

State of matter and mixtures

a) Atomic Structure and Mixtures

b) Periodic Table

c) Structure and Bonding

d) Quantitative Chemistry

e) Chemical Changes

f) Energy Changes

a) Define Atoms , Elements, Mixtures and Compounds

b) Difference between compounds and Mixtures

c) Technique to separate mixtures

Distillation

Crystallization

Fractional Distillation

Filtration

Chromatography

Atoms	Elements	Mixtures	Compounds
<p>Smallest particles that makes matter which contains subatomic particles electrons, protons, and neutrons</p> <p>They combine to forms elements, compounds and mixtures</p>	<p>Substance made up of only one type of atoms.</p> <p>There are more than 100 different elements having different properties.</p> <p>They can be metals, non metals or semi metals</p> <p>Periodic table represents all the known elements in the order of increasing proton number</p>	<p>Mixtures are the substances made up of two different elements or compounds which are not combined chemically.</p> <p>In mixtures the mixed components retain their properties and can be separated by physical means eq: Salt and water Sand and Water Oil and Water</p>	<p>Compounds are the substance which have more than one atom chemically bonded.</p> <p>For example CH₄ is made up of one carbon and 4 hydrogen atom.</p> <p>Compounds has a completely different properties than its constituents elements</p>

a) Calcium. \rightarrow Element

b) Carbon dioxide \rightarrow Compound.

c) Salt and Water \rightarrow Mixture

d) Iron \rightarrow Element

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a) Periodic table contains the elements arranged in the order of increasing proton number.

b) Elements are arranged in horizontal row → *periods*
Vertical columns → *groups*

c) Metals are to the left and non metals are to the right

d) Elements in the same group have same number of electrons in the outermost shell and show similar chemical properties

Group → ↓ Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18							
1	1 H																	2 He							
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne							
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar							
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr							
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe							
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn							
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo							
				Lanthanides							57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
				Actinides							89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Source: Wikimedia Commons

Element

① Electron

Protons



Neutrons -



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BALANCING EQUATIONS

Law of Conservation of Mass :-

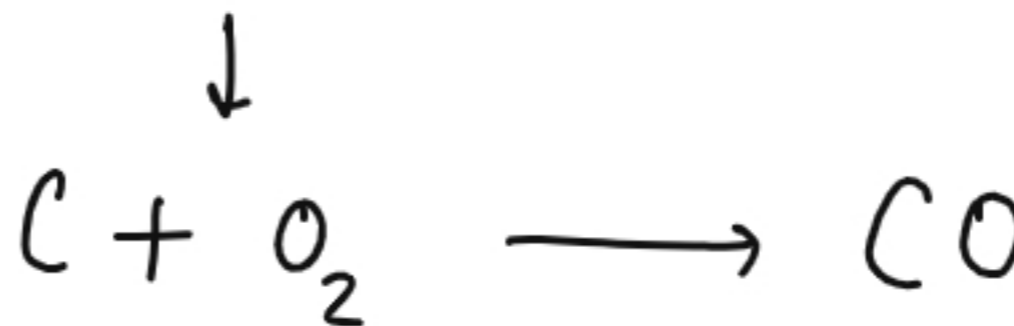
If reaction involves gases then the reaction must be carried out in the closed system to prevent the gas from escaping.

If the gas escapes from reaction mixture the law can be broken down.

In a chemical reaction, mass can neither be created nor destroyed. So the mass of reactant is always equal to the mass of products.



Balanced Chemical Equation



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BASIS	COMPOUNDS	MIXTURE
Composition	Fixed	Variable
Separation	Components cannot be separated by physical methods	Can be separated by physical methods
Properties	Compound has different property than its constituents	All the components retain their properties
Chemical Bond	Components are chemically bonded	Not chemically bonded
Chemical Reaction	Involved chemical reaction in formation	No Chemical reaction
Melting and boiling points	have sharp and fixed MP and BP	do not have sharp and fixed MP or BP
Examples	Water — H_2O Methane — CH_4 Hydrogen Chloride — HCl	Salt and Water Sugar and Water Oil and Water



SEPARATING MIXTURES

FILTRATION

→ Solid + liquid
(Insoluble)

→ Example: Sand + Water

CRYSTALLIZATION

Solid + liquid
(Soluble)

Example: Salt + water

Sugar + Water

DISTILLATION

- Solid + liquid
(Soluble)
 - liquid + liquid
- Oil and water or sand and water

FRACTIONAL DISTILLATION

Mixture of liquid with B.P close together.

Ethanol+water
Crude oil mixture

CHROMATOGRAPHY

Different Komponent in Solutions

FILTRATION

→ Solid component can be separated from a liquid using this technique.



