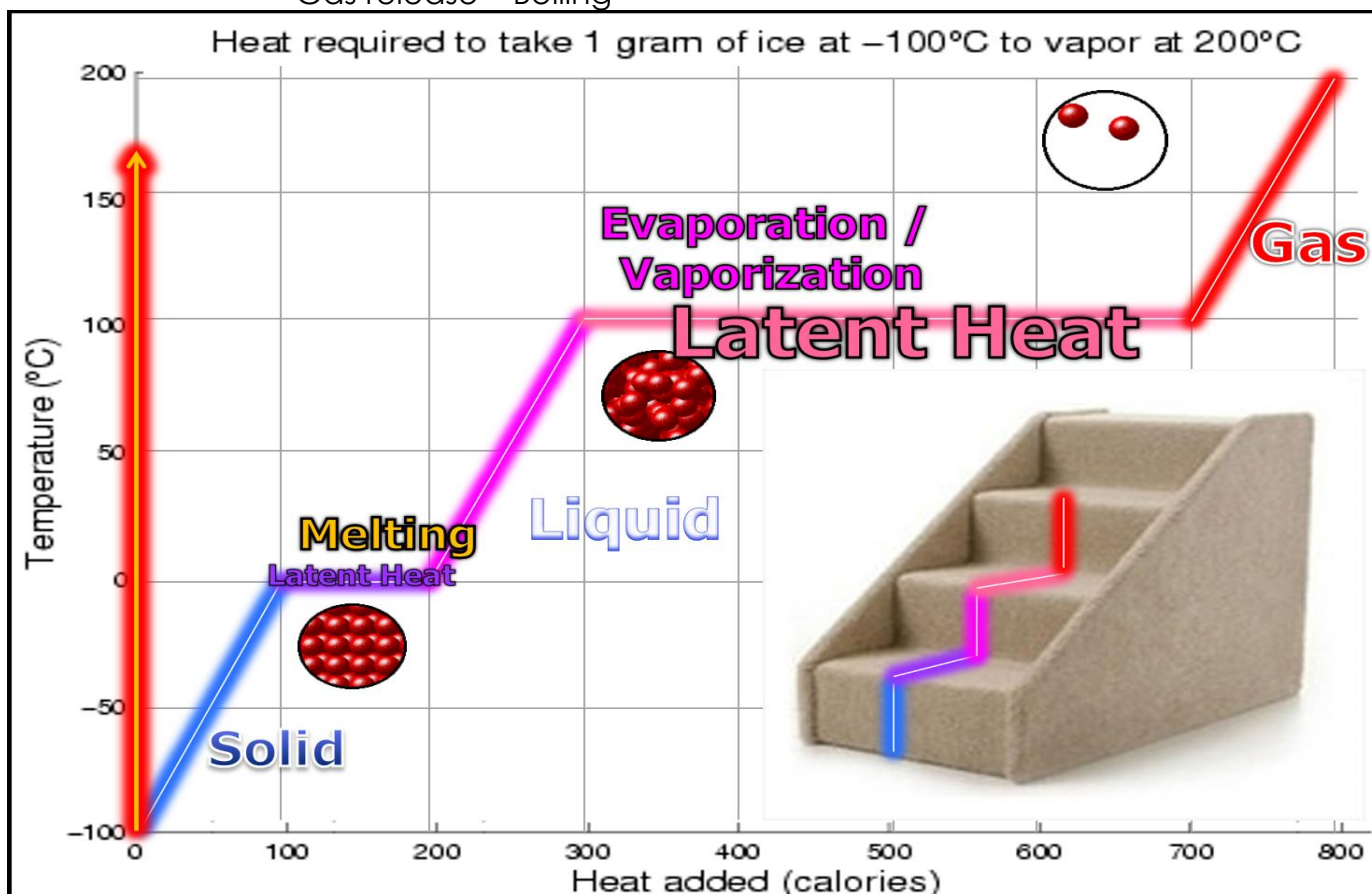
### Part 1 Lesson 7 Continued Phase Change / Activities

Using digital thermometers and water.

-Record temperature of water every minute.

-Record observations of phase change during the minute they occur.

