Things we know

1. Matter:

Anything that has mass and occupies space is called matter. There are three kinds of matter i.e. solid, liquid and gas on the basis of physical character and on the basis of chemical properties it is classified into element, compound and mixture.

Classification of Matter on Basis of Physical Character:

- **Solid:** Matter which have fixed shape and volume. e.g. bricks, table, chair, book etc.
- **Liquid:** Matter which have fixed volume but not definite shape. Liquid takes the shape of vessels in which it is kept or stored. e.g. milk, water, oil, fuel etc.
- **Gas:** Substance which have neither fixed shape nor volume. These substances are easily affected by the pressure. e.g. air, hydrogen gas, LPG, CNG.

Classification of Matter on Basis of Chemical Character:

Element: The matter which is made up of a same type of atoms is called element. Element may be metal or non-metal. Metals are found in the solid state except mercury which is in liquid state. Metals have characteristic of malleability (which can be drawn into sheets) and ductility (which can be drawn into wire).

Metals are tough, have property to shine, usually conduct electricity and heat, density of metals are higher than other substance. e.g. iron, copper, zinc etc. while non-metal does not have property of malleability, ductility, shine and density like metals and they have also lower melting and boiling point in comparison to metals e.g. silicon, sulphur, carbon etc.

Compound: They are made by combination of two or more elements in a definite proportion. Compounds have fixed chemical formulae and its property is different from element from which it is made. e.g. Water (H_2O), Carbon Dioxide (CO_2) Calcium Carbonate/Chalk ($CaCO_3$) and Lime (CaO) etc.

Mixture: They are also made by combination of two or more elements and compounds but these elements and compounds are not present in a definite ratio and proportion. Mixtures can be separated by process of separation either chemical or physical, e.g. air, soil etc.

Alloy: It is a mixture of metal or a mixture of metal with another element. Alloys may be a solid solution of metal or mixture of metallic phase. Inter-metallic compound are alloys with a defined stochiometry and crystal structure. Properties of alloys are different from its constituent elements. e.g. bronze, steel, brass etc.

Alloy and Its Constituent Elements	
Alloys	**Constituent Elements**
Steel	Iron and Carbon
Stainless steel	Iron, Carbon, Nickel and Chromium
Bronze	Copper and Tin
Brass	Copper and Zinc
Duralumin	Aluminium, Bronze, Manganese and Magnesium
22 carat Gold	Gold, Copper

Note: Bronze It is the first alloy to be used. It is being used from very ancient time. It is strong alloy and used to make cannons, guns, statues and vessels.

2. Separation Techniques:

There are various separation techniques used for separating different mixtures.

A. Separation of Solid Components:

i. Manual Separation: Separation done by hands. e.g. separating concrete from rice, pulse etc.

ii. Threshing: It is process of separating the edible part or grain from the stalk and husk, that surrounds the grain. Threshing is done during grain preparation after harvesting. For threshing, these days threshing machines are being used.

iii. Winnowing: in this process, current of air is blow through grain to separate the chaff surrounding the grain. It is done after the threshing.

iv. Filtration: This process helps in filtering the fine matter present along with grain. In this process, fine net is used. e.g, separation of sand and concrete, filtering the flour.

v. Magnetic Separation: In this technique, magnet is used. This can be used to separate iron, cobalt, nickel, steel etc.

B. Separation of Solid and Liquid:

Sedimentation: In this process, liquid containing suspended solid particles are left for a while in a container, slowly solid particles starts to settle down in the bottom of container. This settling down of solid particles is caused by effect of gravity.

Decantation: In this technique, liquid is transferred from one vessel to another without moving or disturbing the liquid or mixture. Before this process sedimentation is done and after settling down of solid or heavier liquid, surface liquid material which is floating on the upper surface is transferred.
Filtration: In this technique of separation net or filter paper / membrane is used. Mixture containing solid and liquid is passed through net/membrane / filter paper and in the process solid particles are trapped in net or membrane while liquid passes it easily.
Evaporation: In this process of separation, mixture containing solid and liquid are heated so that liquid evaporates and solid is left behind as residue. e.g. separation of sugar and salt from solution.
Centrifugation: In this technique of separation, mixture is rotated and due to force of rotation and gravity, solid particles settles down at bottom rapidly and in this way liquid and solid can be separated e.g. cream from milk, butter from milk etc.
Distillation: In this technique of separation mixture containing solid and liquid is heated and vapor formed during heating is collected and condensed in a specific container and in this way desired component is separated.

C. Separation of Liquid from Liquid Mixture:
Separation Cone: It is used to separate two immiscible liquid or liquid which does not mixes. When two immiscible liquids are present in the cone then liquid will form bi-layer. One liquid will be present in the upper layer while other is present in the bottom layer, through this cone bottom layer liquid can be easily drained. So only upper layer liquid will be left in a cone and in this way liquids are separated.
Fractional Distillation: In this process, liquid is heated at different temperature and vapor is collected and condensed in separate container for each temperature, Crude petroleum is heated at different temperature to get Petrol, diesel, kerosene etc. So, process of fractional distillation is used in separating petroleum product.