1 NATURE OF MATTER

1. PHYSICAL CLASSIFICATION OF MATTER

	♦	PHYSICAL CLASSIFICATION OF MATTER
	♦	PROPERTIES OF SOLID, LIQUID AND GASES
	♦	FOURTH AND FIFITH STATES OF MATTER

INTRODUCTION

Definition: "Anything that occupies space has mass and inertia property is called matter". Air, water, gold, silver, table, chair,milk and oil etc., are all different kinds of matterbecause all of them occupy space and mass.

The whole universe is composed **of Matter and Energy.**

Inertia: Fundamental property of matter by virtue of which anybody resists to change its original position.

Characteristics of matter:

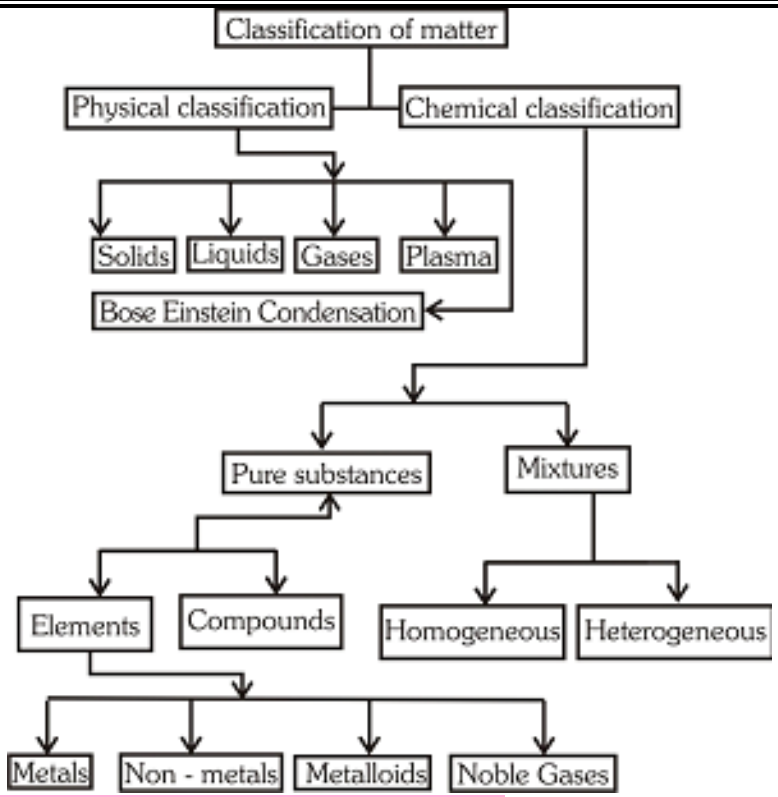
1. Matter is made up of tiny particles called **Molecules.**
2. The molecules in turn are made up of small particles called **Atoms.**
3. The molecules are so small that they are not visible to our naked eye.
4. Molecules of matter are in **constant vibration.**
5. All material bodies have mass and hence have weight
6. All materials occupy space.

In different states of matter, the arrangement of molecules is different.

Classification of matter:

As there are so many kinds of matter, a scientific study of matter becomes easier if we classify matter based on some characteristics. Matter can be classified based on two factors:

1. Physical classification
2. Chemical classification



PHYSICAL CLASSIFICATION OF MATTER

Matter is composed of extremely small particles. Based on the arrangement of these particles, matter is mainly divided into three types. They are solids, liquids and gases. These are also called physical states of matter. This classification is also based on differences of certain physical properties, namely, mass, volume, shape, rigidity, density and arrangement of particles. To understand the properties of solids, liquids and gases, we need to know the kinetic theory of matter.

KINETIC THEORY OF MATTER

The Kinetic Theory is a good way to relate the 'micro world' with the 'macro world.'

Following are the postulates of kinetic theory of matter

Composition of matter: All matter is made up of atoms, the smallest bit of each element or molecules.

Particles in motion: The particles of matter in a state of unending motion. The motion of atoms or molecules can be in the form of linear motion of translation, the vibration of atoms or molecules against one another or pulling against a bond, and the rotation of individual atoms or group of atoms. The motion is responsible for the particles to have kinetic energy.

Variation in kinetic energy: With the supply of heat energy (thermal energy) to matter, the kinetic energy of particles increases, i.e., they start moving more vigorously. Reverse happens, if the matter is cooled i.e., heat energy is taken.

Adhesive and cohesive forces: The particles of matter attract each other with a force. This force is called cohesive force, if the particles are of same kind and adhesive force, if the particles are of different kinds.

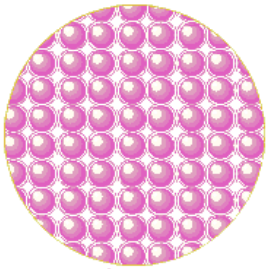
Inter-particular force of attraction: There exists a force between these particles known as Inter-particular force of attraction. This force decreases, if the distance between them increases and vice versa.

SOLIDS

The intermolecular force is very strong in solids. So, the molecules are very closely packed. They cannot move away from one another and can only vibrate about fixed positions. These facts explain the general properties of solids.

CHARACTERISTICS OF SOLIDS

- Solids have fixed shape and fixed volume.



Solid

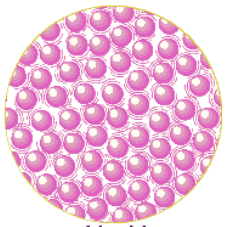
- Generally, solids cannot be compressed.
- A solid does not flow.
- A solid expands very little on being heated.
- Solids have very interparticle spaces and very high inter particle attraction.

LIQUIDS:

The intermolecular force in liquids is weaker than in solids. So, the molecules are farther apart and are not tightly held in their positions. Therefore, they can slip over one another. In other words, liquids can flow.

CHARACTERISTICS OF LIQUIDS:

- A liquid has no fixed shape. It takes the shape of its container.
- A liquid can be compressed only to a small extent.
- Liquids can flow.
- A liquid expands (or) contracts more than a solid.
- Liquids have more inter particle spaces and less inter particle attraction compared to solids.



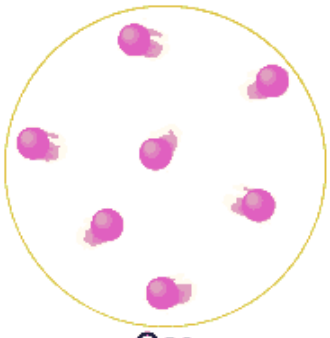
Liquid

GASES:

As you know, the intermolecular space is much larger, and the intermolecular force is much weaker in gases than in solids and liquids. Because of the very weak intermolecular force, gas molecules can move about much more freely than solid and liquid molecules. In fact, they can move about in all directions. Gases also flow. Liquids and gases are called fluids because of their ability to flow.

CHARACTERISTICS OF GASES:

- A gas has neither a fixed volume nor a fixed shape. It assumes the volume and shape of the container.
- Gases can be compressed to a much larger extent than solids and liquids.
- A gas expands to a greater extent on being heated.
- Gases freely mix with one another. Because the molecules of a gas can easily occupy the large intermolecular spaces of another gas. This property is known as diffusion.
- Gases have very large inter particle spaces and negligible inter particle attractions.


Gas

FOURTH STATE OF MATTER

The fourth state of matter is plasma. Plasma is an ionized gas, a gas into which sufficient energy is provided to free electrons from atoms or molecules and to allow both species, ions and electrons, to coexist. Plasma occurs naturally and makes up the stuff of our sun, on earth, plasma is naturally occurring in flames, lightning and the auroras. Most space plasmas have a very low density, for example the Solar Wind which averages only 10 particles per cubic-cm. Inter-particle collisions are unlikely - hence these plasmas are termed collision less.

FIFTH STATE OF MATTER

The collapse of the atoms into a single quantum state is known as Bose condensation or Bose-Einstein condensate is 5^{th} state of matter.

The Bose-Einstein condensate occurs at ultra-low temperature, close to the point that the atoms are not moving at all. A Bose-Einstein condensate is a gaseous superfluid phase formed by atoms cooled to temperatures very near to absolute zero. The first condensate was produced by Eric Cornell and Carl Wieman in 1995 at the University of Colorado at Boulder, using a gas of rubidium atoms cooled to 170 nanokelvins (nK). Under such conditions, a large fraction of the atoms collapse into the lowest quantum state, producing a superfluid. This phenomenon was predicted in the 1920s by SatyendraNath Bose and Albert Einstein, based on Bose's work on the statistical mechanics of photons, which was then formalized and generalized by Einstein.

1. PHYSICAL CLASSIFICATION OF MATTER

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

INTRODUCTION

1. Anything that occupies space and has mass is called:
   1) Material 2) Mixture 3) Matter 4) Symbol
2. Which of the following is/are matter?
   1) Water 2) Salt 3) Heat 4) Both (1) & (2)
3. Which is not an example of matter?
   1) Milk 2) Sound 3) Water 4) Glass
4. All materials around us are made up of:
   1) Substance 2) Matter 3) Metals 4) Glass

PHYSICAL CLASSIFICATION OF MATTER

5. The state of matter with definite shape among the following is/are:
   1) Ice 2) Lead 3) Diamond 4) All of these
6. How many states of matter are there based on physical state?
   1) 1 2) 2 3) 5 4) 0
7. The three states of matter differ in:
   1) Shape 2) Volume 3) Energy 4) All of these

PROPERTIES OF SOLID, LIQUID AND GASES

8. Which of the following has a fixed shape and a fixed volume?
   1) Milk 2) Water 3) Air 4) Sugar
9. Intermolecular space is negligible in:
   1) Gases 2) Solids 3) Water vapour 4) Both (1) & (3)
10. The state of matter in which particles move comparatively lesser is:
    1) Gas 2) Solid 3) Liquid 4) All of these
11. Which of the following has a fixed volume but not a fixed shape?
    1) Book 2) Brick 3) Oxygen 4) Milk
12. _____ have very weak intermolecular force of attraction.
    1) Solids 2) Liquids 3) Gases 4) Both (1) & (2)
13. The particles in _____ have weakest forces of attraction.
    1) Water 2) Iron 3) Steam 4) Chair

FOURTH AND FIFITH STATES OF MATTER

14. The fourth state of matter is:
    1) Solid 2) Liquid 3) Gas 4) Plasma
15. The fifth state of matter is:
    1) Solid 2) Gas
    3) Plasma 4) Bose Einstein Condensate

16. Bose Einstein Condensate was first produced by:
1) Eric Cornell 2) Carl Wieman 3) Lise Meitner 4) Both 1 and 2

LEVEL–II

INTRODUCTION

17. Which of the following is not a matter?
1) Sugar 2) Salt 3) Light 4) Food
18. The properties of living matter are:
1) It does not grow 2) It occupies space
3) It is invisible 4) All of these
19. The quantity of matter present in an object is called its:
1) Weight 2) Gram 3) Mass 4) Density
20. Matter is anything that has mass and occupies:
1) Density 2) Volume 3) Weight 4) Space

