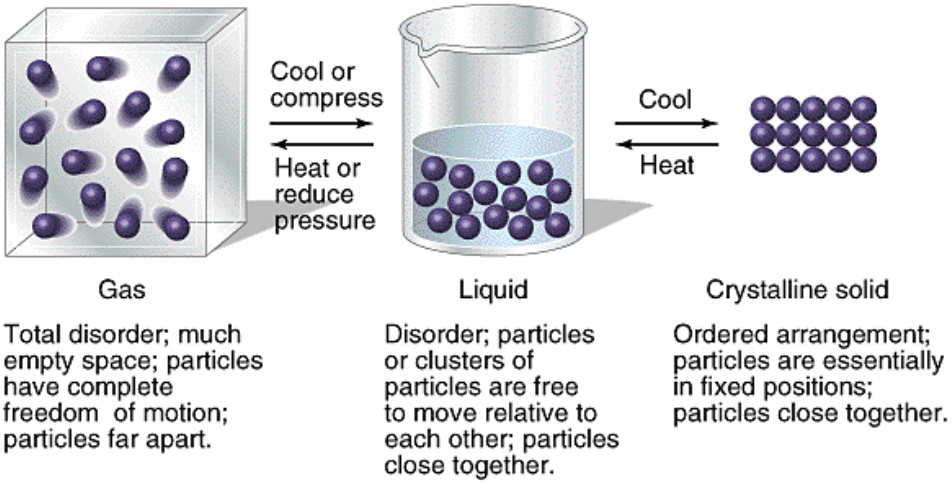
SCIENCE FORM 2
CHAPTER 5 WATER AND SOLUTION

Physical characteristics of water

- exist in three states : solid, liquid and gas
- poor heat and electrical conductor
- density of 1g per cm^3

Kinetic theory

- water consists of many tiny and discrete particles called water molecules

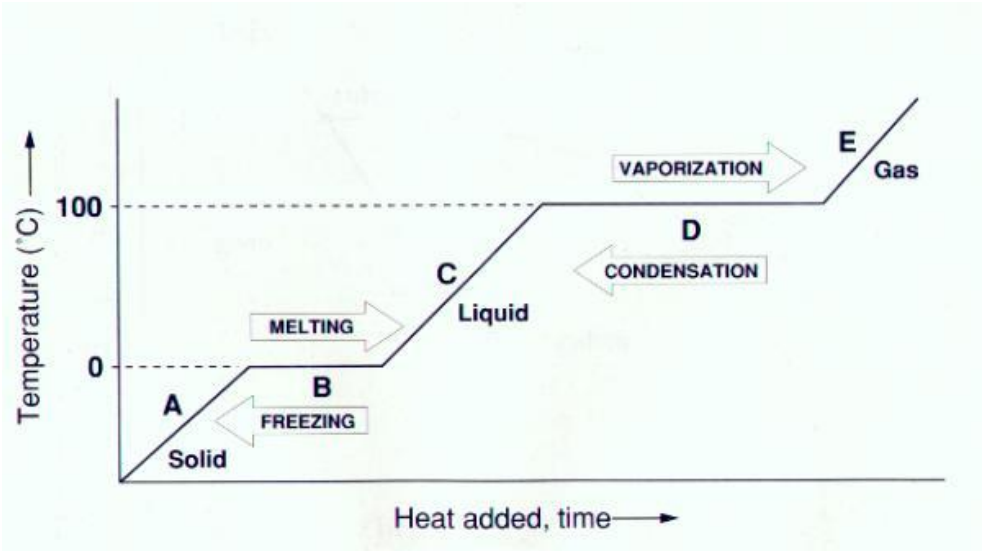


Freezing point

- temperature at which water freezes into ice
- as the water temperature decrease, its molecules lose their energy to the surroundings,as a result, the molecules slow down
- at freezing point, the molecules allow the forces attraction to fix them in definite position in regular arrangement to form a solid

Boiling point

- temperature which water boils and become steam
- as water heated, its molecules gain energy from the heat source, causing the molecules to move faster and further apart.
- at boiling point, the molecules possess sufficient energy to overcome the forces of attraction holding them together



Note:
- water expands upon freezing, therefore, ice is less dense than water and floats on water
- this allows aquatic life to survive during winter
- the water underneath does not freeze, because ice is a good thermal insulator

Impurities
- impurities in water change the physical characteristics of water
- changes in :
  I. Taste, odour and colour
  II. Freezing point and boiling point [eg. Sea water has a lower freezing and higher boiling point]
  III. Density [eg. Sea water and fresh water different in density]

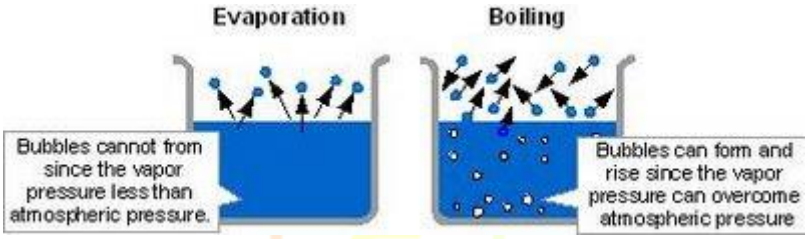
Composition of water
- water is a compound which made up of the 2 hydrogen and a oxygen

Evaporation of water
- a process by which a liquid changes into a gas at any temperature below the boiling point of liquid
- this is due to the water molecules at the surface gain enough energy from the surroundings to escape from the surface into the air and become water vapour
- the water left become cooler because some energy was removed from the water vapour