FILTRATION

filter Paper.

residue.
(solid)

filter funnel.

Conical flask.

filtrate. (runoff liquid)

→ Solution runs off with soluble components and insoluble component like Sand stick to the filter paper as residue.

→ The run off is the filtrate which can be water or te solution with the dissolved components

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CRYSTALLIZATION or

EVAPORATION



Heating the mixture in an evaporating basin or water bath

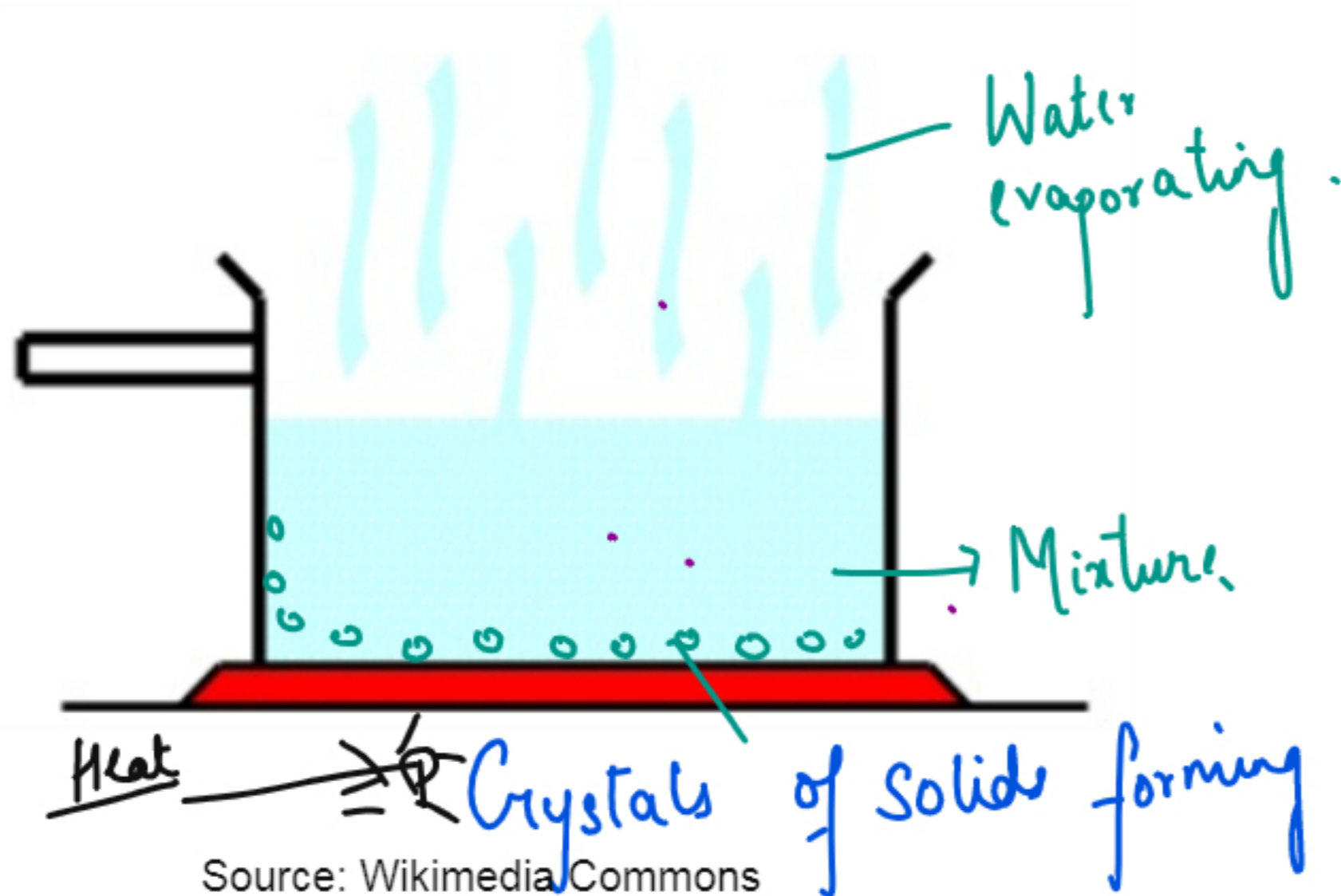


Water will evaporate leaving the crystals of solids behind.