PHYSICAL CLASSIFICATION OF MATTER

21. The physical classification of matter is based on:
1) Arrangement of particles (molecules)
2) Chemical composition
3) Both (1) & (2)
4) Ductility
22. Which of the following is physical classification of matter:
1) Solid 2) Liquid 3) Gas 4) All of these

PROPERTIES OF SOLID, LIQUID AND GASES

23. The physical state of water in the polar ice caps and glaciers is:
1) Liquid 2) Gas 3) Solid 4) None of these.
24. _____ State of matter is incompressible.
1) Gaseous 2) Liquid 3) Solid 4) Both (1) & (2)
25. Liquids have:
1) Fixed shape and fixed volume 2) Fixed shape but variable volume
3) Variable shape but fixed volume 4) Variable shape and variable volume
26. The physical state of water at room temperature is:
1) Solid 2) Liquid 3) Gases 4) All of these
27. In which state do the particles of water possess maximum energy?
1) Solid state 2) Liquid state
3) Gaseous state 4) All three states possess same energy
28. When compressed, the volume of gas decreases. This happens because:
1) The quantity of matter has decreased
2) Some matter has escaped
3) Both (1) & (2) 4) Neither (1) nor (2)

FOURTH AND FIFITH STATES OF MATTER

29. In plasma state:
1) Ions and electrons co-exist 2) Atoms and molecules co-exist
3) Atoms and ions co-exist 4) Molecules and protons co-exist

30. The collapse of the atoms into a single quantum state is known as:
1) Plasma 2) Quantum state
3) Bose condensation 4) Bombardment state

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

31. The least compressible form of matter is:
1) Solids and gases 2) Liquids and gases
3) Solids and liquids 4) Solids only

32. Choose the correct order of physical states at room temperature for the following:
a) Water b) Milk c) Oxygen
1) a→Liquid, b → Liquid, c → Gas 2) a→ Liquid, b → Solid, c → Gas
3) a→ Gas, b → Solid, c →Liquid 4) a → Solid, b →Gas, c → Liquid

33. One of the important characteristics of particles of matter is:
1) Position of the atoms in space 2) Force of attraction between atoms
3) Length of the bond between atoms 4) Number of atoms in a substance

34. (i) Any material which has a definite volume but no definite shape and has one free surface is _____.
(ii) Any material which has neither definite shape nor free definite volume is easily compressible and has no free surface is _____.

	(i)	(ii)
1)	Solid	Liquid
2)	Liquid	Solid
3)	Gas	Solid
4)	Liquid	Gas

35. Which state of matter do not settle to the bottom of the container?
1) Solid 2) Gas 3) Liquid 4) None of these

36. Plasma state is generally observed at _____ temperature.
1) Below 0^0C 2) Room temperature
3) 100^0C 4) Very high temperature

LEVEL–IV

STATEMENT TYPE QUESTIONS

37. Statement I: Solids cannot be compressed.
Statement II: This is due to compact arrangement of molecules.
1) Both statements are true
2) Both statements are false.
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true.

38. Statement I: Gases have a definite mass but no definite volume or shape and are not rigid at all.
Statement II: The intermolecular spaces are very small and so intermolecular force of attraction is negligible.
1) Both statements are true.
2) Both statements are false.
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true.

MULTI CORRECT ANSWER TYPE QUESTIONS

39. Choose the correct statement(s).
1) Solids do not diffuse.
2) The density of liquids relatively less than solids.
3) Gases exert pressure in all directions.
4) None of the above.

40 Choose the incorrect statement(s).
1) Solid has no definite shape.
2) Solids do not need a container to hold them.
3) Solids have no definite volume.
4) Solids do not expand on heating.

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE-1

Solids have fixed shape and volume. A liquid has no fixed shape. A gas has neither a fixed volume nor a fixed shape

41. Which of the following has a fixed volume but not a fixed shape?
1) Milk 2) A book 3) A pen 4) Oxygen

42. Select the properties for A, B & C
A – Hydrogen gas B – A water droplet, C – A piece of brick

	A	B	C
1)	Minimum inter molecularspace	Particles are free to move	Force of attraction between particles is negligible
2)	Maximum inter molecular space	Force of attraction between particles is negligible	Particles are free
3)	Maximum inter molecular space	Particle are free to move	Minimum inter molecular space
4)	Particles are free to move	Minimum inter molecular space	Maximum inter molecular space

43. The correct decreasing order of intra molecular forces among the following oxygen (I), water (II) and sugar (III) is:
1) I > II >III 2) III > II > I 3) II > I > III 4) I > III > II

MATRIX MATCH TYPE QUESTIONS

44.

COLUMN-I	COLUMN-II
a) Steel	p) Particles are very loosely packed.
b) Oxygen	q) Very strong intermolecular force of attraction.
c) Water	r) Very large intermolecular spaces
d) Air	s) Particles are free to move

2. INTER CONVERSION OF MATTER

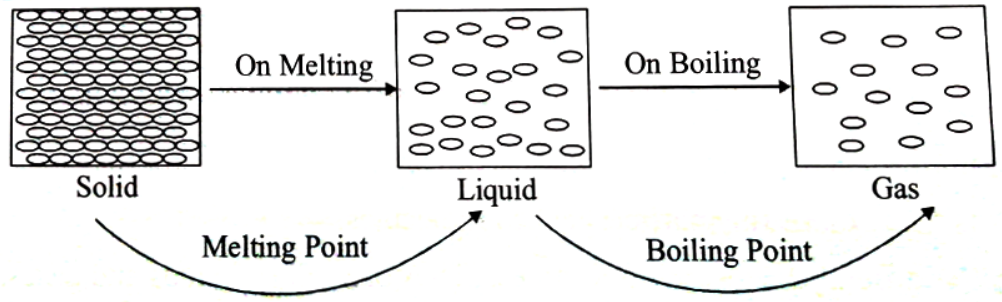
	♦	MELTING AND MELTING POINT
	♦	BOILING AND BOILING POINT
	♦	EVAPORATION
	♦	CONDENSATION FREEZING
	♦	SUBLIMATION

Matter exists in five different states. For a given substance, its state of matter is not permanent i.e., a given state of matter, can always be changed to other states of matter, by altering conditions of temperature and pressure. This phenomenon of change of matter, from one state to another state and back to original state, by altering the conditions of temperature and pressure, is called inter conversion of matter.

ALTERING THE TEMPERATURE OF MATTER:

INTER CONVERSION OF MATTER, ON HEATING:

A block of ice at 0^0C, placed in a beaker and heated. It changes to liquid water. Heat the water till it boils. It slowly gets converted to vapour (gas). From this observation, it is clear that, the solids convert into liquids and liquids in turn convert to gas, on heating.

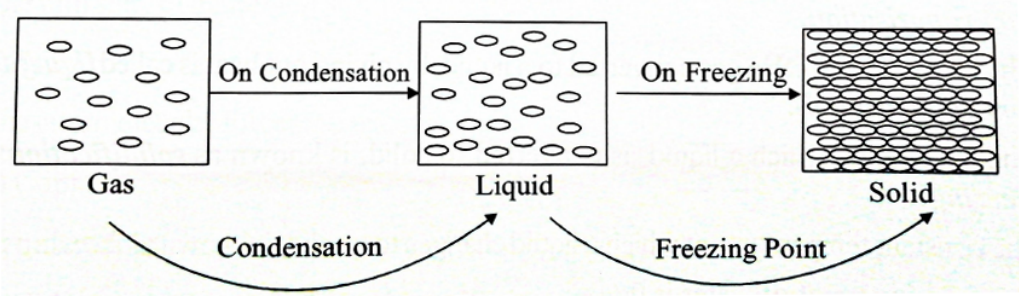


Don't be confused with temperature and heat. Heat is a form of energy while temperature talk about the quantity of heat present in anybody.

INTER CONVERSION OF MATTER BY COOLING:

Collect some water vapour (gas) and cool it. We will notice that it becomes liquid water. On cooling further, the liquid water gets converted to ice (solid). A reverse process of heating is taking place on cooling. That is, a gas is converted to liquid and liquid is converted to solid, by cooling.

The melting point of ice 0^0C or 273 K. The boiling point of water is 100^0C or 373 K.



MELTING: The process of changing a solid substance into liquid by heating is called **melting.** For example, when ice (solid) changes into water (liquid), it is called melting of ice. A solid substance can be melted only by applying heat. The melting of a substances takes place at a fixed temperature. The temperature at which a solid substance melts and changes into a liquid is called melting point of the substance.

EVAPORATION:

The gaseous state of a liquid is also called its vapour state. Most of the liquids keep on changing into vapours slowly even at room temperature. The changing of a liquid into vapours (or) gas is called evaporation.The evaporation of a liquid can take place at all temperatures.

BOILING:

When a liquid is heated continuously, then its temperature goes on rising and its evaporation (changing into vapours) takes place faster and faster. At a certain temperature, the liquid changes into vapours (a gas) very rapidly and we say that the liquid has started boiling. The rapid changing of a liquid into vapours (or) gas on heating is called boiling. The boiling of a liquid takes place at a fixed temperature. The temperature at which a liquid boils and changes into vapours (or gas) very rapidly is called boiling point of the liquid for example, water boils at a temperature of 100^0C to form a gas is called steam, so the boiling point of water is 100^0C.

CONDENSATION:

We have just seen when water is heated, it changes into steam (or) water vapour. The reverse of this is also true. That is, if we cool the steam, it changes back into water (liquid state). The process of changing a gas (or) vapours into a liquid by cooling is called condensation.

Thus, when steam (or) water vapours is cooled, it condenses to form liquid water.

FREEZING:

We have seen that when ice is heated, it melts to form water. The reverse of this is also true. That is, when water is cooled, it changes into ice. The process of changing liquid into solid by cooling, is called **freezing.** For example, when

water is cooled, its freezes to form ice. The change of state from liquid to solid is also called freezing (or) solidification.

SUBLIMATION:

A few substances change directly from solid to gas on heating without coming into liquid state. This process is called sublimation,and such substances are called sublimates. For example: iodine, ammonium chloride, camphor and naphthalene.

DEPOSITION:

A change in which when gases are directly changes to solid state without changing liquid state is called deposition

INTER CONVERSIONS:

The terms involved	Process of change from- (at particular temperature)
Melting	Solid state toliquid state
Vaporization	Liquid state to gaseous state
Liquefaction	Gaseous state toliquid state
Solidification	Liquid state tosolid state
Sublimation	Solid state togaseous state
Deposition	Gaseous state to solid state

DIFFERENCES BETWEEN MELTING AND VAPORISATION:

Melting	Vaporisation
1. Particles gain energy	1. Particles gain energy
2. Intermolecular attraction decreases	2. Intermolecular attraction decreases
3. Intermolecular space between molecules of solid increases	3. Intermolecular space between molecules of liquid increases
4. At melting point, particles become free from fixed position and convert into a liquid.	4. At boiling point, particles become completely free and convert into gas [vapour].