Factors affecting rate of evaporation
I. Temperature of surrounding
   - The higher the temperature of surroundings, the higher the rate of evaporation
II. Surface area of water
   - The larger the surface area, the higher the rate of evaporation
III. Humidity
   - The higher the humidity, the lower the rate of evaporation
IV. Movement of water
   - The higher movement of air removes water vapour from the surface faster

Differences between evaporation and boiling

Boiling	Evaporation
A process in which a substance changes its state from the liquid state to the gaseous state	Evaporation is a process whereby the water changes into vapour without boiling
Quick	Slow
Bubbles are formed	No bubbles formed
Occurs throughout the liquid	Takes place only from the exposed surface of the liquid
Occurs at a definite temperature --- boiling point	Occurs at all temperatures
Source of energy needed	Energy supplied by surroundings



Applications of evaporation of water in daily life

I. Drying clothes
II. Drying hair
III. Preservation of agricultural products
IV. Processing food

Solution

- a homogenous (uniform) mixture that formed when a substance is dissolved in another substance

Solute

- the dissolved substance
- can be in solid, liquid or gases form

Solvent

- the substance that dissolves the solute
- usually in liquid form

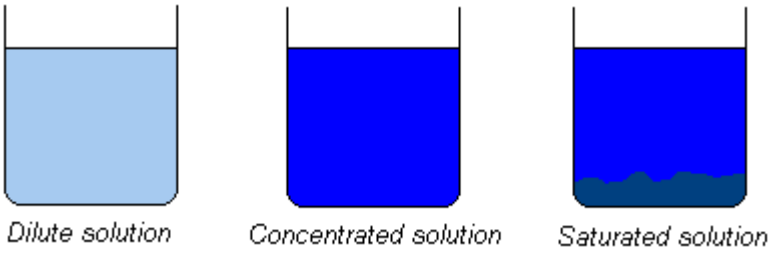
Solute + Solvent → Solution

Proportion of solute to solvent

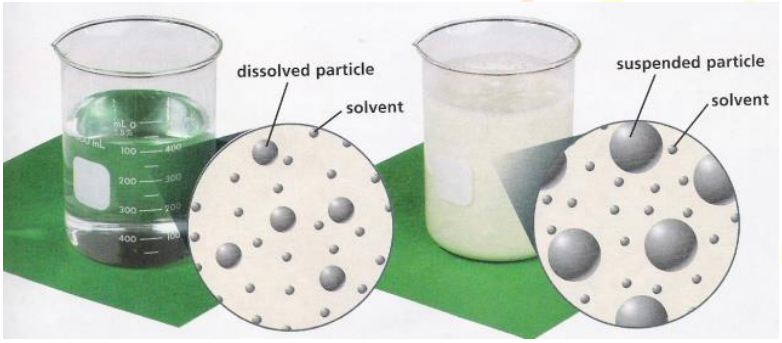
I. Dilute solution
   - A dilute solution has just a small amount of salt dissolved.

II. Concentrated solution
   - In a concentrated solution there is so much salt dissolved

III. Saturated solution
   - That a little bit of extra salt would not be able to dissolve, but instead form an insoluble heap on the bottom. If that happens, the solution is called saturated.
   - It contains the maximum amount if salt it can dissolve at that particular temperature



Solution and suspension



- both solution and suspension are mixtures
- solution

I. Contain dissolve substance
II. Particles dispersed in a solution that we cannot seen in naked eye
III. Homogenous r uniform in color and appearance
IV. Usually transparent and clear

- suspension

I. Contain insoluble substance
II. Particles are not dispersed evenly, small clusters of particles can be seen by naked eye
III. Non- homogeneous or heterogeneous
IV. Appear cloudy, particles either settle at the bottom or float at the surface

Solubility

- maximum amount of solute in grams that will dissolve in 100g of solvent at a given temperature
- solubility is depends on

I. Nature of solvent

- A solute may be soluble in a certain solvent but insoluble in another solvent
- Eg. Salt dissolves readily in water but not in solvents like alcohol or ether

II. Nature of solute
- Different solutes have different solubilities in a given solvent

III. Temperature
- Solubility of solids in a liquid solvent increases with temperature
- Solubility of gases in liquid solvents decreases with temperature

Rate of dissolving
- how fast a solute can dissolve in a given amount of solvent
- factors affecting:

I. The temperature of solvent
- The higher the temperature of solvent, the faster the solute dissolves

II. The rate of stirring
- The faster the stirring, the faster the solute dissolve in solvent

III. The size of the solute particles
- The smaller the size, the faster it dissolve in solvent

Water as a universal solvent
- water can dissolve almost every known substance
- a solution in which water is the solvent is known as aqueous solution

Uses of organic solvent
- organic compounds containing carbon that are used to dissolve solutes to form solution
- eg. Alcohol, kerosene, turpentine, acetone
- some are volatile, can be used to remove stains
- mostly carcinogenic, toxic and flammable

Organic solvent	Solute	Uses of solvent
Alcohol	Iodine	Antiseptics or disinfectants
	Resins	Liquid polish
	Pigments	Printing ink and correction fluid
	Scented substances	Perfumes
Turpentine, thinner	Paint pigments	Remove paints
	Varnishes	Thin varnishes
Acetone	Resin	Nail polish
Ether	Fats	Extract fats and oils
Benzene	Chemicals	Solvent in chemical laboratories Dissolve rubber in tyres
Chloroform	Plastics	Stick plastics together