Science 8

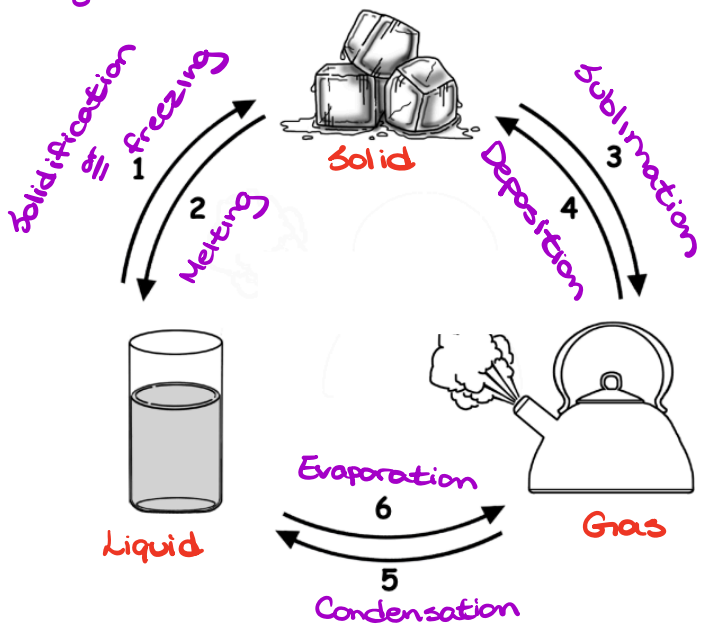
Atomic Theory 2

Name: Key
Date:
Block:

1. **Changes in State**
2. **Phase Change Diagram**

How does adding or removing energy affect the state of matter?

- When energy is added, thermal expansion happens. Particles move faster, spread out, and take up more space.
- When energy is removed, thermal contraction happens. Particles move more slowly, get closer together, and take up less space.
- When enough energy is added or removed, it can completely change the state:



What are examples of phase changes?

1. Solidification
   - Heat is removed
   - Examples:
     - Making ice cubes
     - Lake freezing over
     - Hail stones

2. Melting
   - Heat is added
   - Examples:
     - Popsicle melting
     - Rock turning into lava
     - Ice cubes melting in a drink

3. Sublimation
   - Heat is added
   - Examples:
     - Dry ice
     - Air freshener

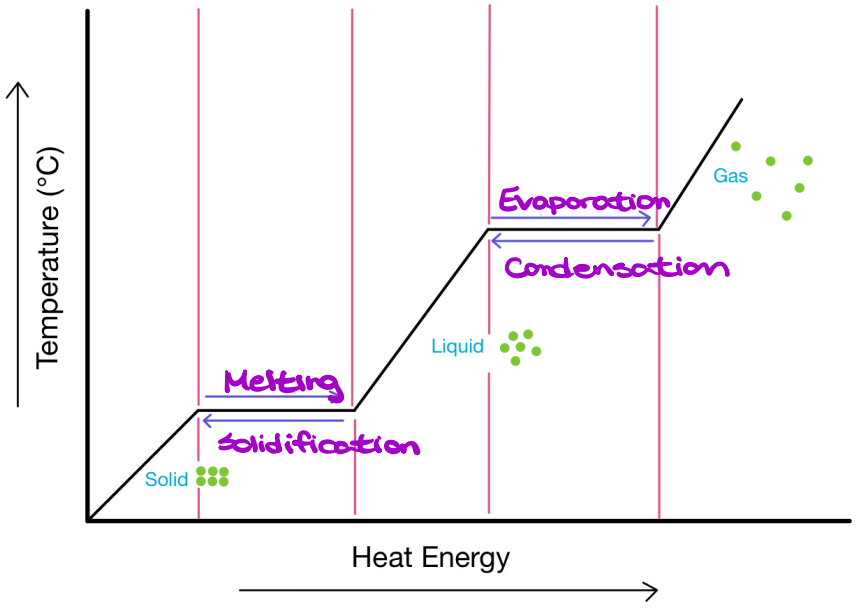
4. Deposition
   - Heat is removed
   - Examples:
     - Frosted windows
     - Snow, snowflakes

5. Condensation
   - Heat is removed
   - Examples:
     - Dew on grass.
     - Rain
     - Fog on a mirror after shower

6. Evaporation
   - Heat is added
   - Examples:
     - Boiling water
     - Puddle disappearing
     - Drying laundry on a clothesline.