DIFFERENCES BETWEEN LIQUEFACTION AND SOLIDIFICATION:

Liquefaction	Solidification
1. Particles lose energy	1. Particles lose energy
2. Intermolecular attraction increases	2. Intermolecular attraction increases
3. Intermolecular space between molecules of gases decreases	3. Intermolecular space between molecules of liquid decreases
4. At liquefaction point, particles slow down, come close and convert into a liquid.	4. At solidification [freezing] point, particles slow down and convert into a solid.

2. INTER CONVERSION OF MATTER

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

MELTING AND MELTING POINT

1. The process by which a solid changes to liquid by absorbing heat, is called:
   1) Boiling 2) Vaporisation 3) Melting 4) Heating
2. The temperature at which the solid melts to become a liquid at the atmospheric pressure is called:
   1) Boiling point 2) Melting point 3) Freezing point 4) None

BOILING AND BOILING POINT

3. The rapid changing of a liquid into vapours (or) gas on heating is called:
   1) Boiling 2) Melting 3) Heating 4) None of these
4. The temperature at which a liquid boils and changes into vapours (or gas) very rapidly is called:
   1) Boiling point 2) Melting point
   3) Vapourisation 4) None of these

EVAPORATION

5. The changing of a liquid into vapours (or) gas is called:
   1) Evaporation 2) Sublimation 3) Condensation 4) None of these
6. The process by which wet clothes dry up is called:
   1) Boiling 2) Evaporation 3) Condensation 4) None

CONDENSATION FREEZING

7. The process a gas is converted to a liquid by giving out heat is:
   1) Liquefaction 2) Condensation 3) Boiling 4) Both (1) & (2)
8. The process, by which a liquid gets converted to a solid is known as:
   1) Solidification 2) Freezing 3) Condensation 4) Both (1) & (2)

SUBLIMATION

9. A few substances change directly from solid to gas on heating without coming into liquid state is called:
   1) Evaporation 2) Condensation 3) Sublimation 4) None
10. The gaseous form of solid during sublimation is _____.
    1) Sublimate 2) Filtrate 3) Sediment 4) Sublime

LEVEL–II

MELTING AND MELTING POINT

11. The melting point of ice is:
    1) 0^0C 2) 100^0C 3) 273 K 4) Both (1) & (3)
12. Matter changes from one state to another state by changing:
    1) Temperature 2) Pressure 3) Volume 4) Both (1) & (2)

BOILING AND BOILING POINT

13. When water vaporizes at room temperature, it changes to:
    1) Ice 2) Steam 3) Fog 4) Water vapour
14. SI unit of temperature is:
    1) Kelvin 2) Celsius 3) Both (1) & (2) 4) None of these

EVAPORATION

15. During summer water kept in an earthen pot becomes cool because of the phenomenon of:
    1) Diffusion 2) transpiration 3) Osmosis 4) Evaporation
16. Evaporation occurs only:
    1) After boiling 2) At surface of a liquid
    3) After extreme cooling 4) None of these

CONDENSATION FREEZING

17. The freezing point of water is:
    1) 0^0C 2) 100^0C 3) 373 K 4) None of these
18. Which process is accompanied by the cooling of gases?
    1) Evaporation 2) Vaporisation 3) Freezing 4) Condensation

SUBLIMATION

19. Ammonium chloride and common salt are the constituents of a mixture, the separation technique used to separate these constituents is:
    1) Using gravity 2) Using solvents
    3) Magnetic separation 4) Sublimation

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

20. The melting point temperature of the solid state and freezing point temperature of the liquid state of the same substance are:
    1) Both same 2) Both different 3) Can't say 4) None of these
21. When liquid starts boiling, further heat energy which is supplied:
    1) Is lost to the surroundings as such
    2) Increase the temperature of the liquid
    3) Increase the kinetic energy of the particles in the liquid
    4) Is absorbed as latent heat of vaporization by the liquid
22. Dry ice is produced under:
    1) Low pressure and high temperature 2) High pressure and low temperature
    3) Low pressure and low temperature 4) High pressure and high temperature
23. The liquefaction point of gases is:
    1) 0^0C 2) 100^0C 3) 273^0C 4) None

24. A gas can be best liquefied:
1) By increasing the temperature
2) By lowering the pressure
3) By increasing the pressure and reducing the temperature
4) None of these is correct

LEVEL–IV

STATEMENT TYPE QUESTIONS

25. Statement I: The process of changing a gas into a liquid by cooling is called liquefaction.
Statement II: When steam is cooled to form water.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

26. Statement I: Ammonium chloride on heating directly change to gaseous state.
Statement II: Some solids on heating, directly change into gaseous state, without changing into liquid state in sublimation process.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

27. The process involved in cloud formation are:
1) Freezing 2) Sublimation 3) Evaporation 4) Condensation

28. Addition of impurities to water:
1) Increases the boiling point of water
2) Decreases the freezing point of water
3) Decreases the boiling point of water
4) Does not affect the freezing or boiling point of water

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE:

Inter conversion of matter involves change of state of matter from one state to another state and back to its original state due to change in temperature and pressure

29. Solids vaporize without melting into liquid this process is involved in:
1) Evaporation 2) Sublimation 3) Condensation 4) Liquefaction

30. The change in state from liquid to gaseous state is known as:
1) Vaporisation 2) Condensation 3) Evaporation 4) Both 1 and 3

31. At constant temperature in the liquid changes into a solid state is called:
1) Melting point 2) Boiling point 3) Freezing point 4) Liquefaction

MATRIX MATCH TYPE QUESTIONS

32.

COLUMN – I	COLUMN – II
a) Increase in surface area	p) Surface phenomenon
b) Evaporation	q) Evaporation decrease
c) Decrease in surface area	r) Bulk phenomenon
d) Boiling	s) Evaporation increase

3. CHEMICAL CLASSIFICATION OF MATTER

	♦	PURE SUBSTANCES
	♦	METALS
	♦	NON-METALS
	♦	METALLOIDS AND INERT GASES
	♦	COMPOUNDS

THE CHEMICAL CLASSIFICATION OF MATTER:

The chemical classification of matter is into two types

1. Pure substances 2. Mixtures

PURE SUBSTANCE:

The substance containing particles of only one kind are called pure substances.

Ex: Iron, silver, oxygen, carbon dioxide, sodium chloride etc. Pure substances are further divided into elements and compounds.

ELEMENTS: Substances, which cannot be broken further into any other substances by any physical means are called 'element'.

Ex: Hydrogen, oxygen, nitrogen, sulphur, carbon etc...

CHARACTERISTICS OF ELEMENTS:

Nature: An element is pure and homogeneous substance

Melting and boiling points: It has characteristic melting and boiling points.

Separation of compounds: An element cannot be broken-down into simpler substances,by any physically (or) chemical means.

Nature of atom: An element is made up of same kind of atoms.Different elements are made up of different kinds of atoms.

Chemical reaction: An element may chemically react with other element(s) to from compound(s).For example,hydrogen combine with oxygen to form water and chlorine to form hydrogen chloride.

CLASSIFICATION OF ELEMENTS:

There are more than 118 elements known today, out of these, 92 elements are naturally occurring elements and remaining areartificially synthesized. On the basis of their general characteristics, the broadly divided into four groups.

1.Metals 2.Non-metals 3. Metalloids 4. Inert gas

METALS:

The substance which conducts electricity is called metal (or) Elements which 1,2 and 3 electrons in valence shell is called metal.

- Most of the elements are metals

- Out of the 118 elements known, 82 elements are metals
- Most abundant metal in earth crust is aluminium followed by iron
- Metals are solid state at room temperature except mercury, which is a liquid state at room temperature.
- Metals are malleable which means that they can be hammered into thin sheets. Gold and silver are the most malleable metals.
- Metals are ductile i.e., they can be drawn into the wires. Gold is most ductile followed by silver, copper and aluminium
- Metals are good conductors of heat and electricity. Silver is the best conductor and lead is the poorest conductor of heat. Silver is thebest conductor of electricity followed by copper, gold, aluminium and tungsten.
- Metals have lustre i.e., they have shining surfaces. Silver has a shining white surface, gold has yellow, and copper has reddish brown
- Metals have high tensile strength. Sodium and potassium are quitesoft hence have low tensile strength.
- Metals are generally hard. Sodium and potassium are soft and canbe cut with a knife.
- Metals are sonorous i.e., they produce a ringing sound when hit.
- Metals have generally high densities
- Metals have generally high melting and boiling points. Sodium and potassium have low melting points (371 and 336 K respectively)
- Gallium and cesium become liquid at slightly higher temperature than room temperature (303 K).

NON – METALS:

The substance which do not conduct electricity is called non metal

(or) Elements which have 5, 6 & 7 electrons in valence shell is called non-metal.

- Most abundant non-metal in earth crust is oxygen followed by silicon
- Non-metals are either gases, liquids or solids at room temperature. Bromine is liquid at room temperature. Boron, carbon, sulphur and phosphorus are solids. Hydrogen, oxygen, nitrogen, etc., are gases.
- Non – metals are brittle. They are not malleable or ductile. They break into pieces when hammered
- Non – metals are bad conductors of heat and electricity. Graphite an allotropic form of carbon is good conductor of electricity due to its special crystalline structure in which one electron of carbon remains free.
- Non-metals have nolustre. Solid non – metals have generally dull surfaces. Iodine has a shining lustre and a crystalline structure.
- Non–metals are generally soft. Diamond, an allotropic form of carbon, is the hardest natural substance known

- Non–metals have low tensile strength i.e., they are not strong and their bonds break easily.
- Non–metals are non – sonorous
- Non–metals have comparatively low melting and boiling points except boron, graphite and diamond which have high boiling points.

METALLOIDS:

Elements which exhibit some properties of metals and some properties of non-metals are called metalloids.

Ex: Boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb) tellurium (Te) &polonium (Po)

INERT GASES:

These elements are found in air in the form of gas in very small amounts, therefore, sometimes are called rare gases or inactive gases. They are called noble gases because they do not react chemically with any known element.

Ex:Helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe) &radon (Rn)

Note:

Helium is the second lightest element after hydrogen.

Radon is given out by the radioactive emission from earth.

ATOM:

The smallest particle of an element that retains the properties of the element is called the **atom** of the element.

MOLECULE:

An atom can sometimes exist alone and sometimes in groups. A group of atoms is called a **molecule.** A molecule can always exist by itself. A molecule may contain similar or dissimilar atoms.

Ex: molecules with similar atoms: O_2, H_2, Cl_2 and molecules with dissimilar:CaO, MgO

Atoms of most elements can exist alone, e.g. iron, gold, aluminium or silver. But in certain gaseous elements, such as hydrogen, nitrogen, oxygen, chlorine or iodine, atoms cannot exist alone. They can exist only in pairs. A molecule of these elements contains two similar atoms. Some molecules even contain three similar atoms. For example, ozone gas has three atoms of oxygen.

We can therefore define a molecule as:

A molecule is the smallest particle of an element or a compound that can exist by itself.

The molecule of an element contains one or more atoms of the same kind. The molecule of a compound contains two or more atoms of different kinds.