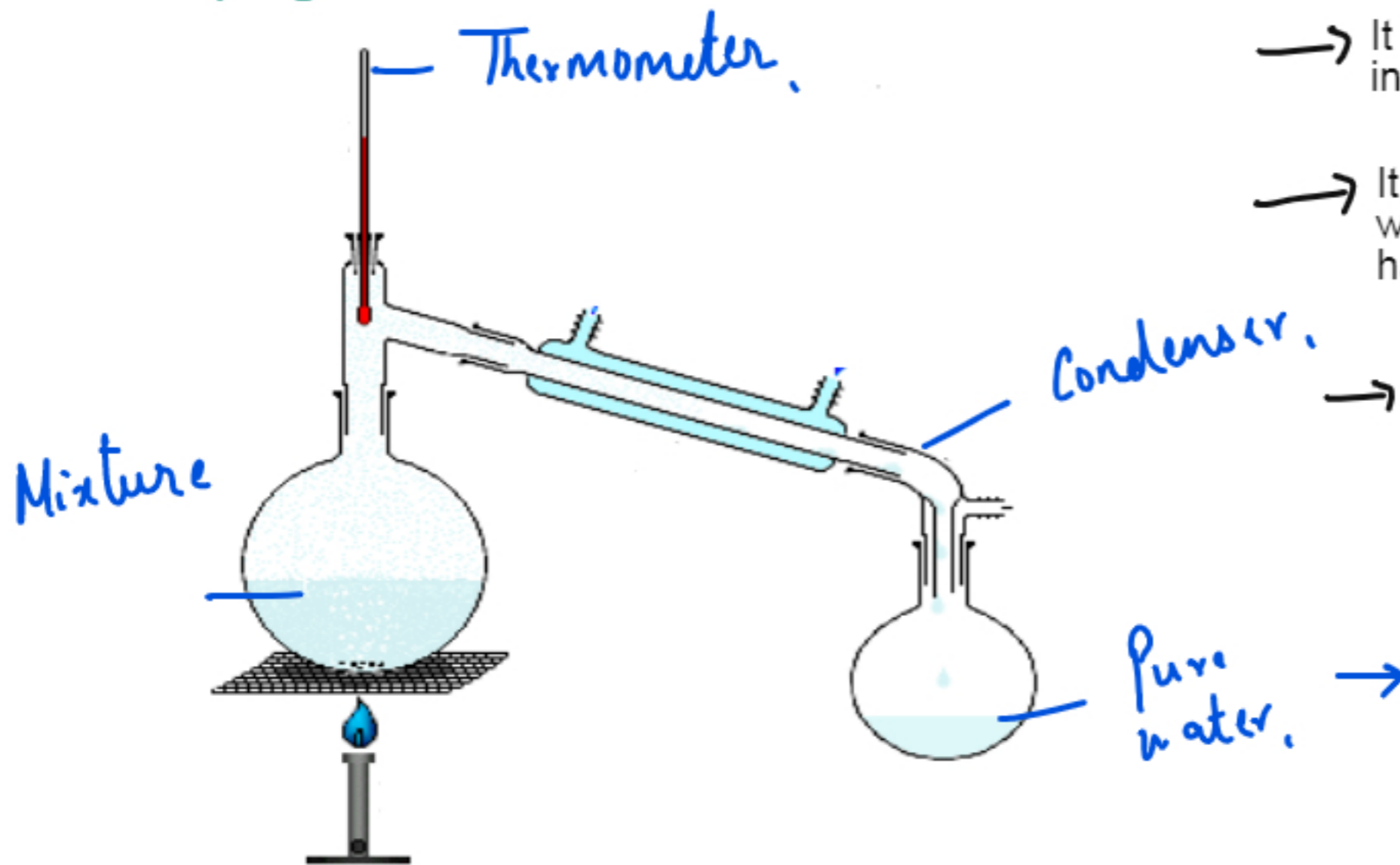
Solid can then be collected on a filter paper and dried.

eg Salt Water.



Source: Wikimedia Commons

DISTILLATION



→ It can be used to separate solid and a liquid in which solid is completely soluble in the solvent.

→ It can also be used to separate two liquids which are completely miscible in each other and have different boiling points.