How do we know <u>when</u> a phase change will happen?	• For a substance (e.g. water), there are known properties like freezing point and boiling point that tell us when the state of matter will change.
	• For example, with water:
	  ○ Freezing point: the temperature at which water transitions from a liquid to a solid (ice) = 0°C
	  ○ Boiling point: the temperature at which water transitions from a liquid to a gas (water vapor) = 100°C

- We show how these phases change in the form of a <u>Phase Change Diagram:</u>



Expand and contract

Vocabulary	
condensation	melting
contracts	move around quickly
deposition	rises
evaporation	slide past each other
expands	slower
falls	solidification
faster	state of matter
kinetic molecular theory	sublimation
mass	vibrate
matter	volume

Use the terms in the vocabulary box to fill in the blanks. Use each term only once. You do not need to use all the terms.

1. Mass is the amount of material that makes up something.
   Volume is the amount of space that a material takes up.
   Anything that has mass and volume is called matter.

2. When you add energy to matter, its temperature rises.

3. Melting is the process of a solid changing to a liquid.
   Sublimation is the process of a solid changing directly to a gas.

4. Evaporation is the process of a liquid changing to a gas.
   Solidification is the process of a liquid changing to a solid.

5. Condensation is the process of a gas changing to a liquid.
   Deposition is the process of a gas changing to a solid.

6. Particles in a solid are packed so close together they can only vibrate.
   Particles in a liquid can slide past each other.
   Particles in a gas can move around quickly.

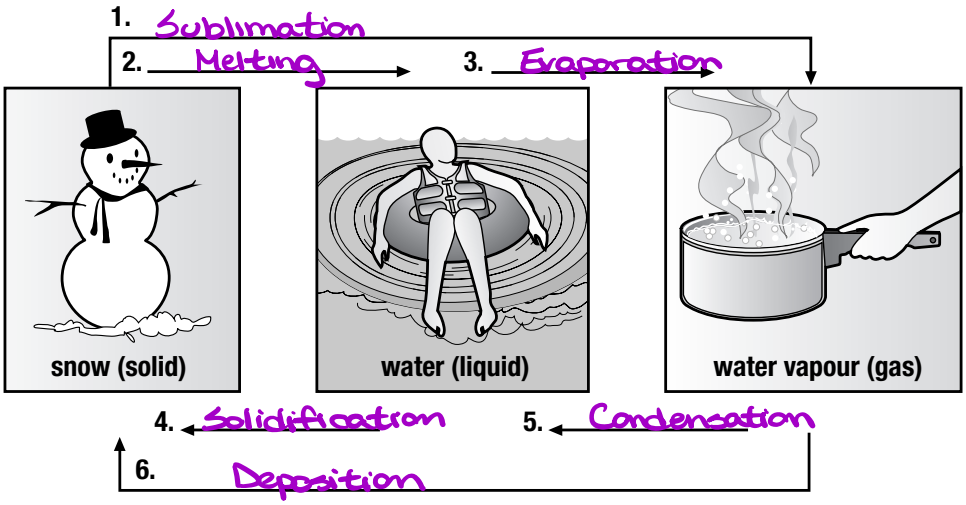
7. When you remove energy from particles they move slower and the matter contracts.

8. The Kinetic Molecular Theory explains how particles act when their spacing and movement change.

What's the matter?

Vocabulary	
condensation	melting
deposition	solidification
evaporation	sublimation

Use the terms in the vocabulary box to label the diagram. Place the terms on the numbered arrows.



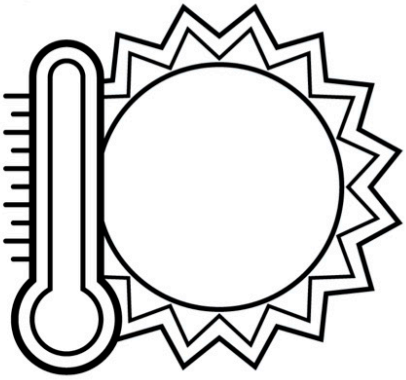
Complete the following table by describing the change of state. The table has been partially completed to help you.