From the above discussions, we can conclude the following facts.

1. The smallest particle of compound is known as its **molecule.**

2.The molecules of compounds can be broken down into the elements from which they are made.

3. A molecule is the smallest particles of an element or a compound, which shows all the properties of that substance (element or compound).

4. Symbol represents one atom of an element. On the other hand, molecular formulae represent one molecule of an element or a compound.

COMPOUNDS:

A compound is a pure substance, which is composed of two or more elements combines chemically in a fixed proportion by weight and can be broken into smaller parts or elements by chemical methods only. Most of the elements do not exist in elementary form in nature.

Formula of a compound: By combining the elements in different combinations, we can make an endless number of compounds. Each compound is represented by a formula.

Following information is given by the formula of a compound:

It tells which elements are present in a compound.

It tells the number of atoms of each element present in a compound.

Definition of formula:

A symbolic representation of one molecule of a compound representing the number of atoms of various elements present in it, is called formula of compound.

How to read information in the formula of a compound?

The symbols in a formula can be prefixed or suffixed by a numeral. When the numeral is written on the left-hand side before the formula, it represents number of molecules of the compound and, hence the number of atoms present in each molecule.

For examples: When we write 2S, 3C*l* or 4A*l*, it means two atoms of sulphur, three atoms of chlorine or four atoms of aluminium respectively.

When we write 2NaC*l*, 4ZnO, etc., it means two molecules of sodium chloride (which contain two atoms of sodium and two atoms of chlorine), four molecules of zinc oxide (which contain four atoms of zinc and four atoms of oxygen) respectively.

When the numeral is written on the right bottom side of the symbol, it represents the number of atoms in one molecule of a compound.

For example: When we write H_2, O_2 etc., it means that one molecule of hydrogen has two atoms in it. Similarly, one molecule of oxygen has two atoms in it.

When we write SO_2, it means one molecule of sulphur dioxide has one atom of sulphur and two atoms of oxygen.

When we write $Al_2(SO_4)_3$, it means a molecule of aluminium sulphate has two atoms of aluminium, three atoms of sulphur and twelve atoms of oxygen.

When we write $3KNO_3$, it means there are three molecules of potassium nitrate. Furthermore, total numbers of various atoms in three molecules are: three atoms of potassium, three atoms of nitrogen and nine atoms of oxygen.

In homo atomic compounds atoms of same elements are present.

3. CHEMICAL CLASSIFICATION OF MATTER

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

PURE SUBSTANCES

1. The substance containing particles of only one kind are called:
   1) Impure substances 2) Pure substances
   3) Both (1) & (2) 4) None of these
2. Substances which cannot be broken further into any other substances by any physical means are called:
   1) Element 2) Atom 3) Molecule 4) None of these
3. The smallest particle of matter which cannot exist independently is called:
   1) Molecule 2) Atom 3) Compound 4) None of these

METALS

4. The substance which conduct electricity is called:
   1) Metal 2) Non-metal 3) Metalloid 4) None
5. The first most abundant metal in earth crust is:
   1) Iron 2) Aluminum 3) Sodium 4) Calcium
6. Metals can be hammered into thin sheets. This property is called:
   1) Density 2) Malleability 3) Ductility 4) Strength
7. The metals that is a liquid at 30^0C (room temperature is 25^0C) is:
   1) Mercury 2) Francium 3) Cesium 4) Both (1) & (3)

NON-METALS

8. The substance which do not conduct electricity is called:
   1) Metal 2) Non-metal 3) Noble gas 4) Metalloid
9. The second most abundant non-metal in earth crust is:
   1) Nitrogen 2) Chlorine 3) Silicon 4) Boron
10. The non-metal that is extremely hard is:
    1) Diamond 2) Sulphur 3) Phosphorous 4) Graphite

METALLOIDS AND INERT GASES

11. Elements which exhibits some properties of metals and non-metals are called:
    1) Metals 2) Non-metals 3) Metalloids 4) Noble gases
12. Which of the following elements are chemically inert?
    1) All metals 2) All non-metals 3) All metalloids 4) Noble gases
13. Which of the following is noble gas?
    1) He 2) H 3) Li 4) O

COMPOUNDS

14. When two or more elements combine chemically in a fixed proportion by weight is called:
    1) Mixture 2) Compound
    3) Atom 4) None of these
15. H_2SO_4 represents as:
    1) Compound 2) Mixture 3) Alloy 4) Element

LEVEL–II

PURE SUBSTANCES

16. Which of the following is a pure substance?
    1) Iron 2) Silver 3) Oxygen 4) All of these
17. Which of the following is an element?
    1) Hydrogen 2) Oxygen 3) Nitrogen 4) All of these
18. Which of the following is a pure and homogeneous substance?
    1) Oil in water 2) Oxygen 3) Sand in water 4) All of these

METALS

19. Which of the following is liquid at ordinary temperature?
    1) Germanium 2) Gallium 3) Gold 4) Galena
20. The physical property for making the heating element in electrical appliances is:
    1) High electrical conductivity 2) High density
    3) High melting point 4) High tensile strength
21. The property of metals by virtue of which their surface shines, is:
    1) Sonority 2) Ductility 3) Lustre 4) Malleability

NON METALS

22. The non-metal that is an excellent conductor of electricity:
    1) Gas carbon 2) Graphite
    3) Both (1) and (2) 4) None

METALLOIDS AND INERT GASES

23. The approximate number of metalloids are:
    1) 7 2) 33 3) 92 4) 104
24. He, Ne, Ar, Kr, Xe, Rn are known as:
    1) Trace elements 2) Rare gases
    3) Inert gases 4) All the above

COMPOUNDS

25. Which of the following is not a compound?
    1) Marble 2) Coal 3) Washing soda 4) Quick lime

26. Identify which of the following is / are compounds:
1) NaCl 2) $AlCl_3$ 3) HgS 4) All the above

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

27. When a substance X is hit with a hammer, it expands in size but does not break. This is because the substance is:
1) Ductile 2) Hard 3) Elastic 4) Malleable

28. Which of the following is the property of non-metals?
1) Low densities 2) Low melting points
3) Poor conductors 4) All of these

29. The property by virtue of which a substance can bear a lot of strain without breaking is called:
1) Malleability 2) Ductility 3) Tensile strength 4) Conductivity

30. The metal which is soft is:
1) Na 2) Al 3) Cu 4) Pb

31. In the long form of periodic table, all the non-metals are placed in:
1) s-block 2) p-block 3) d-block 4) f-block

LEVEL–IV

STATEMENT TYPE QUESTIONS

32. Statement-I: The substance containing of only one kind of atoms or molecules are called pure substances.
Statement-II: An element cannot be broken down into simple substance by any physical or chemical means.
1) Both Statements are true
2) Both Statements are false
3) Statement I is true. Statement II is false
4) Statement I is false. Statement II is true

33. Statement I: A symbolic representation of one molecule of a compound representing the number of atoms of various elements present in it, is called formula of compound.
Statement II: Formula of aluminiumsulphate is $Al(SO_4)_3$
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true.

34. Statement I: Formula of compound tells the elements present in a compound.
Statement II: A pure chemical compound is homogeneous in nature.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

35. Which of the following metals are not ductile?
1) Zinc 2) Gallium 3) Bismuth 4) Mercury

36. Which of the following statements is / are true?
1) Bromine is a liquid non-metal at room temperature
2) Iodine is a solid state
3) Graphite is a non-metal
4) Mercury is the liquid non-metal at room temperature

37. Correct statement is/are:
1) Compounds are always homogeneous
2) Properties of compound are different from the properties of their substances
3) Formation of compound energy is absorbed or released
4) Formula of calcium carbonate is $CaCO_3$

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE:

Elements are divided into three types they are metals, non-metals and metalloids. Some non-metals are very rare in atmosphere which are chemically inert. Some elements show both metals and non-metals characteristics called metalloids.

38. Which of the following element is not chemically inert?
1) He 2) Ne 3) Na 4) Ar

39. Which of the following is soft metal?
1) Li 2) Na 3) K 4) All of these

40. Tellurium is a:
1) Metal 2) Non-metal 3) Metalloid 4) Inert gas

MATRIX MATCH TYPE QUESTIONS

41.

COLUMN – I	COLUMN – II
a) Liquid metal at 29^0C	p) Cesium
b) Radioactive elementsmelt at 27^0C is	q) Xenon
c) Liquid metal at 30^0C	r) Gallium
d) Inactive element	s) Francium
	t) Uranium

4. IMPURE SUBSTANCES

	♦	MIXTURES
	♦	CHARACTERISTICS OF MIXTURES

MIXTURES:

If two or more substances (elements, compounds or both) mixed together in any proportion, do not undergo any chemical change, but retain their characteristics, the resulting mass is called mixture.

TYPES OF MIXTURES:

Mixtures can be classified into two types. They are

1) Homogeneous mixtures 2) Heterogeneous mixtures

HOMOGENEOUS MIXTURE:

A mixture in which different constituents are mixed uniformly is called homogeneous mixture.

Examples: Brass is an alloy of copper and zinc and is a homogeneous mixture. Similarly, all solutions are homogeneous mixtures.

HETEROGENEOUS MIXTURE:

A mixture in which various constituents are not mixed uniformly is called heterogeneous mixture.

Ex: Oil in water, sand in water.

CHARACTERISTICS OF MIXTURE:

Variable composition: The constituents of a mixture are present in any ratio.

Ex: A mixture of sand and salt can be in a ratio of 1:2 or 5:6, etc.by weight.

PHYSICAL CHANGE:

The mixture is a result of a physical change. The constituents of a mixture do not bind each other by chemical bonds.

No specific properties:

The properties of a mixture are the average of the properties of its constituents.

HOMOGENEITY:

Most of the mixtures are heterogeneous, i.e., their constituents are not spread evenly throughout. However, some mixtures are homogeneous. Example: In the mixture of iron and sulphur, at some places iron is more and at some places sulphur is more.

SEPARATION:

Generally, the constituents of mixture can be separated by employing suitable physical means.

Ex: Iron can be separated from the mixture of iron and sulphur with the help of a magnet.

ENERGY CHANGES:

No energy is released or absorbed during the formation of a mixture.

Ex: On mixing iron and sulphur, heat energy is neither absorbed nor evolved.