- Bubbles – Boiling starts
- Gas release – Boiling



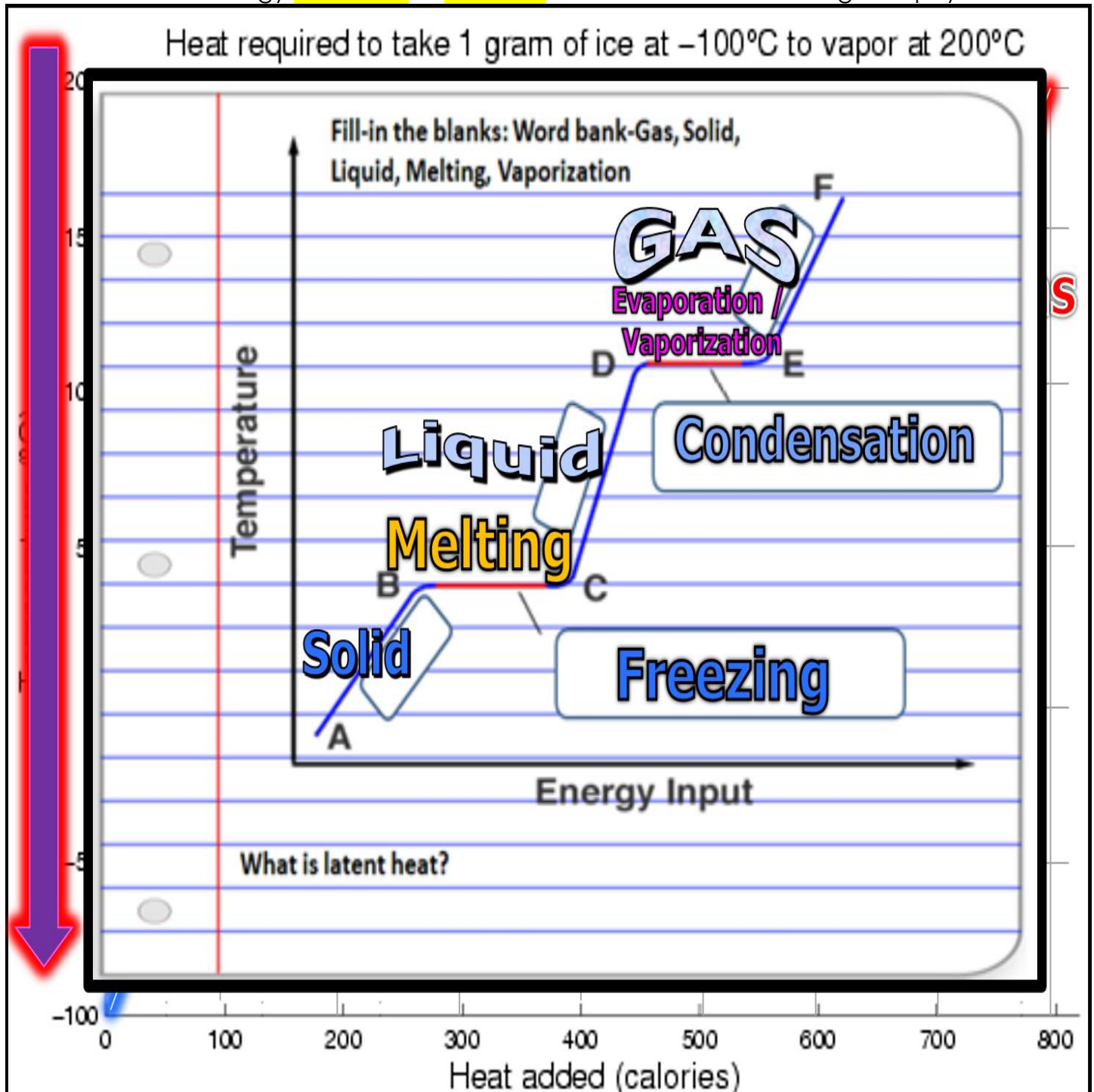


Please label the states of matter as they occur on your graph (based on observations and use correct terms such as melting and vaporization).

What happened at 100 degrees Celsius? What trends do you see in the data?

- During each phase change, the temperature stays the same even though the heat energy changes.
  - This energy is going into changing the phase and not into raising the temperature. That's why water doesn't get hotter as it's boiling. The temperature remains constant until the phase change is complete.

Latent Heat: The energy **absorbed** or **released** when a substance changes its physical state.



What was added to the ice to cause it to melt?

Salt was added. The sodium and chlorine in the salt split apart into charged ions, and these ions attract water molecules to form weak chemical bonds.



How cold did the bag get?