	Change of state	Heat added or released
condensation	Gas to liquid	released
deposition	Gas to solid	Released
evaporation	liquid to gas	Added
melting	Solid to liquid	added
solidification	Liquid to solid	Released
sublimation	Solid to gas	Added

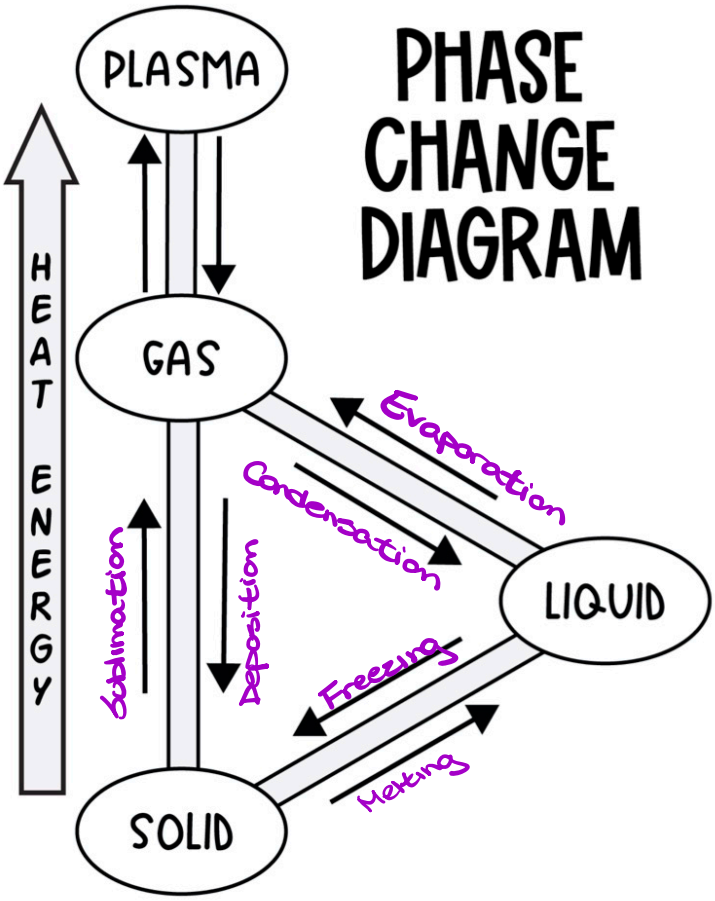
PHASE CHANGES

HOW DOES HEAT AFFECT THE STATE OF MATTER?

Matter can change from one state to another with a change in heat (thermal) energy. When heat increases, the particles move faster and spread further apart. When heat decreases, the particles move slower and get closer together.



PHASE CHANGE DIAGRAM



PHASE CHANGE	ORIGINAL STATE	FINAL STATE	MOTION OF PARTICLES
MELTING	Solid	Liquid	Increasing
Evaporation	Liquid	Gas	Increasing
FREEZING	Liquid	Solid	Decreasing
DEPOSITION	Gas	Solid	Decreasing
SUBLIMATION	Solid	Gas	Increasing
CONDENSATION	Gas	Liquid	Decreasing

CHECKING FOR UNDERSTANDING

Circle true or false for each statement about states of matter.

TRUE OR (FALSE) 1. The particles in a solid are rigid and do not move.
(TRUE) OR FALSE 2. A liquid does not have a shape of its own.
(TRUE) OR FALSE 3. Decreasing heat energy can cause a phase change.
(TRUE) OR FALSE 4. Increasing heat energy can cause a phase change.
TRUE OR (FALSE) 5. The evaporation of water over time is an example of sublimation.
(TRUE) OR FALSE 6. Plasma is rare on Earth but plentiful in the universe.
TRUE OR (FALSE) 7. Placing a balloon in a freezer will cause the balloon to expand.