Science Department

2023/2024

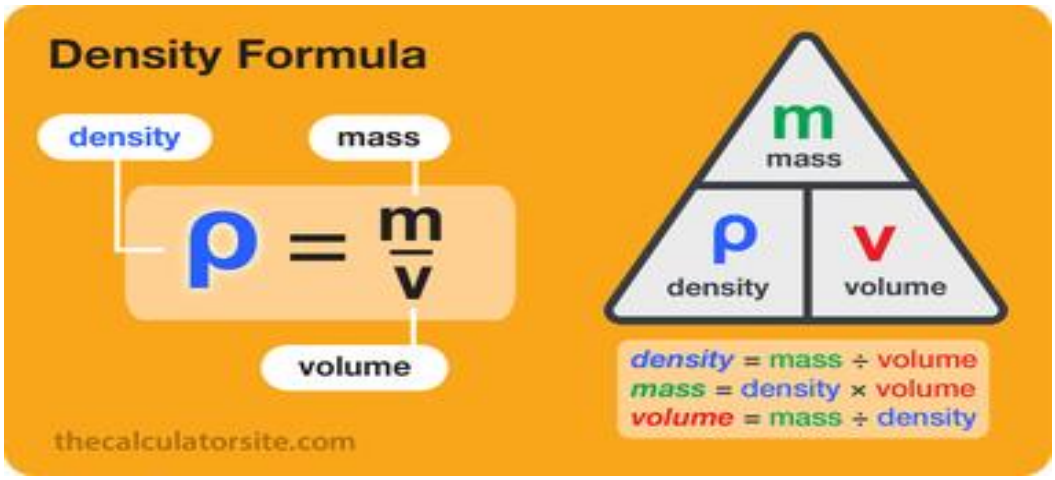
Year 8

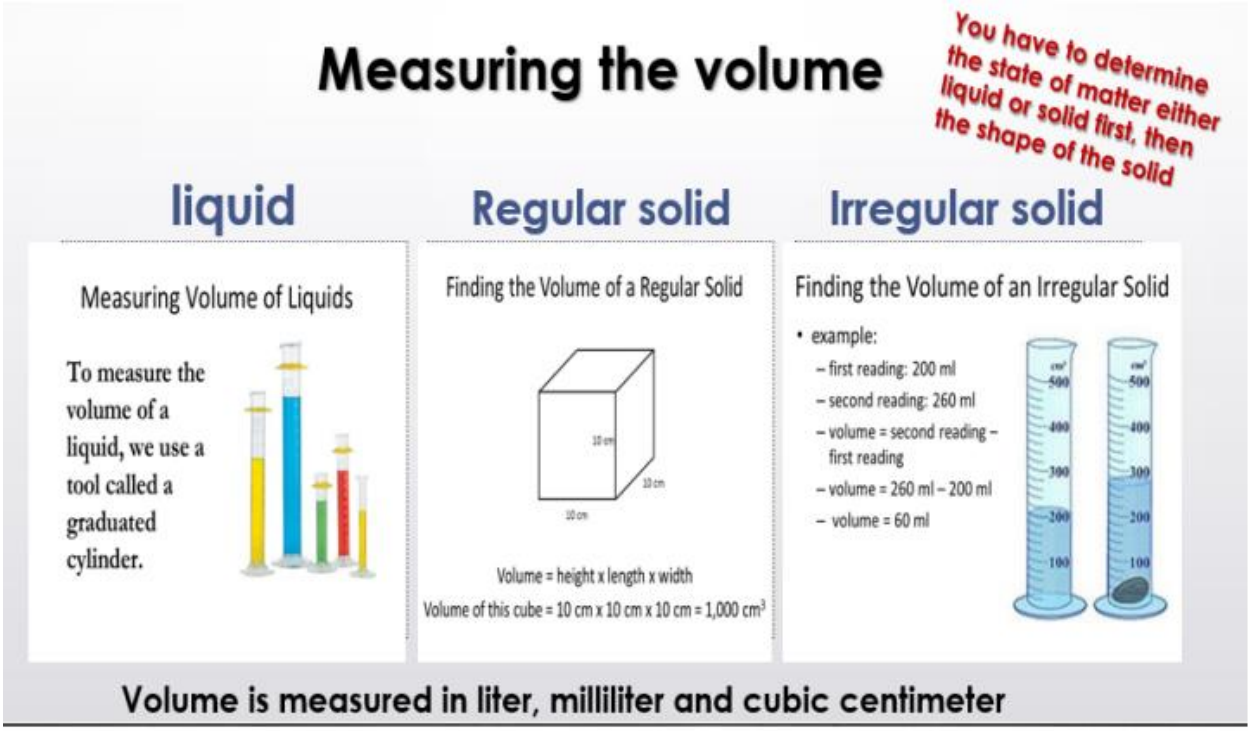
Term 1, Summary Sheets on Unit 3

Name: …….

Class: ……

3.1 Density

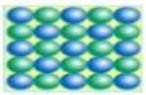
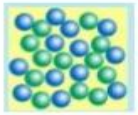
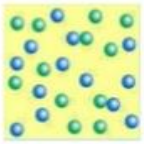




Mass is measured by balance or scale.

Measuring unit of mass is gram, while density is g/cm^3

Comparing different densities of different state of matter

	Picture	Particles	Density	Motion	Example
SOLID		Tightly packed	Usually the most dense	Particles locked into place	ICE
LIQUID		Loosely packed	Usually less dense than solids, dens er than gases	Particles move past each other	Water
GAS		Not packed at all	Least dense	Particles move past each other	Water Vapor

- If something is more dense than water, it will sink in water.
- If something is less dense than water, it will float in water.

3.2 Heat and temperature

Heat	Temperature
• Heat is a measure of the energy in the particles. • Heat is the total thermal energy of the vibrating particles in an object. • Heat tells us about the total energy of the particles.	• Temperature also gives us information about the energy of the particles. • Temperature tells us the average energy of the particles.