The resulting compound has a freezing point of -21.1 degrees Celsius (-5.98 degrees Fahrenheit). This is 21.1 degrees colder than ice.



Why did the ice cream turn from a liquid to a solid?

For the phase change to occur, the heat is removed from the milk, sugar, and vanilla when the salt melts the ice.



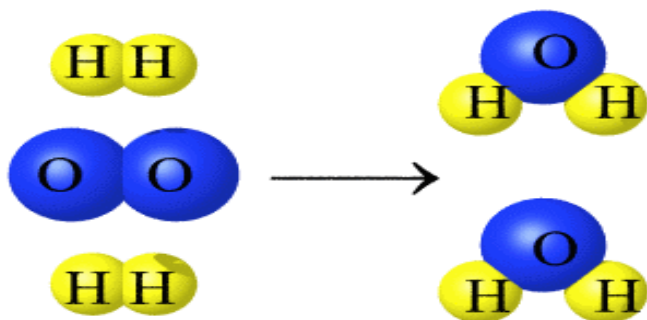
This results in the phase change from a liquid to a solid.

Why is salt put on the roads to prevent icing?

When people put salt on an icy sidewalk or road, the ice mixes with the salt, and the mixture of the two solids (ice and salt) produces a liquid, but the sidewalk actually gets colder than it was before.



Which of the following pictures is a chemical change, and which is a physical change? Explain in the boxes next to the picture.



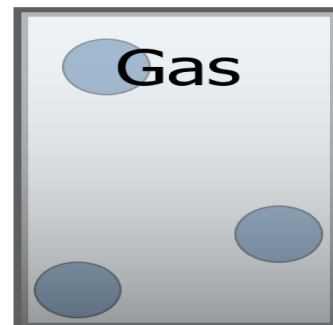
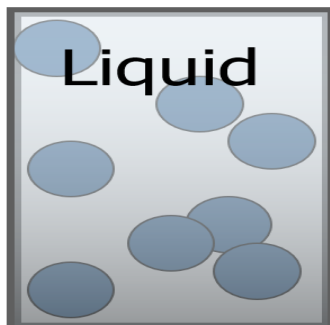
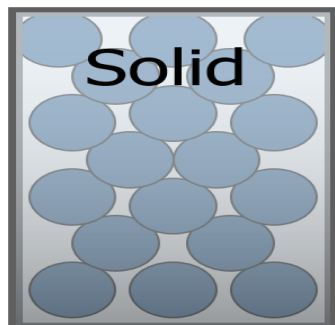
This is a chemical change as it resulted in a rearrangement of the atoms



This is a physical change as the ice cream just went from a solid to a liquid through melting. There was no change in the identity of the atoms.

Please create an arrow showing how the effort (energy) needed to compress the three states of matter below,

## Effort Needed to Compress



### Part 1 Lesson 8 Physical Properties

Physical Property: A characteristic that can be observed or measured without **changing** the identity of the substance.