DIFFERENCE BETWEEN MIXTURE AND COMPOUND:

S. No	MIXTURE	COMPOUND
1	**Nature** When two or more elements or compounds or both are mixed together, such that they don't combine chemically, a mixture is formed	**Nature** When two or more elements unite chemically, a compound is formed
2	**Structure** Mixtures are generally heterogeneous, e.g., mixture of sand and salt or iron and sulphur, however some mixtures can be homogeneous	**Structure** Compounds are always homogeneous
3	**Composition** In case of mixtures their constituents can be present in any ratios, i.e., mixtures have variable proposition	**Composition** In case of compounds constituents are present in a fixed ratio by weight
4	**Properties** The constituents of a mixture retain their individual physical and chemical properties	**Properties** The properties of a compound are entirely different from the properties of their constituents
5	**Separation of constituents** The constituents of a mixture can be separated by physical methods like solubility, filtration, evaporation, distillation, use of magnet etc.,	**Separation methods** Separation of constituents cannot be separated by simple methods
6	**Energy change** During formation of mixture neither energy is absorbed nor given out	**Energy changes** During formation of compound either energy is absorbed or given out

4. IMPURE SUBSTANCES

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

MIXTURES

1. If two or more substances mixed together in any proportion, do not undergo any chemical change, but retain their characteristics, the resulting mass is called:
   1) Mixture 2) Change 3) Separation 4) All the above
2. Which of the following represents a mixture?
   1) Ammonia 2) Calcium carbonate
   3) Gun powder 4) Hydrogen chloride
3. Identify the heterogeneous mixture.
   1) Alloy 2) Pure water 3) Nitre 4) Soil
4. Identify the homogeneous mixture.
   1) Soil 2) Pure water 3) Syrup 4) Sodium chloride
5. Oil in water is an example of:
   1) Homogeneous liquid – liquid mixture
   2) Heterogeneous liquid– liquid mixture
   3) Homogeneous solid – liquid mixture
   4) Heterogeneous liquid – gas mixture

LEVEL–II

MIXTURES

6. Choose the true statement.
   1) Composition of a mixture is always fixed.
   2) A mixture has definite melting and boiling points.
   3) In the formation of a mixture, no chemical reaction occurs
   4) During the formation of a mixture the constituents undergo a major change in their composition.
7. Which of the following would be described as impure?
   1) Crystallized salt 2) Salt solution
   3) Rock salt 4) All of the above
8. Mixtures always have:
   1) Definite composition 2) Invariable composition
   3) Variable composition 4) None of the above
9. Which of the following statement is correct?
   1) A pure substance must contain only one type of atom.
   2) A mixture containing two compounds must be heterogeneous.
   3) A heterogeneous mixture must contain at least three elements.
   4) A homogeneous mixture must be uniform.

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

10. When two substances A and B are powdered together in a pestle and mortar, a substance C with average properties of constituents is formed, it is:
    1) Compound 2) Mixture 3) Element 4) Alloy
11. Iodized common salt is:
    1) Homogeneous mixture 2) Heterogeneous mixture
    3) Pure substance 4) Oxidized substance.
12. Which of the following is a homogeneous mixture?
    1) Solution of sugar in water 2) Chalk powder in water
    3) Kerosene oil in water 4) None of these
13. Amalgam is a mixture of:
    1) Copper & zinc 2) Iron & carbon
    3) Sodium and mercury 4) Copper &tin

LEVEL–IV

STATEMENT TYPE QUESTIONS

14. Statement-I: A mixture in which different constituents are mixed uniformly is called homogeneous mixture.
    Statement-II: Oil in water is an example of homogeneous mixture.
    1) Both Statements are true.
    2) Both Statements are false.
    3) Statement I is true. Statement II is false
    4) Statement I is false. Statement II is true
15. Statement I: The constituents of mixture can be separated by physical method.
    Statement II: The mixture of iron and sulphur get separated with the help of magnet.
    1) Both Statements are true.
    2) Both Statements are false.
    3) Statement I is true. Statement II is false
    4) Statement I is false. Statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

16. Choose the correct statement(s):
    1) Ink is a mixture made of water and one or more dyes.
    2) Gun powder is a mixture of charcoal, nitre and sulphur
    3) Soft drinks are homogeneous mixture

4) Alloys form a homogeneous mixture

17. Which one is the related to mixture:
1) Syrup is a mixture of sugar in water.
2) Milk is a mixture of protein, fat and water.
3) Sea water is a mixture of mineral salts in big quantity.
4) The components of mixture are in any ratio.

18. Which of the following is a homogeneous mixture?
1) Fizzy drink 2) Pure air
3) Salt pepper mixture 4) Mixture of iron fillings and sand

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE:

Mixture in which different constituents are mixed not uniformly is called heterogeneous mixture.

19. Which of the following is a heterogeneous liquid-liquid mixture.
1) Ammonia gas in water 2) Petrol in water
3) Carbon dioxide in water 4) Mixture of oxygen and nitrogen

20. Charcoal and salt are an example of:
1) Homogeneous solid-solid mixture 2) Heterogeneous solid-solid mixture
3) Homogeneous solid-liquid mixture 4) Homogeneous liquid-liquid mixture

21. Which out of the following is a heterogeneous mixture?
1) Salt and water 2) Brass
3) Salt and sand solution 4) Steel

MATRIX MATCH TYPE QUESTIONS

22.

COLUMN – I	COLUMN – II
a) Homogeneous mixture	p) Gun powder
b) Heterogeneous mixture	q) Calcium
c) Alloy	r) 22 carat gold
d) Pure metal	s) German silver

5. SEPARATION OF SOLID-SOLID MIXTURES

	♦	THRESHING, WINNOWING AND HAND PICKING
	♦	SIEVING, MAGNETIC SEPARATION AND USING GRAVITY
	♦	USING SOLVENTS, FRACTIONAL CRYSTALLISATION AND SUBLIMATION

INTRODUCTION:

Mixture is said to be impure when its components are known, and they are put together in a desired quantity.

Need for separation: Sometimes it happens that an unwanted substance gets mixed up with the required substances. Things are thus rendered impure. To remove impurity, we need separation of the components of a mixture.

Principles involved in the separation of components of a mixture:

The method(s) necessary to separate the components of a mixture depends upon:

- The physical state of the constituents of the mixture
- The difference in one or more physical properties of the constituents of the mixture.

Techniques for the separation of solid-solid mixtures are:

1) Threshing
2) Winnowing
3) Handpicking
4) Sieving
5) Magnetic separation
6) Sublimation
7) Using gravity
8) Using solvents
9) Fractional crystallization.

THRESHING:

Threshing is part of the harvesting process. The stacks of harvested crop are thrashed against a slab of rock is called ***thrashing.*** The different threshing methods:

1.Foot threshing or trampling: Use of bare feet or animals to thresh the crop which is spread on the floor. In some regions animals have been replaced by tractors.

2.Beating against a threshing rack: The grains are separated from the straw by impact when the crop is beaten against a slatted bamboo, wooden platform or any other hard object such as a steel oil drum.

3.**Pedal thresher:** Holding the crop against a threshing drum driven by a foot crank comes the grains from the straw. Because small straw chaff and foreign matter drops with the grains, cleaning is needed.

4.**Machine threshing:** Because of the high labour requirement of manual threshing, mechanical threshers of different types and sizes are increasingly being used.

Threshing

WINNOWING:

When the mixture is allowed to drop from certain height then light weight constituent is blown away by air and heavy weight constituent is settled on ground. This process of mixture is called winnowing. The separation of grain or seeds from the husks and straw is the step in the chaff-removal process that comes before winnowing.Farmers use this method to separate chaff (the covering of grain) from grain. A mixture of chaff and grain is made to fall from a height. The lighter chaff drifts away and the heavier grain falls vertically on the ground. A wind helps in winnowing by blowing away the chaff more easily.

If there is no wind, the winnower moves slowly through a length of about five metres while letting the mixture fall. The movement of the winnower stirs the air, which helps the chaff drift. If some chaff falls on the grain, it can be blown away.

Winnowing

HAND PICKING:

If a constituent of a solid mixture is big and visibly different, it can be separated by hand-picking.

Ex:stones can be separated from rice in this fashion. If the grains of rice and wheat or the seeds of different varieties of pulses get mixed up, they are separated by hand-picking. Plucking rotten grapes from a bunch is nothing but hand-picking. For picking, forceps can also be used. However, hand-picking is useful only if you need to separate a small amount of a constituent from a mixture. This is because the process is time-consuming.

Hand picking

SIEVING:

Separating the particles of different sizes by using a sieve is called sieving.

A sieve (or) sifteris a device for separating wanted elements from unwanted material. The word "sift" derives from 'sieve'. In cooking, a sifter is used to separate and break up clumps in dry ingredients such as flour, as well as to aerate and combine them.

Hand sieving is a simple technique for separating particles of different sizes. A small sieve used for sifting flour has very small holes. Depending upon the types of particles to be separated, sieves with different types of holes are used. Sieves are also used to separate stones from sand.

Sieving

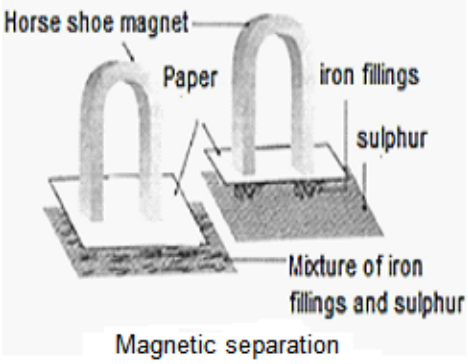
MAGNETIC SEPARATION:

The method of separation of mixtures where one of the components is magnetic in nature, i.e., it consists of iron, steel, cobalt, nickel or their compounds is called magnetic separation.

Let us consider a mixture is of iron fillings and sulphur.

Method:

- spread the mixture evenly in the form of a thin layer over a piece of paper.
- Place another sheet of paper over the mixture.
- Place a powerful horseshoe magnet over the paper and then lift. Some iron fillings will cling to paper.
- Remove the magnet from the paper. The iron fillings will fall down.
- Repeat the process a number of times, till all the iron fillings are removed.



Magnetic separation

SUBLIMATION:

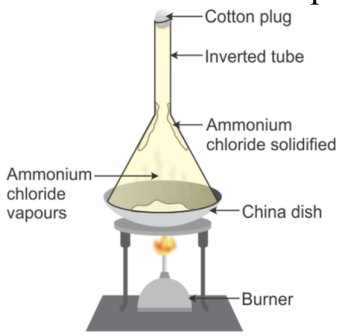
The process of changing of a solid directly into vapour state without changing into liquid state on heating is called sublimation.

This method is used in separation of such mixtures, where one of the components of the mixture sublimes on heating. It is useful for mixture mentioned in Table. However, care should be taken that the components of mixture do not react chemically on heating

Solid-Solid mixture	Sublimable solid
Ammonium chloride and common salt	Ammonium chloride
Iodine and sand	Iodine
Iodine and common salt	Iodine
Sodium sulphate and benzoic acid	Benzoic acid
Naphthalene and iron filling	Naphthalene

Method:

- The mixture is placed in a china dish and heated by a low flame.
- An inverted dry funnel is placed over the china dish and its stem is closed with cotton wool.
- The sublimable component of the mixture sublimes and its vapours condense on the sides of the funnel to form fine powder.
- The fine powder (sublimable component) is scrapped from the sides of funnel.
- The residue left behind is non-sublimable component.



Sublimation

USING GRAVITY:

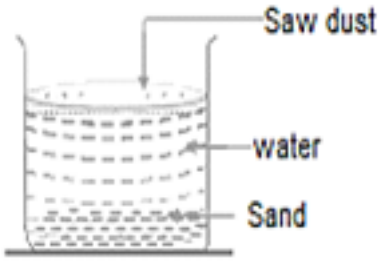
The method of separation of the components mixture when either lighter than the other or is soluble in water. This method is suitable for mixtures given in table.

