7.1 notes

November 21, 2019 9:02 AM

7.1 Notes: States of Matter

Name: _____

Matter – anything with mass and volume

Mass – the quantity of matter in a substance
- Usually measured in: grams (g); mg; kg

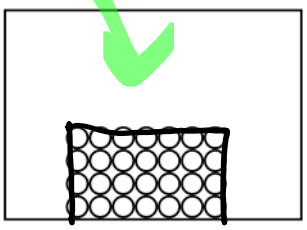
Volume – The amount of space taken up by an object
- Usually measured in: Liq.: Litres (L); mL Solid: cm^3

PARTICLE MODEL OF MATTER - (KINETIC MOLECULAR THEORY)

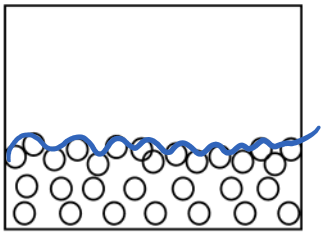
- All matter is made up of very small microscopic particles.
- There is nothing but microscopic empty space between particles.
- Particles have constant motion.
  - They move on their own accord. (intrinsic motion)
- The more heat that is added to particles, the faster they move.
- Particles move differently in solids, liquids, gases
- Particles are attracted to one another.

There are 3 states of matter:

1. **SOLID STATE:**
   - A solid has definite shape and volume
   - In the solid phase, particles are regularly arranged. The are closely packed in regular patterns.
   - In solids, particles move very slowly back and forth in the same spot.
   - In solids, particles are strongly attracted to neighbouring particles.

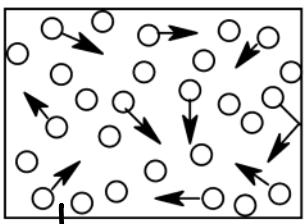


2. LIQUID STATE:



- A liquid has definite volume but its shape is determined by its container
- In the liquid phase, particles are not regularly arranged. They are closely packed in an irregular arrangement.
- In liquids, particles are free to slip 'n' slide and over each other. They keep swapping places.
- In liquids, particles are weakly attracted to neighbouring particles.

3. GASEOUS STATE:



- A gas has both it shape and volume determined by its container
- In the gas phase, particles are not regularly arranged. They are widely spread out in an irregular arrangement.
- In gases, particles move very quickly and bounce around their container. They collide very hard with each other and the walls of their container.
- In gases, particles are seemingly not attracted together at all.

The Kinetic Molecular Theory

Kinetic = means moving
Molecular are particles of matter
Theory is used to explain observations

KMT

The **kinetic molecular theory** explains our observations of moving particles of matter

There are 8 statements in the KMT:

1. All matter (solid, liquid & gas) is made up of tiny particles.

2. These particles are in constant motion. This means they have kinetic energy or "motion" ~~motion~~ energy

3. There are spaces between the particles of matter.

4. The particles and spaces are so TINY that they cannot be seen.

5. In a solid, the particles are very close together, and the spaces between the particles are small. Particles of a solid can not move very fast, but can only vibrate.

6. In a liquid, the particles are slightly farther apart, because the spaces between the particles are larger. Liquid particles move slightly faster than solid particles.

7. In a Gas, the particles are very far apart. The spaces between the gas particles are very large. Gas particles move very fast.

8. If heat or energy is added to matter, the particles gain kinetic energy, and so they can move faster

1. read p.246 - 249
2. DO RC p.249 #1-5
3. 7.1 WS p.100 ONLY

Temperature, Thermal Energy and Heat

Temperature, Thermal Energy and Heat

- Thermal energy is HEAT
- Heat and temperature are **not** the same thing.

Heat or **thermal energy** is the total energy of all the particles in an object

- Depends on the size of the object, a pot of hot soup has more energy than a cup of hot soup

Temperature is a measure of the speed of the particles

- Temperature does not depend on the size of the object, a cup and a pot of soup have the same temperature
- Low temperature – SLOW moving particles
- High temperature – FAST moving particles
- Thermometers measure temperature, either mercury or coloured alcohol
  - The Farenheit thermometer measures water freezing at 32°F
  - The Celcius thermometer measures water freezing at 0°C

Heat Transfer

- Heat transfer involves the movement of heat from a hot object to a cooler object

1. **Conduction** – Heat transfer in SOLIDS
   - A conductor is a substance that transfers heat well by the collision of particles (many metals are excellent conductors)
2. **Convection** – Heat transfer in FLUIDS
   - Fluids are liquids and gases that are poor heat conductors because particles are too far apart
   - Hot fluids RISE