## How are these different?

**High Density (sinks)**

**Conducts Heat and Electricity**

**High Melting Point**

**Luster / Shine**

**Malleable and Ductile**

**Low Density (Floats)**

**Doesn't Conduct**

**Heat and Electricity**

**Low Melting Point**

**Dull**

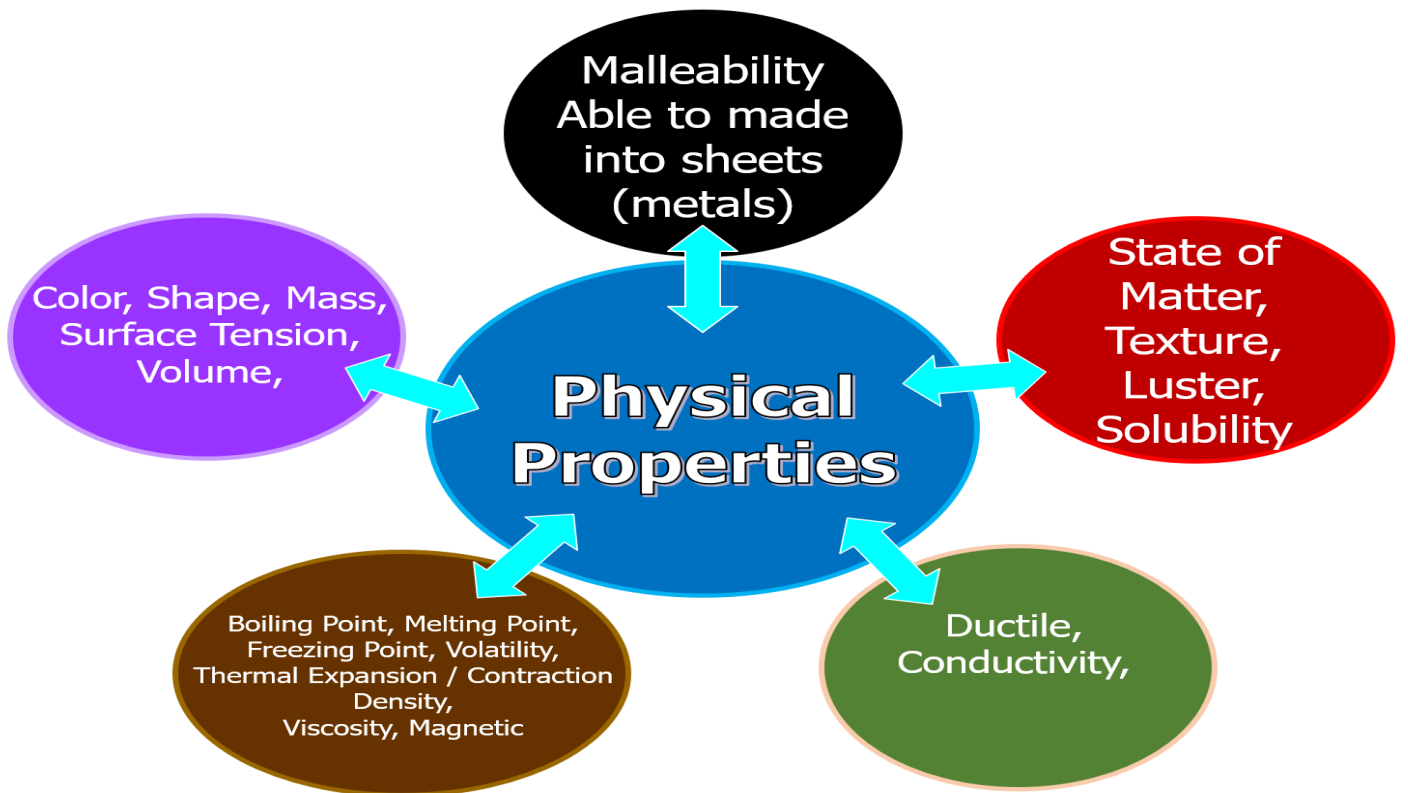
**Not Malleable or**

**Ductile**

Take a guess. What is inside the mystery boxes?



Please list as many physical properties as you can in the circles.



**Intensive physical properties** don't change with the **amount** that you have.

- Examples... Density, melting point, freezing point, hardness



**Extensive Physical Property:** Mass and Volume are extensive physical properties. The amount of **mass** or **volume** depends on the amount of matter that you're measuring.

Use the spreadsheet below to describe the differences in physical properties (Freezing and Boiling Point) between two different solvents.