Solid-Solid Mixture	Heavier Component	Lighter component Or Soluble component
i) Sand and saw dust	Sand	Saw dust (lighter)
ii)Salt and sand	Sand	Salt (soluble)
iii)Charcoal and limestone	Limestone	Charcoal (lighter)

Stir the mixture in water or any other suitable solvent.

Allow the mixture to stand, so that the heavier components settle down.

Decant off or filter the water along with lighter or soluble component



USING SOLVENTS:

This method is suitable for such mixtures in which one of the components is soluble in some particular solvent. Table shows some mixtures which can be separated by this process.

LIST OF IMPORTANT SOLVENTS METHOD:

Solid-solid Mixture	Solvent	Soluble Component	Insoluble Component
Sand and sulphur	Carbon disulphide	Sulphur	Sand
Charcoal and sulphur	Carbon disulphide	Sulphur	Charcoal
Sand and wax	Turpentine oil	Wax	Sand
Common salt and marble powder	Water	Common salt	Marble powder
Nitre and charcoal	Water	Nitre	Charcoal
Gun powder (Nitre,carbon and sulphur)	Water,carbondisulphide	Nitre	Sulphur and carbon

Choose the solvent, such that only one particular component of the mixture is soluble in it, and other component is insoluble.

Dissolve the mixture is a good amount of solvent such that the soluble component of the mixture completely dissolves.

The above solution is filtered. The insoluble component of the mixture is left on the filter paper. The soluble content collects as filtrate.

Recovery of the components:

1. The insoluble component is left on filter paper. It is dried either in hot air or the folds of filter paper.

2. The filtrate is evaporated either on slow heat or in the sunlight. The solvent evaporates, leaving behind soluble component.

FRACTIONAL CRYSTALLIZATION:

The process of Separation of two different soluble substances from their solution by crystallization at controlled temperature, such that one of the solid crystallises is called fractional crystallisation.

Fractional crystallisation is based on the principle that different solids have different solubilities at a given temperature.

This method is suitable for mixtures mentioned in Table.

Solid- Solid Mixture	More Soluble Component	Less Soluble Component
Potassium nitrate and Sodium chloride	Potassium nitrate	Sodium chloride
Potassium chloride and Potassium chlorate	Potassium chlorate	Potassium chloride
Sodium nitrate and sodium chloride	Sodium nitrate	Sodium chloride

Method:

Choose the solvent (generally water) and warm it to around 60^0 C.

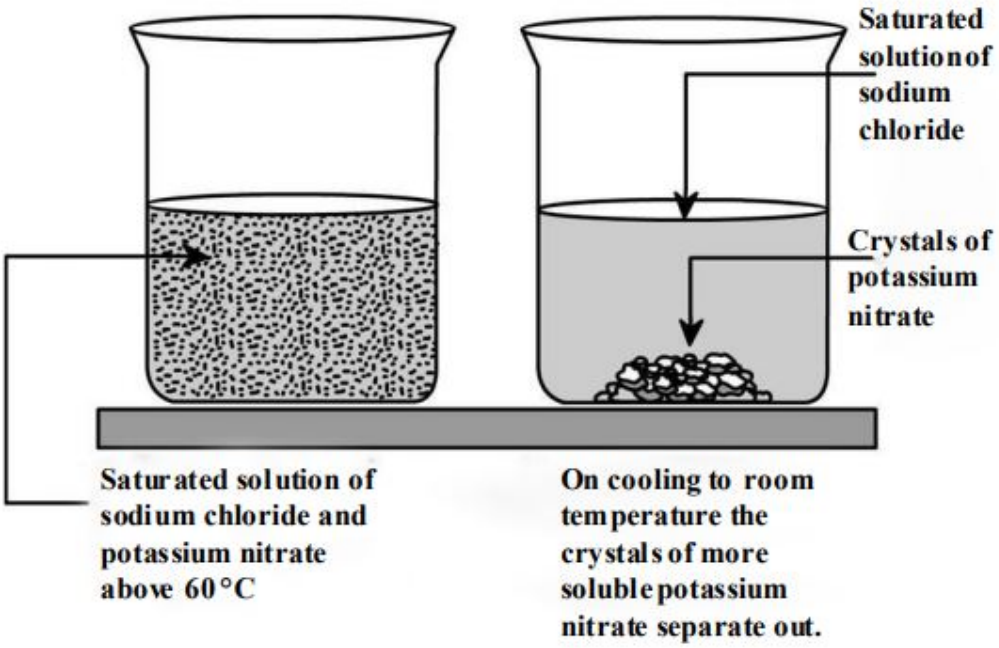
Add the mixture in solvent, till it stops dissolving.

Allow the mixture to cool. Large amount of more soluble solid crystallises out along with some amount of less soluble solid.

Filter the crystals and re dissolve them in minimum amount of warm solvent.

Recrystallise the crystals, when large amount of more soluble salt crystallises out.

Concentrate the filtrate containing **less soluble** solid. On cooling, the crystals of less soluble solid separate out.



5. SEPARATION OF SOLID-SOLID MIXTURES

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

THRESHING, WINNOWING AND HAND PICKING

1. The method of separating seeds of paddy from its stalks is called _____.
   1) Decantation 2) Threshing 3) Winnowing 4) Sedimentation
2. The method used to separate grains and saw dust is:
   1) Threshing 2) Hand- picking
   3) Winnowing 4) Magnetic separation
3. The method of separating substances based on size, colour and shape is called:
   1) Handpicking 2) Winnowing 3) Sieving 4) Threshing
4. Which amongst the following methods would be most appropriate to separate grain from bundles of stalks?
   1) Handpicking 2) Winnowing 3) Sieving 4) Threshing

SIEVING, MAGNETIC SEPARATION AND USING GRAVITY

5. While preparing chapatis, Paheli found that the flour to be used was mixed with wheat grains. Which out of the following is the most suitable method to separate the grains from the flour:
   1) Threshing 2) Sieving 3) Winnowing 4) Filtration
6. One of the components of the mixture is iron, then the separation technique used to separate the constituents is:
   1) Magnetic separation 2) Using gravity
   3) Using solvents 4) Fractional crystallization
7. One of the components of the mixture is heavier than water, whereas the other components are either lighter or soluble in water, then the separation technique used to separate the constituents is:
   1) Fractional crystallization 2) Using gravity
   3) Using solvents 4) Magnetic separation

USING SOLVENTS, FRACTIONAL CRYSTALLISATION AND SUBLIMATION

8. The solvent used in sand and wax is:
   1) Turpentine oil 2) Carbon disulphide
   3) Water 4) None of these
9. The process of Separation of two different soluble substances from their solution by crystallization at controlled temperature, such that one of the solid crystallises is called:
   1) Distillation 2) Evaporation
   3) Fractional crystallisation 4) None of these

10. The process of changing of a solid directly into vapour state without changing into liquid state on heating is called:
1) Distillation 2) Evaporation
3) Sublimation 4) None of these

LEVEL–II

THRESHING, WINNOWING AND HAND PICKING

11. 'Combine' is used in which of the following?
1) Threshing 2) Winnowing 3) Sieving 4) Filtration
12. Which of the following is essential to perform winnowing activity?
1) Soil 2) Water 3) Wind 4) None of the above
13. Peanuts are separated from a mixture of peanuts and corn by:
1) Sieving 2) Handpicking 3) Winnowing 4) Threshing

SIEVING, MAGNETIC SEPARATION AND USING GRAVITY

14. Pebbles and stones are removed from sand by _____.
1) Winnowing 2) Sieving 3) Threshing 4) Decanting

USING SOLVENTS, FRACTIONAL CRYSTALLISATION AND SUBLIMATION

15. Oil is not soluble in:
1) Benzene 2) Oxalic acid
3) Carbon disulphide 4) Petrol
16. Ammonium chloride and common salt are the constituents of a mixture, the separation technique used to separate these constituents is:
1) Using gravity 2) Using solvents
3) Magnetic separation 4) Sublimation
17. A solid - solid mixture of Sodium nitrate and Sodium chloride can be separated through the method of:
1) Dissolution 2) Fractional crystallization
3) Magnetic separation 4) Fusion

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

18. Corn is separated from husk by the process of:
1) Sleeving 2) Winnowing 3) Churning 4) Handpicking
19. Choose the correct statement:
1) Grease is soluble in petrol 2) Nitre is soluble in Ethyl alcohol
3) Paraffin wax is soluble in benzene 4) Phosphorous is soluble in water
20. The process used for separation grains from stalk is called:
1) Threshing 2) Sieving 3) Winnowing 4) Decanting

21. Using gravity method _____ mixture can be separated.
1) Nickel and lead 2) Saw dust and sand
3) Iodine and sand
4) Potassium nitrate and sodium chloride

22. The separation method used in separating common salt and ammonium chloride
1) Distillation 2) Sedimentation 3) Evaporation 4) Sublimation

LEVEL–IV

STATEMENT TYPE QUESTIONS

23. Statement I: The method of separation of mixtures where one of the compound is magnetic in nature is called magnetic separation.
Statement II: Iron, cobalt and nickel are magnetic substances.
1) Both Statements are true.
2) Both Statements are false.
3) Statement I is true. Statement II is false
4) Statement I is false. Statement II is true

24. Statement I: The visible unwanted particles are removed by hand is called hand picking.
Statement II: Rotten fruits are removed from fresh fruits by sieving.
1) Both Statements are true.
2) Both Statements are false.
3) Statement I is true. Statement II is false
4) Statement I is false. Statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

25. We can separate certain solid-solid mixtures by using solvents.
The principle behind this method of separation is:
1) One of the components is soluble in specific solvent.
2) One of the components is not soluble in specific solvent.
3) Both the components should be soluble be in specific solvents.
4) None of the components should be soluble in specific/solvents.

26. Which of the following is sublimablecomponent?
1) Iodine 2) Naphthalene
3) Ammonium chloride 4) Common salt

27. Which of the following can be separate from soil by using a magnet?
1) Cobalt wire 2) Wood 3) Iron nails 4) Sugar

LEVEL–V

MATRIX MATCH TYPE QUESTIONS

28.