Measured in joules	Measured in Celsius , Fahrenheit & Kelvin

the thermal energy (heat) is greater at the water of the higher temperature because it contains particles that are moving faster, the **number of particles in both glasses of water is the same**, **but the total thermal energy (heat) of the particles in the water with the higher temperature is higher**.

- As there are more particles, the total thermal energy (heat) of all these particles is greater than in the water with fewer particles.
- **That means the larger volume of water has greater total thermal energy (heat) than the smaller volume, even when their temperatures are the same**

Factors affecting the thermal energy

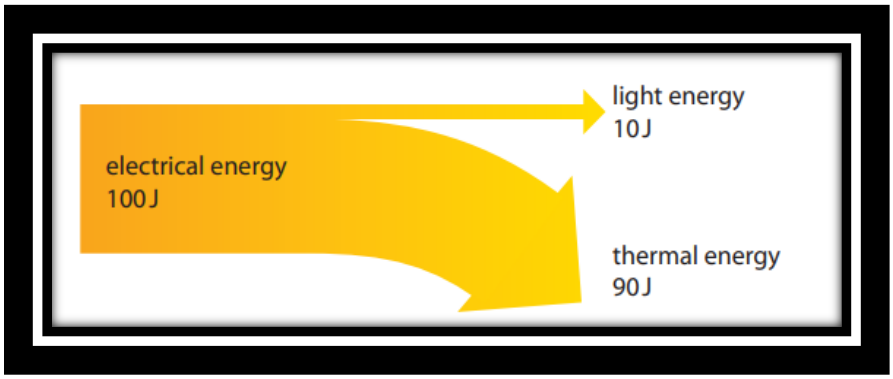
Factor	Factor Variation	Result
Number of Particles	More particles	Increased thermal Energy
	Less particles	Less thermal energy
Temperature	Higher Temperature	Increased thermal energy
	Lower Temperature	Reduced thermal energy

Temperature gives us information about two things:

- **the direction that thermal energy will be transferred**
- **the average energy of the particles in an object.**