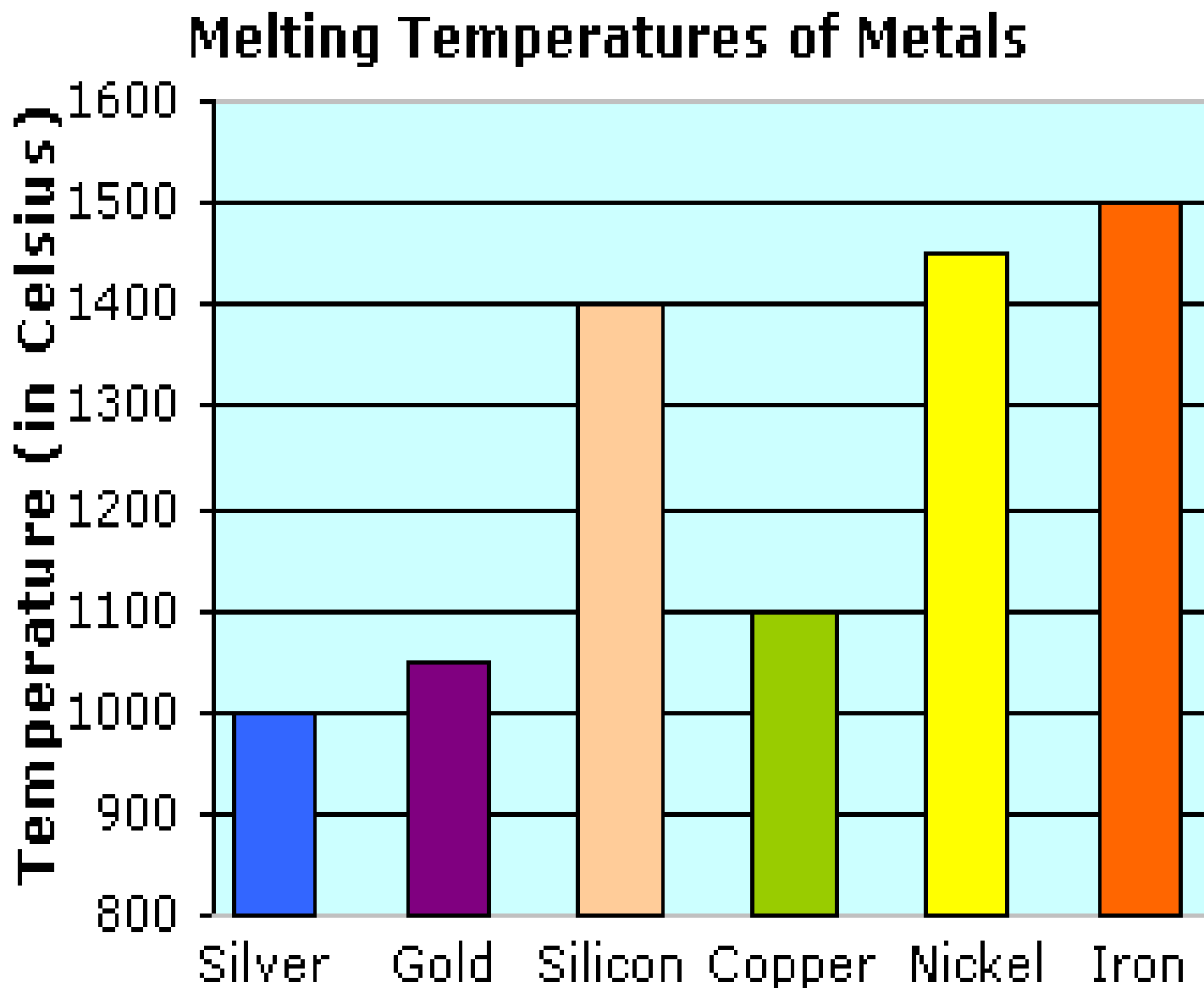
**Table 1. Molal Freezing Point and Boiling Point Constants**

Solvent	Formula	Freezing Point (°C)	K <sub>f</sub> (°C/molal)	Boiling Point (°C)	K <sub>b</sub> (°C/molal)
Water	H <sub>2</sub> O	0.0	1.86	100.0	0.51
Acetic acid	CH <sub>3</sub> COOH	17.0	3.90	118.1	3.07
Benzene	C <sub>6</sub> H <sub>6</sub>	5.5	4.90	80.2	2.53
Chloroform	CHCl <sub>3</sub>	-63.5	4.68	61.2	3.63
Ethanol	C <sub>2</sub> H <sub>5</sub> OH	-114.7	1.99	78.4	1.22
Phenol	C <sub>6</sub> H <sub>5</sub> OH	43.0	7.40	181.0	3.56

Example – Water has a freezing point of 0.0 degrees C and a boiling point of 100.0 degrees C. This is much different from ethanol, which is a freezing point of -114.7 degrees C, and a boiling point of 78.4 degrees C. It requires less energy to boil ethanol than water. Ethanol however freezes at a much lower temperature.

Melting Point, Boiling Point, Freezing Point. The temperature point in which various substances change form from **solids**, to **liquids**, and to **gases**.

Use the graph below to answer the questions.