COLUMN – I	COLUMN – II
a) Separation of charcoal and limestone	p) Using solvents
b) Separation of gun powder	q) Sublimation
c) Separation of sodium nitrate and sodium chloride	r) Fractional crystallization
d) Separation of naphthalene and iron fillings	s) Magnetic separation
	t) Using gravity

6. SEPARATION OF SOLID-LIQUID MIXTURES

	♦	SEDIMENTATION AND DECANTATION
	♦	FILTRATION
	♦	EVAPORATION AND DISTILLATION

INTRODUCTION:

The solid-liquid mixtures can be separated by the techniques depending upon the physical properties of the components of the mixtures

Techniques for the separation of solid-liquid mixtures are:

1) Sedimentation and Decantation 2) Filtration
3) Evaporation 4) Distillation

SEDIMENTATION AND DECANTATION:

SEDIMENTATION:

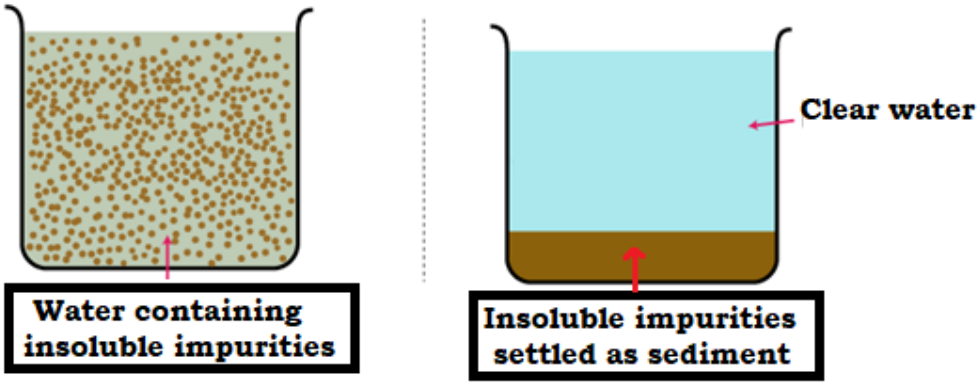
The process in which a suspension of insoluble fine particles suspended in a liquid are allowed to stand undisturbed, such that solid particles settle down, leaving the clear liquid above is called Sedimentation.

SEDIMENT:

The insoluble solid material which settles down when a suspension is allowed to stand undisturbed is called sediment.

SUPERNATANT LIQUID:

The clear liquid above the sediment, when a suspension is allowed to stand undisturbed is called supernatant liquid.



Sedimentation

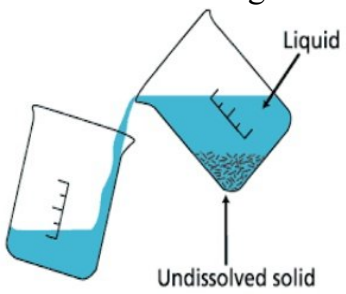
DECANTATION:

The process of pouring out the clear supernatant liquid above the sediment, thus helping the separation of solid particles from liquid is called Decantation.

Drawbacks of Decantation

➢ The constituent of the mixture of a solid and a liquid do not get separated

- The constituents of a solid lighter than liquid cannot be separated as they float on the surface of liquid, rather than settling down.



Decantation

FILTRATION:

FILTRATION:

The process of separation of insoluble solid constituents of a mixture from its liquid constituent by passing it through some porous material is called filtration.

FILTRATE:

The clear liquid obtained from a mixture of a solid and a liquid by the process of filtration is called filtrate.

RESIDUE:

The insoluble solid constituent left on the filter paper when a mixture of an insoluble solid and a liquid filtered is called residue.

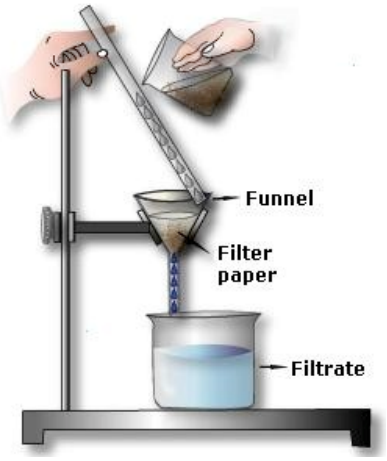
The method of filtration is employed for the following solid-liquid mixtures as shown in table.

Solid-Liquid mixture	Residue	Filtrate
Silver chloride and water	Silver chloride	Water
Barium sulphate and water	Barium sulphate	water
Chalk and water	Chalk	water

Method:

- Filter paper is generally available in the form of a circular disc. It is folded to form a cone.
- A glass funnel is moistened with water. The filter paper cone is inserted in the cavity of the funnel and is pressed on the sides. This expels out the air and the filter paper cone sticks tightly to the walls of the funnel.
- The funnel is clamped in an iron stand and under its stem is placed a beaker, such that the wall of beaker is in contact with the stem of the funnel.

- The suspension of the solid-liquid is poured in the funnel slowly with the help of glass rod.
- The filtrate collects in the beaker. The residue is left on filter paper. The residue is dried either in hot air or in the folds of filter paper.



Filtration

Advantages of filtration over sedimentation and decantation:

- It is a quicker process than sedimentation and decantation.
- The insoluble solid is completely removed, which is not possible in case of decantation.

EVAPORATION:

The process of changing a liquid into a gaseous state, below its boiling point by supply of external heat is called evaporation.

The process of evaporation is suitable for the separation of non-volatile solublesolidfrom its liquid solvent.Table shows the solid liquid mixtures which can be separated by evaporation.

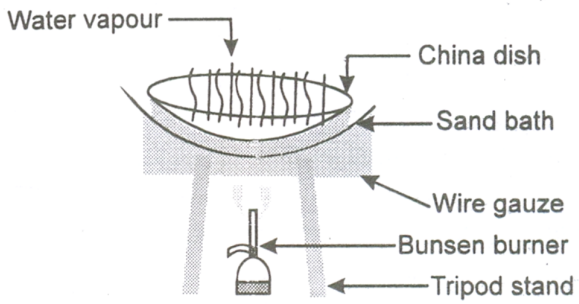
Sold-Liquid mixture	Non-volatile solid	Liquid
Common salt and water	Common salt	Water
Sodium sulphate and water	Sodium sulphate	Water
Carbon disulphide and sulphur	Sulphur	Carbon disulphide

Method:

- Heat the sand in an iron vessel by placing it over a tripod stand. This arrangement is called sand bath.
- Take the clear solution of soluble non-volatile substance in the china dish. Place the china dish on the sand bath.

➢ Heat gently, such that water (liquid) evaporates, but does not boil, continue heating till liquid completely evaporates.

When almost dry solid is left, reduce the flame, but go on heating for another five minutes. This helps in forming (i) completely dry solid (ii) will prevent the spurting (jumping out) of solid from the china dish due to excessive heat.



Evaporation

DISTILLATION:

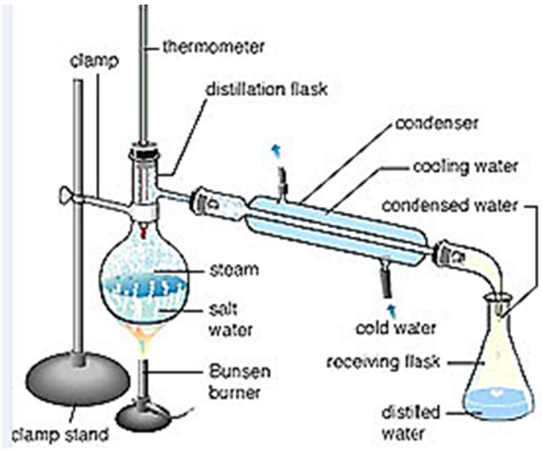
The process of conversion of a liquid into gaseous state on boiling and then recondensing the gas so formed into liquid by condensation in another vessel is called distillation. It is used in the situations where the liquid component of solid-liquid mixture is required in pure state. Table shows some of the solid-liquid mixtures which can be separated by distillation.

Method:

The solid-liquid mixture is placed in a distillation flask. The distillation flask is connected to Liebig's condenser, at the end of which is placed a receiver to collect distilled liquid (distillate).

When the distillation flask is heated, the liquid starts boiling. The vapour of liquid passes through the Liebig condenser, where they condense to form liquid. The liquid so formed trickles into the receiver.

The solid component of mixture forms residue in the flask.



Distillation

6. SEPARATION OF SOLID-LIQUID MIXTURS

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

SEDIMENTATION AND DECANTATION

1. The process in which a suspension of insoluble fine particles suspended in a liquid are allowed to stand undisturbed, such that solid particles settle down, leaving the clear liquid above is called:
   1) Sedimentation 2) Decantation 3) Filtration 4) Evaporation
2. The process of pouring out the clear supernatant liquid above the sediment, thus helping the separation of solid particles from liquid is called:
   1) Sedimentation 2) Decantation 3) Filtration 4) Evaporation
3. The insoluble solid material which settles down when a suspension is allowed to stand undisturbed is called:
   1) Residue 2) Supernatant 3) Filtrate 4) Sediment
4. The clear liquid above the sediment, when a suspension is allowed to stand rest is called:
   1) Filtrate 2) Residue
   3) Supernatant liquid 4) Universal liquid

FILTRATION

5. The process of separation of insoluble solid constituents of a mixture from its liquid constituent by passing it through some porous material is called:
   1) Filtration 2) Evaporation 3) Sedimentation 4) Distillation
6. The insoluble solid constituent left on the filter paper when a mixture of an insoluble solid and a liquid filtered is called:
   1) Residue 2) Filtrate 3) Sediment 4) None
7. The clear liquid obtained from a mixture of a solid and a liquid by the process of filtration is called:
   1) Filtrate 2) Residue
   3) Supernatant liquid 4) Universal liquid
8. The best method of separation of solid-liquid mixture is:
   1) Sedimentation 2) Filtration 3) Decantation 4) Distillation

EVAPORATION AND DISTILLATION

9. The process of changing a liquid into a gaseous state, below its boiling point by supply of external heat is called:
   1) Filtration 2) Distillation 3) Evaporation 4) None
10. The process of conversion of a liquid into gaseous state on boiling and then recondensing the gas so formed into liquid by condensation in another vessel is called:
    1) Filtration 2) Distillation 3) Evaporation 4) None

11. In common salt solution, the constituents are separated by:
    1) Sedimentation 2) Decantation
    3) Evaporation 4) Filtration
12. Iodine in chloroform is separated by:
    1) Distillation 2) Filtration 3) Decantation 4) Sedimentation

LEVEL–II

SEDIMENTATION AND DECANTATION

13. The separation technique involved in separating sand from water is:
    1) Sedimentation 2) Sublimation
    3) Gravity separation 4) All the above

FILTRATION

14. Which of the following mixtures would you be able to separate using the method of filtration?
    1) Oil in water 2) Cornflakes in milk
    3) Salt in water 4) Sugar in milk
15. The separation technique involved in sodium sulphatesolution:
    1) Evaporation 2) Filtration 3) Distillation 4) Sedimentation

EVAPORATION AND DISTILLATION

16. Methods used to separate a mixture of salt and sand is by treating the mixture with water and then:
    1) Filtration followed by evaporation
    2) Sedimentation followed by evaporation
    3) Filtration followed by condensation
    4) None of the above

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

17. You might have observed the preparation of ghee from butter and cream at home, which method can be used to separate ghee from the residue?
    i) Evaporation ii) Decantation iii) Filtration iv) Churning
    1) (i) and (ii) 2) (ii) and (iii) 3) (ii) and (iv) 4) (iv) and (i)
18. When milk cooled after boiling is poured onto a piece of cloth the cream (malai) is left behind on it, this process of separating cream from milk is an example of:
    1) Churning 2) Filtration 3) Sedimentation 4) Hand picking
19. Salt is obtained from sea water by drying it in the sun. The process is known as:
    1) Filtration 2) Sedimentation 3) Evaporation 4) Condensation

20. In an activity, a teacher dissolved a small amount of solid copper sulphate in a tumbler half filled with water. Which method would you use to get back solid copper sulphate from the solution?
1) Decantation 2) Evaporation 3) Sedimentation 4) Condensation

LEVEL–IV

STATEMENT TYPE QUESTIONS

21. Statement-I: The solid - liquid mixture can be separated by the technical, depending upon the physical property of the compound of a mixture.
Statement-II: In sedimentation of the components is heavier than the liquid and is insoluble.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

22. Statement I: Evaporation cannot separate a mixture of mustard oil and water
Statement II: Mustard oil and water are completely miscible into each other.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

23. When sodium hydroxide is added to ferric chloride solution a reddish-brown precipitate is formed. The precipitate cannot be separated from the mixture by the process of:
1) Evaporation 2) Sublimation 3) Distillation 4) Filtration

24. Identify the correct statement:
1) The insoluble solid material which settles down when a suspension is allowed to stand undisturbed is called sediment
2) The process of conversion of a liquid into gaseous state on boiling and the recondensing the gas is called distillation
3) Iodine in chloroform is separated by distillation
4) The constituent of a mixture of a solid and liquid dust gets separated completely by decantation method.