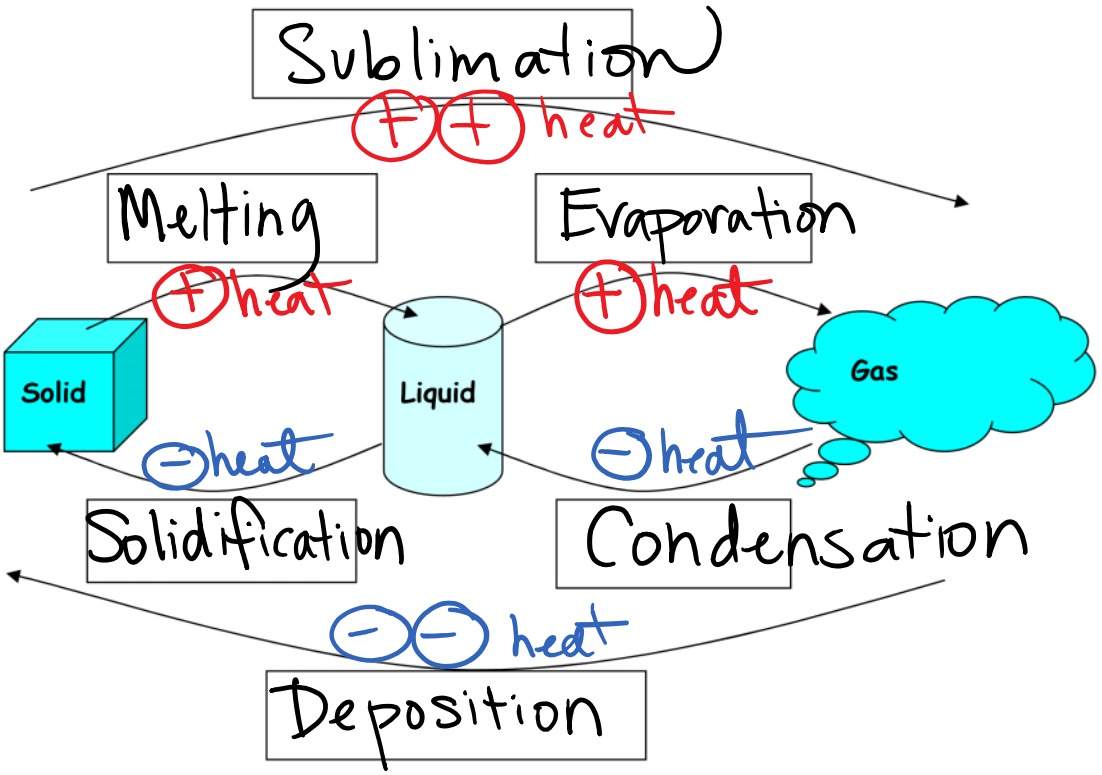
3

- **Radiation** – heat and light come to us from the sun through empty space where there are no particles – energy that is transferred without particles is called radiant energy
  - Dark objects absorb energy well

- Preventing heat transfer – In order not to lose heat:
  - Insulators – slow down or prevent heat transfer – like in a thermos
- Thermal expansion: when heat is added to a substance and its temperature increases, the substance increases in volume
- Thermal contraction when heat is removed from a substance and its temperature decreases, the substance decreases in volume.