3.3 Conservation of energy

- Law of conservation of energy:
- Energy is conserved, energy can't be created nor destroyed , but can transfer and transform.
- we mean that the total quantity of energy stays the same.
- Total energy input must equal to total energy output.
- Energy diagram can clarify the total energy input equals to the total energy output.
- The **electrical energy** is called **the energy input** and **the light and thermal energy together** are called the **energy output**.
- The light energy is **useful** and the thermal energy is **wasted.**

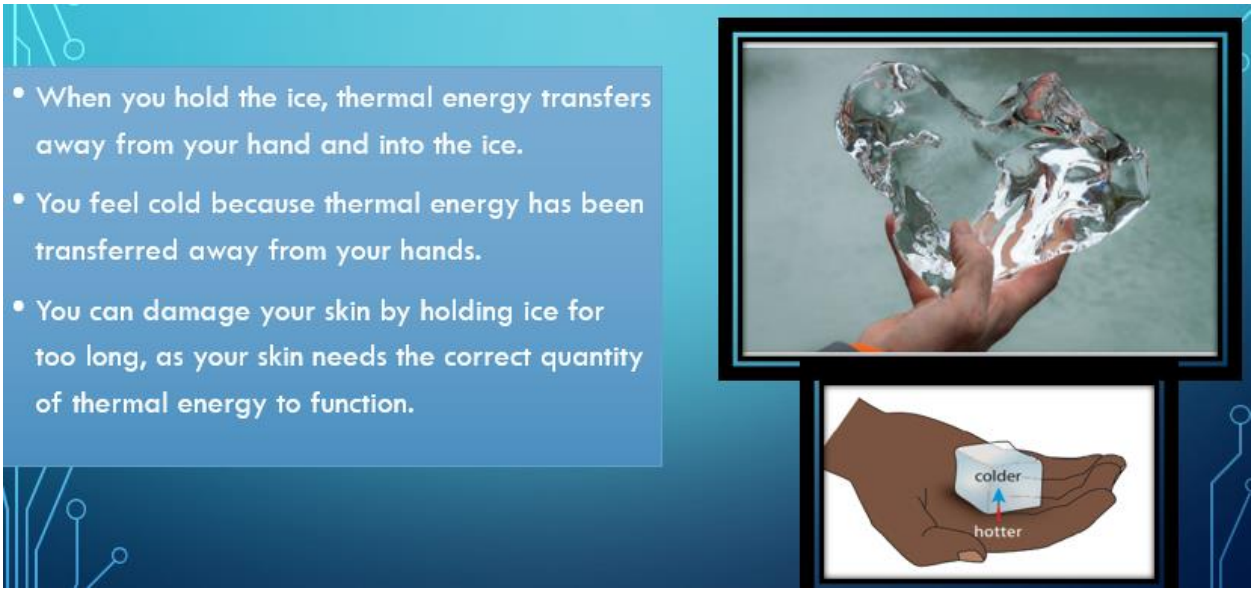


3.4 Moving from hot to cold

- Thermal energy will always transfer from hotter regions or objects to colder ones, and this is known as heat dissipation.

N.B: When thermal energy is removed from a hot object, we say that the thermal energy has dissipated.

- Dissipation is used to describe energy that spreads out and becomes less useful.
- The rate, or speed, of thermal energy transfer increases :When the **temperature difference** between the hot place and the cold place increases.



3.5 Ways of transferring thermal energy

The thermal energy transfers by the processes of conduction, convection and radiation.

Types of Energy Transfer

Conduction	Convection	Radiation
• Energy transferred by direct contact • Energy flows directly from warmer object to cooler object • Can occur within one object • Continues until object temperatures are equal	• Occurs in gases and liquids • Movement of large number of particles in same direction • Occurs due to difference in density • Cycle occurs while temperature differences exist	• Energy transferred by electromagnetic waves such as light, microwaves, and infrared radiation • All objects radiate energy • Can transfer energy through empty space

Convection can happen in liquids and gases because the particles are free to move.