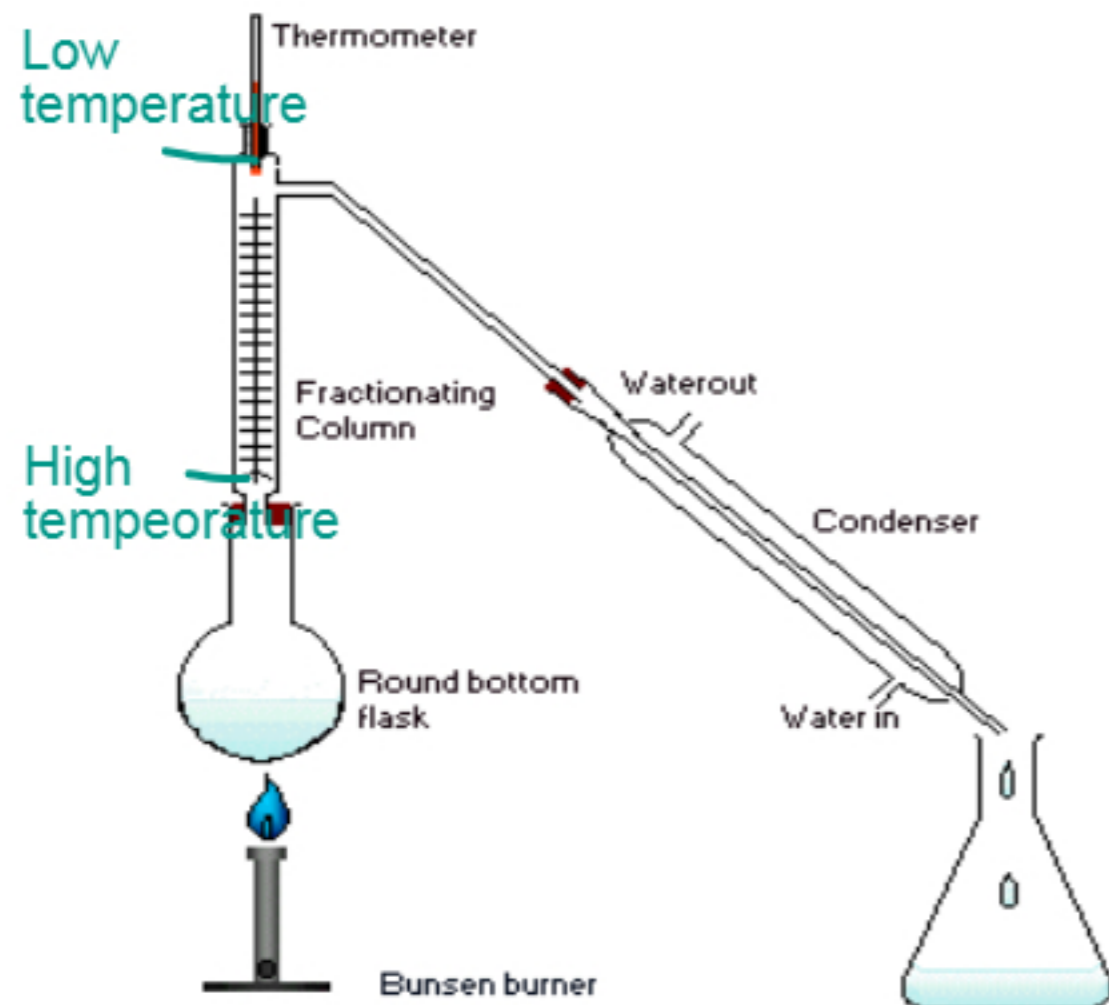
→ In evaporation solvent is allowed to evaporate leaving solid behind but in distillation solvent is evaporated and the vapours are passed on to the condenser which cools the vapour and collect the solvent in a separate container.