Which has a higher melting point, Silicon or Copper? **Silicon**

Which has the lowest melting point? **Silver**

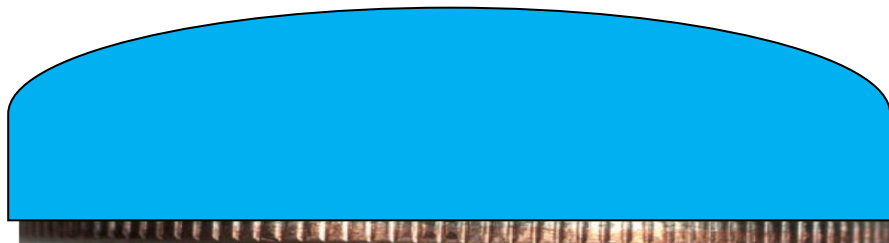
How hot in °C does it need to be for Iron to melt? **1500 C**

How hot in °C does it need to be for Gold to melt? **1050 C** (really 1,064C)

### Part 1 Lesson 9 Surface Tension

How many drops of water can you get on a penny? **Answers will vary**

What did it look like close to your last drop. It should have looked like a giant dome on the penny



Surface tension: Water molecules tend to hold to themselves instead of the air. This creates a small film over the water.

What did your swirly milk look like?



## Part 1 Lesson 10 More Physical Properties

**Volatility:** The tendency for a liquid to evaporate at normal temperatures.

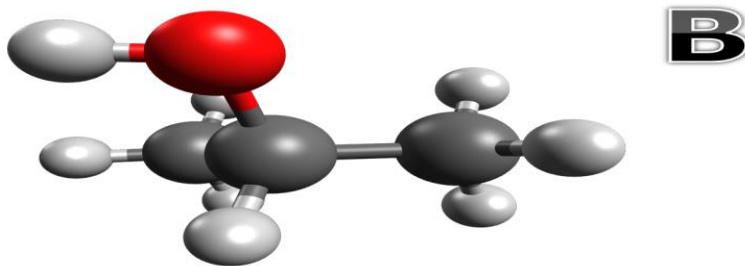
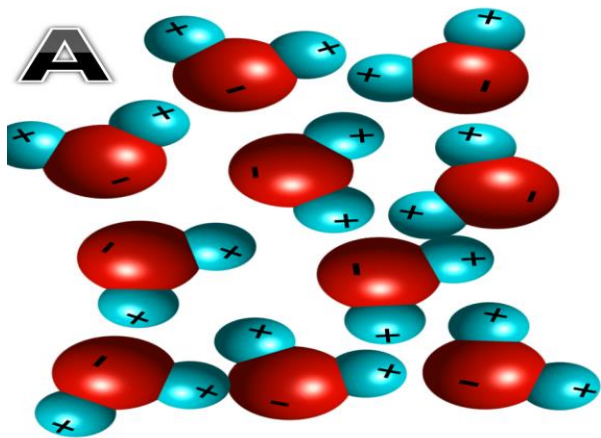
- Evaporate is to turn from a liquid into a gas.

Activity! What evaporates faster / more volatile? Water or Rubbing Alcohol The rubbing alcohol should evaporate much faster than the water. After a few minutes the alcohol will be gone from the paper towel. The alcohol is more volatile than water. You can also smell it easily and it cools your hands when you use hand sanitizer as it evaporates so fast.

- Place a sheet of brown paper towel on your table.
  - Place 20 drops of water on the paper towel next to 20 drops of rubbing alcohol.
    - If you can do it at the same time that would create a more fair test.
  - Record the time it takes for the wet mark made by the drops to disappear on the towel.

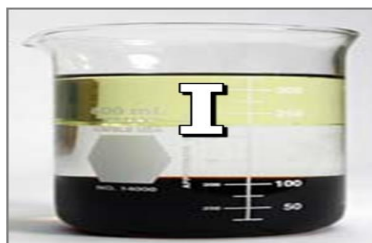
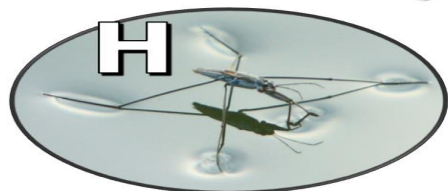
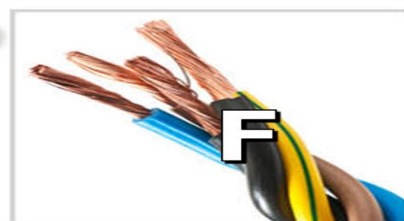
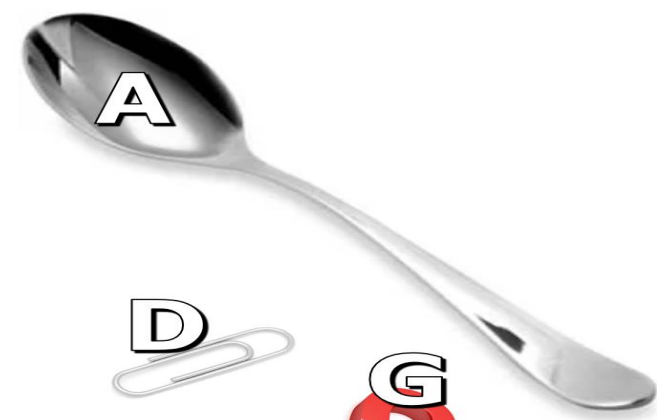