- **Convection cannot happen in a solid because the particles are not free to move.**
- **The particles in a solid can only vibrate about fixed positions.**
- **Convection cannot happen in a vacuum as there are no particles to move.**

Conduction does not work well in liquids because the particles move around more when heated, rather than just vibrating.

Conduction also does not work well in gases because the particles are far apart and the collisions are not very frequent.

Conduction cannot happen in a vacuum as there are no particles to vibrate in a vacuum.

The best emitters and absorbers of radiation:

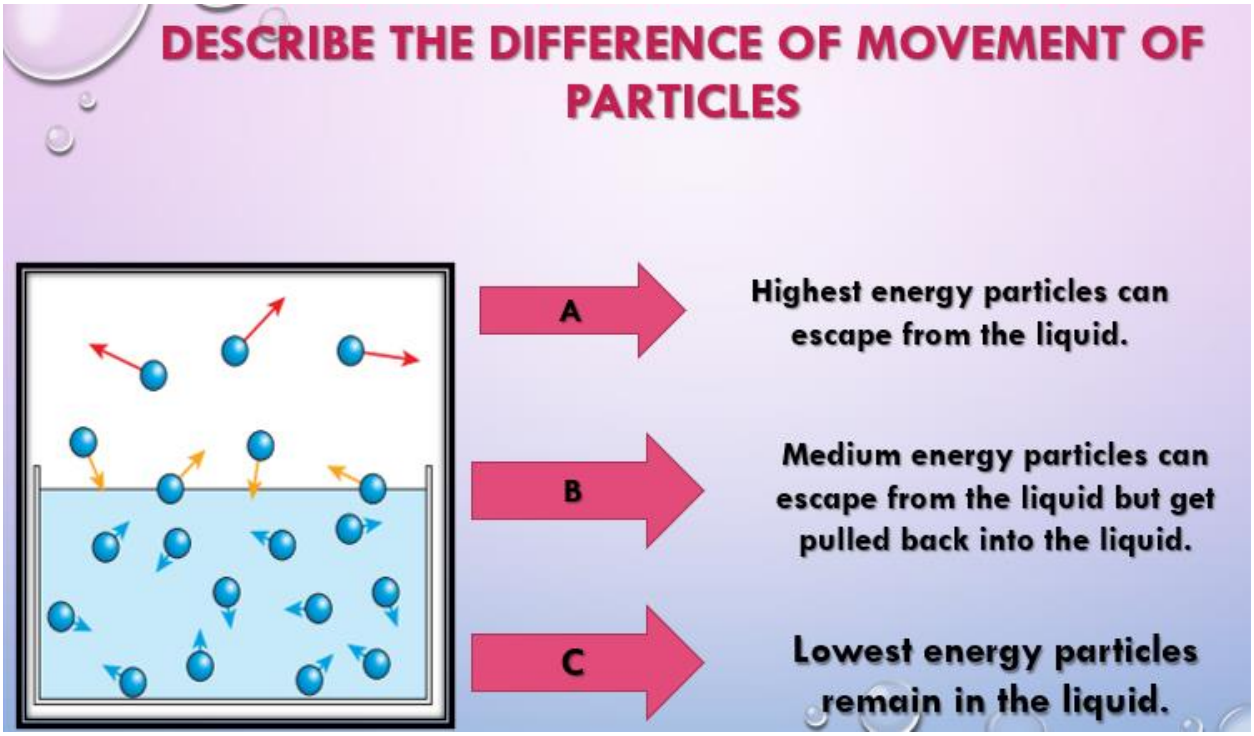
- are dull
- are black
- have a large surface area.

The worst emitters and absorbers of radiation:

- are shiny
- are white or silver
- have a small surface area.

Shiny, white or silver surfaces reflect radiation away.

3.6 Cooling by evaporation



-temperature is a measure of the average energy of particles.

- When the particles with the highest energy escape from the water, this will lower the average energy of the particles that remain.
- Therefore, evaporation causes cooling.