CHAPTER FOUR

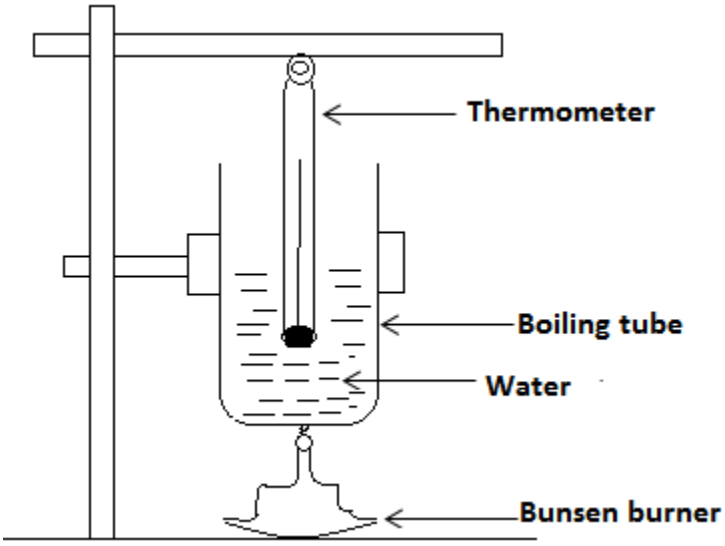
Water, Solutions and Solubility

Water: This is the commonest substance on earth, which covers about 70% of the earth's surface.

Properties of water:

— It boils at 100°C.
— It freezes at 0°C.
— It has no colour.
— It has no taste or scent..

Experiment to show that water boils at 100^0C.



- Water is placed inside a boiling tube and a thermometer is inserted into the water.
- The tube is heated until thewater boils.
- The mercury thread rises and stops doing so, when the temperature is $10O^0$C.
- No matter how long the water is heated, the temperature of the boiling water still remains 100^0C.

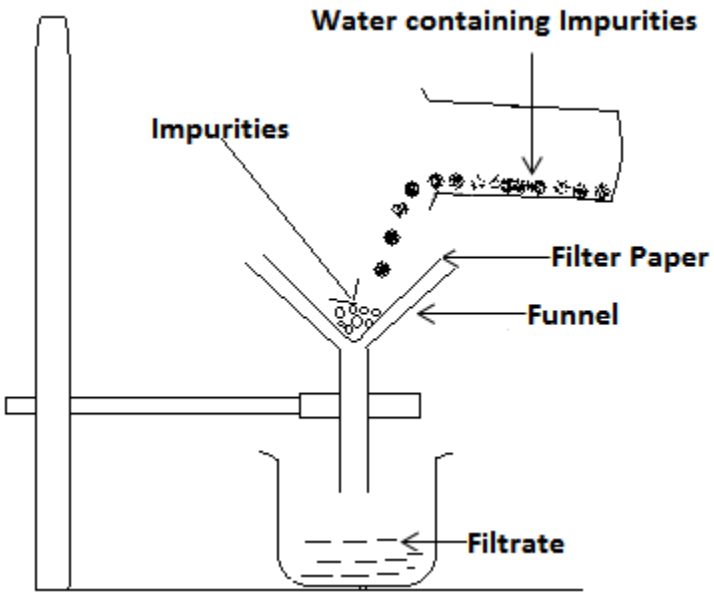
- This shows that water boils at 100^0C.

Purification of water:

— Water from natural sources may be very dangerous to be used by man, eventhough they may look very clean.
— They may contain very dangerous germs and poisonous chemicals, which can have very serious effects on the health of man.
— For this reasons, water from these sources must first be purified before it is used by man.
— Water purification is the process of subjecting water to certain treatment, inorder to make it safe enough to be used by man.
— The importance of water purification is to kill the germs within the water, remove the solid particles and the poisonous chemicals found within the water body.
— The purification of water is as follows:

(1) Water is collected in a reservoir for a number of days, and exposed to sunlight for the mud it contains to settle.
(2) The water is then passed or pumped into a storage tank, and the addition of alum to it causes any suspended particle in it to settle.
(3) From the storage tank, the water is filtered using sand as the filter, in order to remove the undissolved impurities.
(4) The filtered water is then passed into a tank and chlorine is added to it, in order to kill the germs it contains.
(5) The water is then piped or pumped to places where it is needed.

Experiment to demonstrate that water from a pond contains impurities:



(1) A sample of water from a pond is poured into a funnel, which has a filter placed in it.
(2) The water drains through the filter paper into a beaker placed under the funnel.
(3) It will be observed that several impurities will be deposited on the filter paper, after a close examination using a lens.
(4) This shows that water from a pond contains impurities.

Water Conservation:

- Because treated water is expensive, it is important that we conserve and use it wisely.Water conservation is the method in which treated water is put to good use, in order to make it available especially during the dry season, and to cut down on the cost of treated water.Some of the methods used in the conservation of domestic water supply, includes the following;

(1) Poly Tank:

— In this method, the water is stored in tank made of rubber, and since the rubber cannot rust the water is good for drinking.

(2) Metallic Tank;

— In this method, the water is stored in tanks made of iron.
— Rusting sometimes occurs and in case the iron is contaminated with lead, then lead poisoning may occur.

(3) Underground Tank;

— The water in this case is stored in underground tanks made of cement, and the stored water can be contaminated by underground water.
— Apart from these methods, other ways or methods of conserving water are:

(1) By repairing pipe leaks or damaged pipes in our homes and environments.
(2) By keeping taps closed when they are not in use.
(3) By not using treated water in activities such as the washing of cars and the watering of gardens.
(4) By minimizing the amount of treated water wasted daily.

Well water: -

Wells must not be constructed in areas where the water table is high, especially in water logged areas since water from deep wells are clean, because it has been filtered by the different layers of soil that it passes through. Therefore for clean and good water, wells must be sunk deep into the land or soil. Apart from that, wells must not be located very close to underground septic tanks which contain both liquid and solid human waste, which can lead to the contamination of the well water.

Hard Water;

- This is water which does not easily form lather with soap.- There are two types of hardness and these are;

(1) Temporary hardness.
(2) Permanent hardness.

Temporary Hardness:

— This is caused when calcium hydrogen carbonate is present in the water.
— It can either be removed by boiling the water, or by adding slake lime to the water.

Permanent Hardness:

- This is due to the presence of magnesium sulphate, or calcium sulphate within the water, which gives rise to the presence of $mg^{2}+$ and $ca^{2}+$ ions within the water,
- In other words it is the presence of these two ions which causes the water to be permanently hard.
- This type of hardness can be removed by adding washing soda to the water.