Pure water. →

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FRACTIONAL DISTILLATION

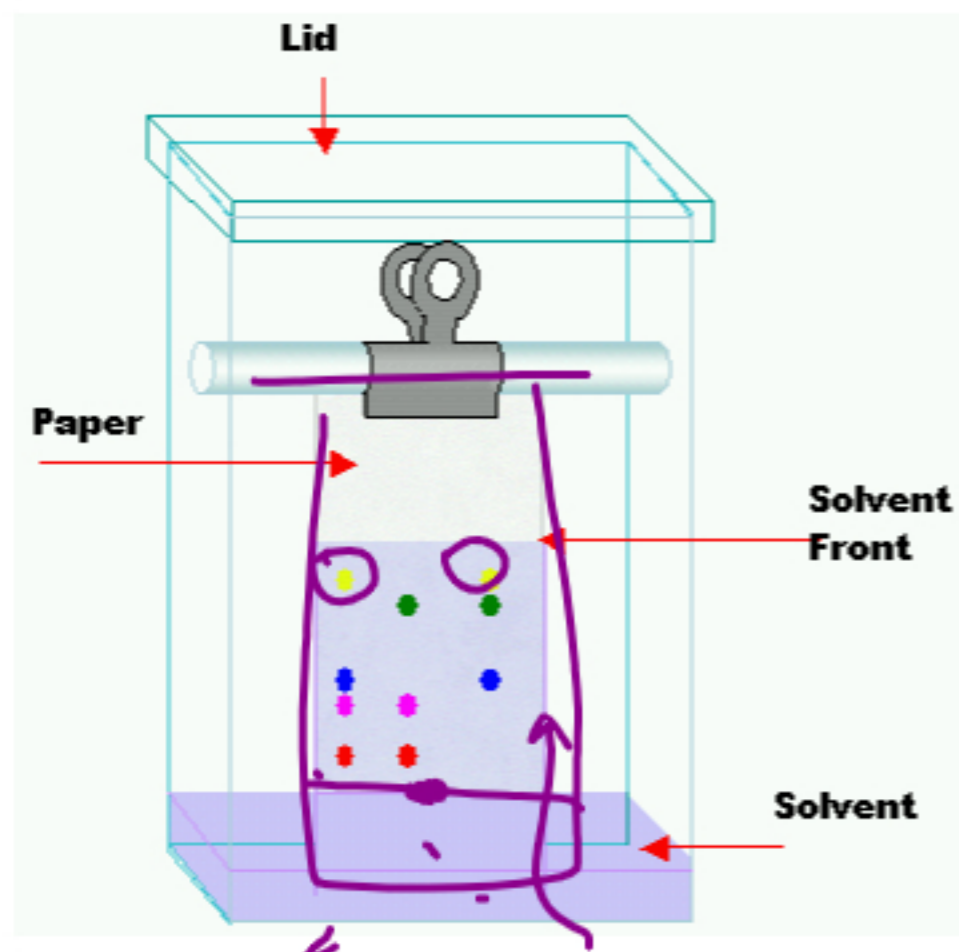


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- Used to separate two or more liquids with the similar boiling points. Distillation cannot effectively separate two or more liquids with similar boiling points.
- Round bottom flask is fitted with tall fractionating columns with glass beads which is connected to a condenser.
- The vapours first evaporate into the fractionating column and hit the glass beads
- Lower boiling point liquids will travel high up the column and reach the condenser and gets separated in the separate flask.
- High boiling point liquids hit the glass beads at the bottom, gets condensed and go back to the flask.

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CHROMATOGRAPHY



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- Components in the mixture are separated on the basis of solubilities of different components of the mixture in a suitable solvent.
- A capillary tube is used to spot the mixture on the chromatography paper.
- The paper is put inside a solvent and the solvent is allowed to run up the chromatography paper.
- The component of the mixture which is more soluble in the solvent will travel greater distance and will leave its mark near the top.
- The component which is less soluble will have a mark near the bottom.

Atoms → the smallest particle of the matter which contains electrons, protons and neutrons.

Elements → the substance made up of one type of atom.

Mixture → the substance made up of two or more elements or compounds which are not bonded chemically

Compound → substance made up of two or more atoms bonded chemically.

Periodic Table → table that contains all the known elements in the order of increasing proton number arranged in groups and periods.

Chemical Equation → Equation showing reactant and products of a reaction

Balanced Equation → Equation showing equal mass of product and reactants in an equation.

State Symbols → Symbols that indicate the physical state of each element in a reaction.

Filtration → technique used to separate insoluble solid and a liquid using a filter funnel and paper.

Crystallisation → Technique used to separate soluble solid from a liquid using evaporation

Distillation → Separation of components on the basis of boiling points.

Fractional Distillation → Separation of immiscible liquids which close boiling points in a fractionating column on the basis of difference in boiling points.

Chromatography → Technique used to separate the components of mixture on the basis of their solubilities in a given solvent.

Name the technique used to separate the following

Label as Element, Mixture or Compounds

a) Sand and Water —

b) Salt and Water —

c) Components of Ink —

d) Mixture of Crude Oil —

e) Copper Sulphate Solution —

Gold

Water

Carbon Dioxide

Sugar dissolved in water

Salt dissolved in water

How will you separate Salt and Sand ?

Name the technique used to separate the following

Label as Element, Mixture or Compounds

- a) Sand and Water — Filtration
- b) Salt and Water — Distillation
- c) Components of Ink — Chromatography
- d) Mixture of Crude Oil — Fractional Distillation
- e) Copper Sulphate Solution — Crystallization

Gold — Element

Water — Compound

Carbon Dioxide — Compound

Sugar dissolved in water — Mixtures

Salt dissolved in water — Mixtures

To separate salt and sand we can dissolve them in water .

Salt and Water will form a soluble solution with sand in it as insoluble solid.

The solution can then be filtered using filtration.

The insoluble sand will stick to the filter paper and the filtrate will contain salt and water.

The salt and water solution can then be evaporated using crystallization

The water will evaporate leaving salt behind.

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NEXT STEP !!!!



Check the specification



Do Exam Questions by topic on Atomic Structure

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