Changes of State

When heat is added to or removed from a substance, it can change state or phase

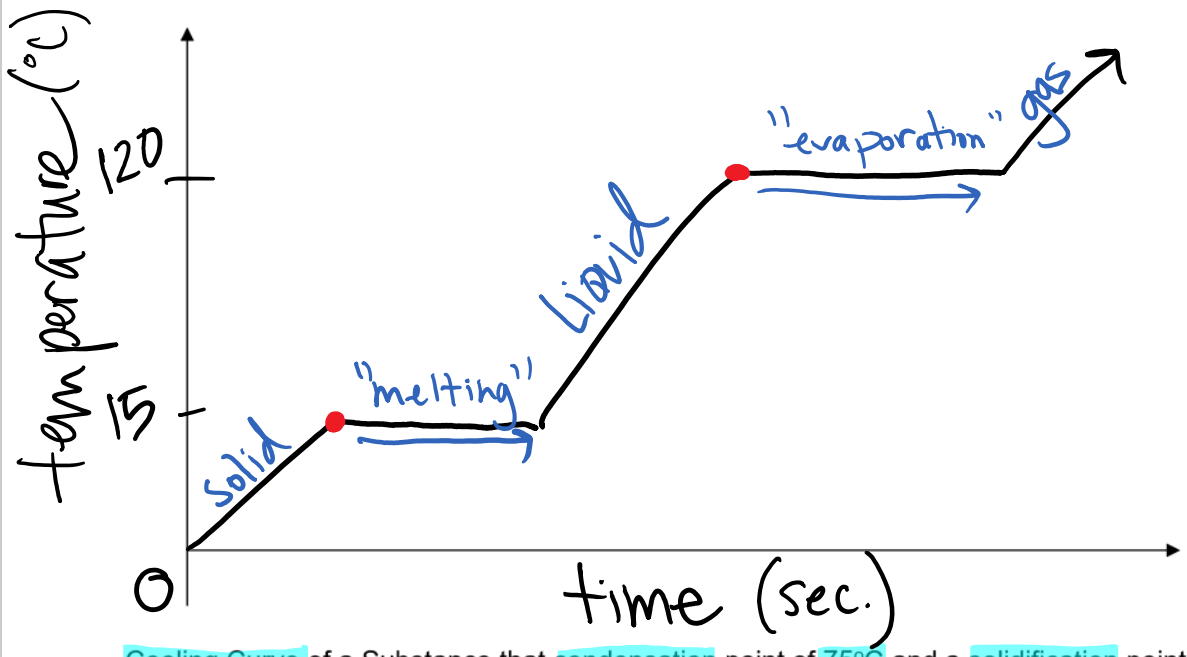


(MP) **Melting Point** – Temperature at which a Solid changes to Liquid

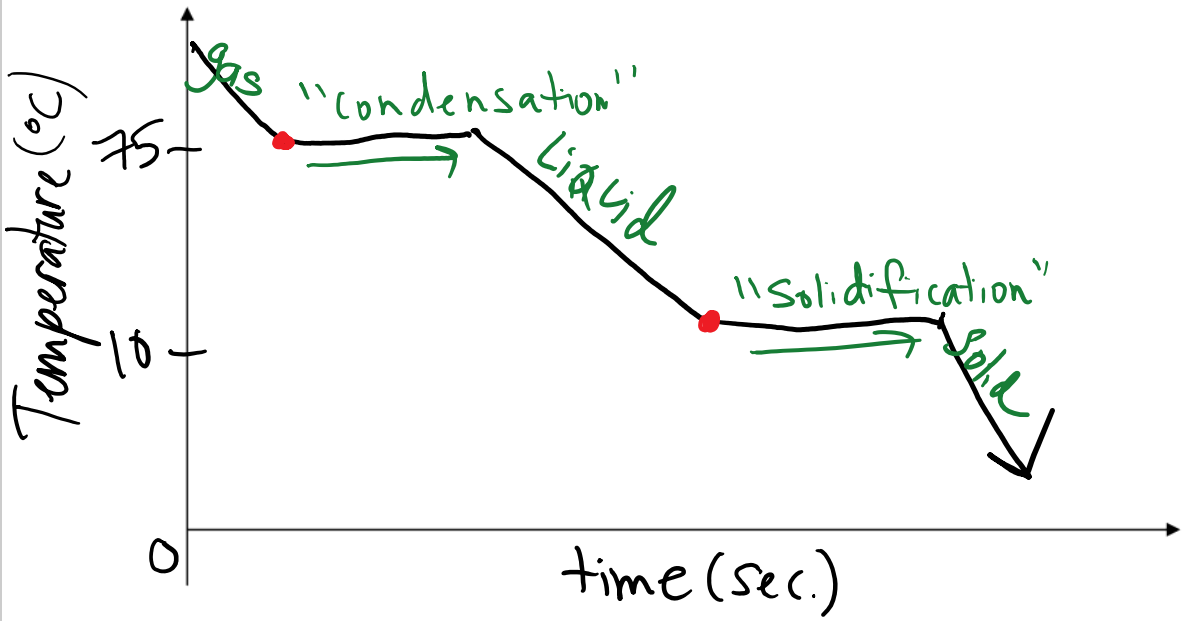
(BP) **Boiling Point** – Temperature at which a Liquid changes to gas

Warming and Cooling curves:

Draw and label a warming curve for a substance that has a melting point of 15°C and a boiling point of 120°C.



Cooling Curve of a Substance that condensation point of 75°C and a solidification point of 10°C



DO: 1) Read p. 249 - 253

2) p. 253 RC Q's # 1-4

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3) Finish 7.1 WS.