Which is water and which is rubbing alcohol? Which one was more volatile? Letter A is water (H<sub>2</sub>O), and letter B is rubbing alcohol



Name a physical property for A-J

A= High Melting point Conducts Heat and Electricity, Metallic Luster, High Density, Malleable	B= Volatility How easily turns to a gas	C= Hardness (minerals) how easily scratched a mineral is
D= Ductile, ability for metals to be made into wires	E= Brittle, how easily something can break (non-metals are brittle)	F= Conductivity, how easily something conducts electricity
G= Magnetic Properties	H= Surface tension	I= Density
J= Viscosity		



Chemical Change: The change of substances into other substances through a reorganization of the atoms.



**Across**

3. Law \_\_\_\_\_ of Matter: During any chemical or physical change the total amount of matter remains constant
6. The substance that gets dissolved
7. \_\_\_\_\_ Property: A characteristic that can be observed or measured without changing the identity of the substance.
10. No definite shape or volume
12. Matter cannot be created or \_\_\_\_\_.
14. Anything that has mass and takes up space
16. Type of mixture with the same molecules throughout
20. \_\_\_\_\_ heat is energy released or absorbed, by a body or a thermodynamic system, during a constant-temperature process
21. Type of mixture with of two or more compounds.
23. Ionized gas that emits electrons.
25. \_\_\_\_\_ is the change of the physical state of matter from the gas phase into the liquid phase, and is the reverse of vaporization.

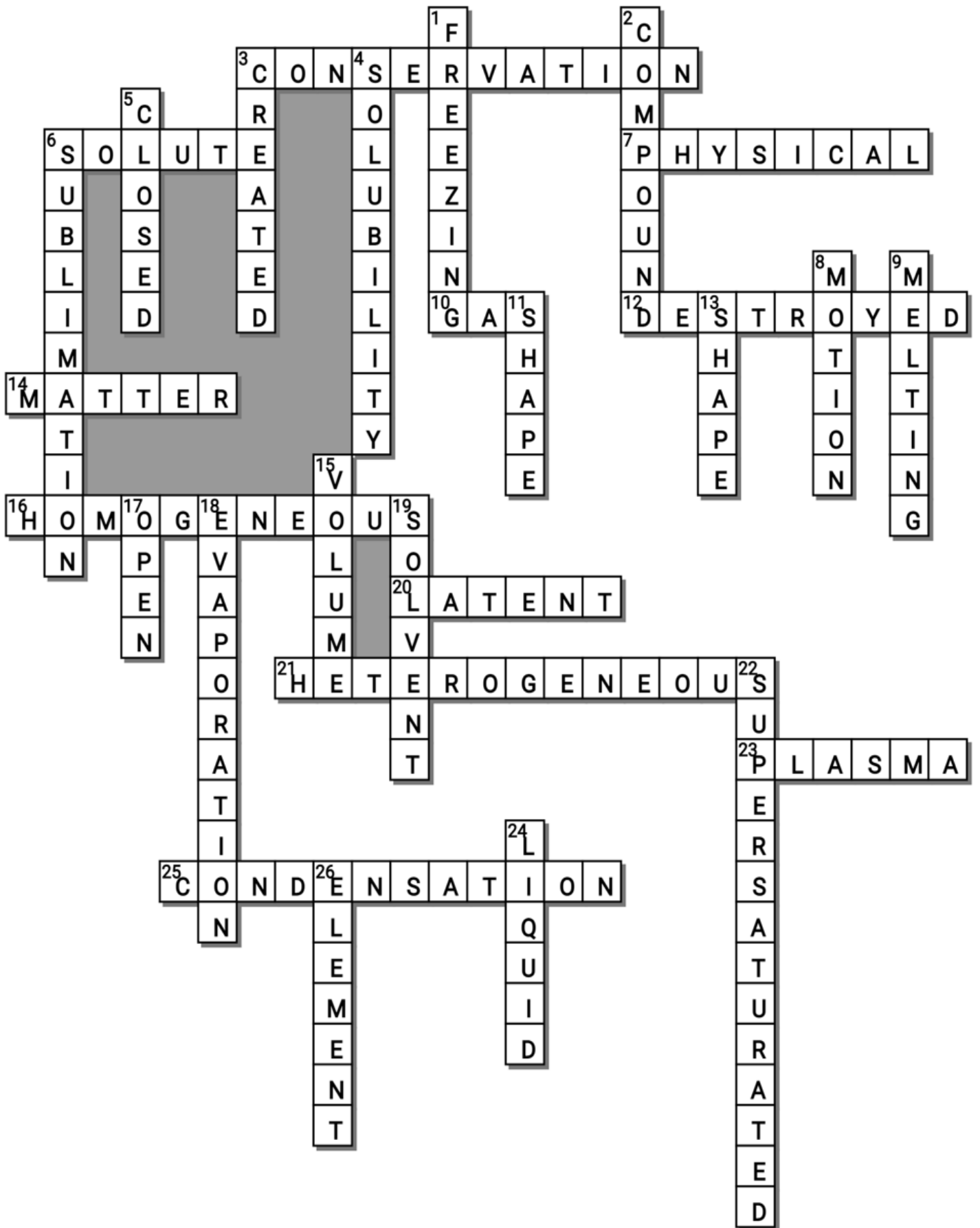
**Down**

1. A phase transition where a liquid turns into a solid
2. Made up of two or more elements bonded together.
3. Matter cannot be \_\_\_\_\_ or destroyed
4. How much solute can dissolve in a substance before it becomes saturated.
5. A \_\_\_\_\_ system is a type of system where mass is conserved
6. The transition of a substance directly from the solid to the gas state, without passing through the liquid state
8. Molecules are in constant state of \_\_\_\_\_.
9. The \_\_\_\_\_ point is the temperature at which a solid changes into a liquid
11. Solid (s) has a definite \_\_\_\_\_ and volume.
13. Liquid (l) Has definite volume but not \_\_\_\_\_.
15. Solid (s) has a definite shape and \_\_\_\_\_.
17. A \_\_\_\_\_ system is a type of system in which mass or energy can be added or removed from the environment.
18. \_\_\_\_\_ is a type of vaporization that occurs on the surface of a liquid as it changes into the gas phase
19. A substance that does the dissolving
22. When no more solute will dissolve.
24. Physical Change Changes form: Solid > \_\_\_\_\_ > Gas > Plasma
26. A substance that is made entirely from one type of atom

-----Teacher can remove this word bank to make more challenging-----

**Possible Answers**

COMPOUND, CONDENSATION, CONSERVATION, CREATED, DESTROYED, ELEMENT, EVAPORATION, FREEZING, GAS, HETEROGENEOUS, HOMOGENEOUS, LATENT, LIQUID, MATTER, MOTION, OPEN, PHYSICAL, PLASMA, SHAPE, SHAPE, SOLUBILITY, SOLUTE, SOLVENT, SUBLIMATION, SUPERSATURATED, VOLUME, CLOSED , MELTING



# Part 1 Matter Review Game

1-20 = 5 pts **Part 1 Lesson 5**

\*20-\*25 \* = Bonus + 1 pt,

(Secretly write owl in correct space +1 pt)

Final Question = 5 pt wager

Name: \_\_\_\_\_

Due: Today

Score \_\_\_\_ / 100

IT DOES MATTER	MATTER OF FACT	STATES OF MATTER	STATES OF MATTER II	NAME THAT STATE Bonus round 1pt each
1) Matter cannot be created or destroyed	6) Liquid	11) Solid	16) Ionization and Vaporization / Evaporation	*21) Massachusetts
2) Matter has Mass and takes up Space	7) Solid	12) Gas	17) Condensation (g to l) and Melting (s to l)	*22) Montpelier, VT
3) A=Compound B=Compound C=Element D=Mixture	8) Gas	13) Liquid	18) A=Deionization B=Condensation C=Freezing D=Energy Removed	*23) Lincoln Nebraska
4) Compound Element	9) Plasma	14) Plasma	19) A and B are switched, Element and Mixture	*24) Washington State
5) Kinetic Molecular Theory	10) B.) BEC, Solid, Liquid, Gas, Plasma	15) Energy Added	20) A=Solute B=Solvent	*25) South Carolina

Final Question Wager \_\_\_\_ /5 Answer: Latent Heat