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE:

The process of changing a liquid into a gaseous state, below its boiling point by the supply of external heat is called evaporation.

25. Why do you think filtration is more beneficial than sedimentation and decantation?

1) The constituents of the mixture of a solid and a liquid can be separated completely

2) The constituents of a solids are lighter than liquid and can be separated as they float on the surface of a liquid rather than settling down

3) The process of suitable for the separation of non – volatile soluble solid from its liquid solvent

4) None of these

26. The non – volatile solid in common salt and water is:

1) Common salt 2) Water 3) Solution 4) None of these

27. Carbon di sulphide and sulphur can be separated by the method of evaporation because:

1) Carbon dioxide is non-volatile solid and sulphur is a solvent

2) Sulphur is a non-volatile solid and carbon di sulphide is liquid

3) Bothsulphur and carbon di sulphide are solvents

4) Neither sulphur is solvent nor carbon disulphide

MATRIX MATCH TYPE QUESTIONS

28.

COLUMN-I	COLUMN-II
a) Muddy water	p) Filtration
b) Common salt solution	q) Evaporation
c) Iodine in chloroform	r) Decantation
d) Silver chloride precipitate in water	s) Distillation
	t) Using solvents

7. SEPARATION OF LIQUID-LIQUID MIXTURES

	♦	SEPARATING FUNNEL
	♦	FRACTIONAL DISTILLATION
	♦	CHROMATOGRAPHY

The liquid-liquid mixtures can be separated by the techniques given in Table, depending upon the physical properties of the components of the mixture.

TECHNIQUES OF SEPARATION OF LIQUID-LIQUID MIXTURES:

1) Separating funnel
2) Fractional distillation
3) Chromatography

SEPARATING FUNENEL:

SEPARATION OF LIQUID-LIQUID MIXTURES OF SEPARATING FUNNEL:

Separating funnel is a long glass tube provided with a tap. The liquid-liquid mixture of immiscible components is poured into the funnel and allowed to stand. **The liquids separate out on account of difference in their densities.** Table shows various immiscible liquids which can be separated by the separating funnel.

Immiscible liquid-liquid mixtures	Heavier liquid	Lighter liquid
Benzene and water	Water	Benzene
Kerosene oil and water	Water	Kerosene oil
Turpentine oil and water	Water	Turpentine oil
Carbon disulphide and water	Water	Carbon disulphide
Mercury and alcohol	Mercury	alcohol

Method:

The tap of the separating funnel is closed. The separating funnel is clamped in the vertical positions in an iron stand.

The immiscible liquid-liquid mixture is poured into the **separating funnel.**

The mixture is allowed to stand for half an hour or more.

The immiscible components of the mixture separate out into two distinct layers. The heavier and denser liquid forms the lower layer. The lighter and less denser liquid forms the upper layer.

A conical flask is placed under the nozzle of separating funnel. The tap is gently opened so that the heavier liquid trickles in flask drop by drop. Once the denser liquid is drained out, the tap is closed.

Another conical flask is placed under the nozzle of separating funnel. The tap is opened to drain the lighter liquid.

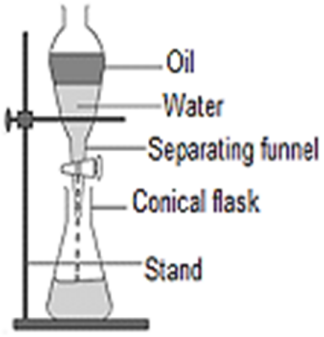


Diagram of apparatus

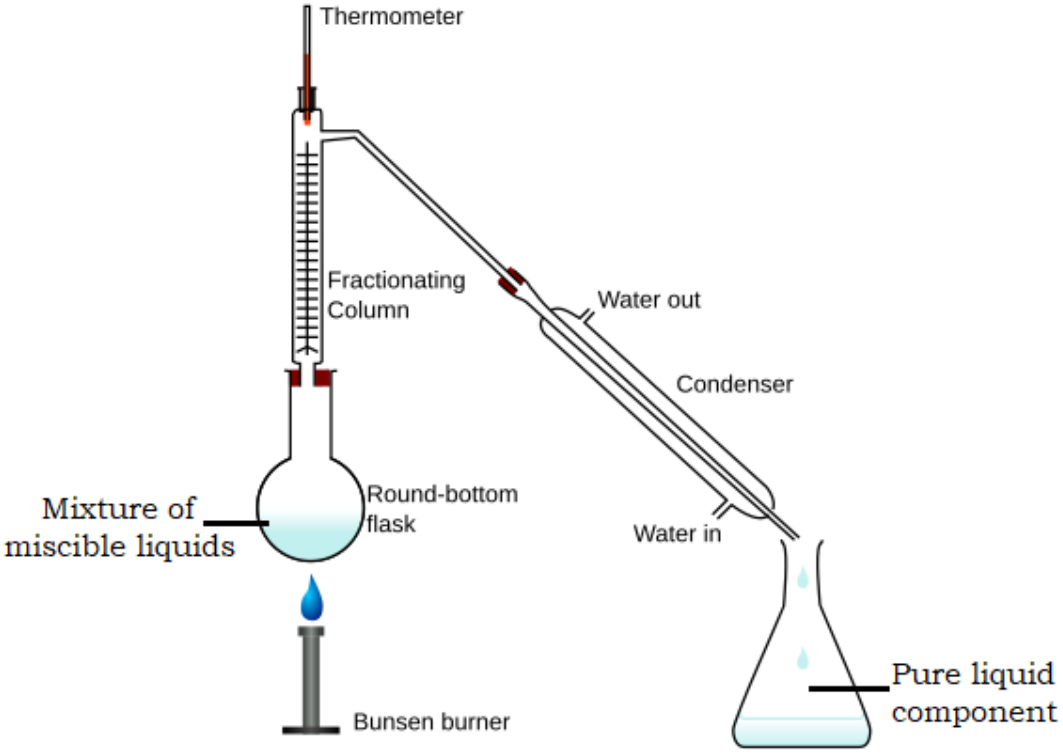
FRACTIONAL DISTILLATION:

In case two liquids have very close boiling points, both the liquids tend to distil over in different proportions. It means lesser the boiling point of a liquid, more is the proportion of it distilling over. The above problem can be avoided by using a fractionating column. It gives the effect of repeated distillation by offering resistance to the message of vapours. The process of separation of two miscible liquids by the process of distillation, making use of their difference in boiling points, is called fractional distillation. This process is useful only, if the difference in the boiling points of the two miscible liquids is less than 25^0C.

Note: Distillation is used when the boiling point difference is greater than 25^0C.

TABLE SHOWS VARIOUS MISCIBLE LIQUIDS, WHICH CAN BE SEPARATED BY FRACTIONAL DISTILLATION:

Miscible liquid-liquid mixture	Component which distills over
Ethyl alcohol + water (b.p 78^0C) (b.p) 100^0 C	Ethyl alcohol
Methyl alcohol + ethyl alcohol (b.p 64.5^0 C) (b.p 78^0 C)	Methyl alcohol
Ethyl alcohol + chloroform (b.p 78^0 C) (b.p 61^0 C)	Chloroform
Acetone + ethyl alcohol (b.p 56.5^0 C) (b.p 78^0 C)	Acetone



CHROMATOGRAPHY:

The process of separation of different constituents of a mixture by absorbing them over an appropriate absorbent material is calledchromatography.

The absorbent medium is generally magnesium oxide, alumina or filter paper.

The solvent generally used for dissolving a mixture of two or more constituents in water or alcohol. The different constituents of a mixture get adsorbed differently on the same absorbent material, because they have different rates of movement. The rate of movement of each absorbed material depends upon:

i)The relative solubility of the constituent of mixture in a given solvent.

ii) The relative affinity of the constituents of mixture for the adsorbed medium

If a filter paper is used as an adsorbent material for the separation of various constituents of a mixture, then this method of separation of mixture is calledpaper chromatography. Paper chromatography is very useful in separating various constituents of coloured solutes present in a mixture like ink, dyes, etc.

SEPARATION OF COLOURED CONSTITUENTS PRESENT IN A MIXTURE OF INK AND WATER:

Method:

Take a filter paper 22 cm long, 5 cm broad and stick its smaller end to a glass rod with the help of gum. On the other end, measure a distance of 7 cm from lower end and mark a small point. On this point pour a drop one or two of the ink.

Suspended this filter paper in a wide and tall cylinder. Gradually, pour water into the cylinder till the lower end of filter paper slightly dips in the water. Cover the cylinder with a glass lid to prevent any evaporation and leave the apparatus undisturbed for an hour. The water rises up the filter paper and reaches the ink mark. This water then dissolves various constituents of the ink in it. These constituents of the ink get adsorbed by the filter paper in different amounts. More a constituent gets adsorbed the lesser it moves upward and vice versa.

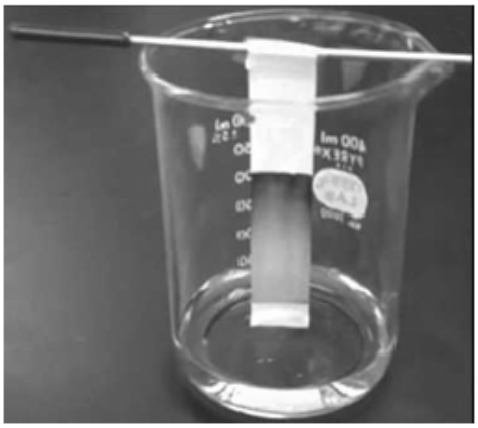
When the solvent (water) reaches near the top of filter paper, the filter paper is removed from water and dried. On the filter paper will be seen a hand of colours, of various constituents.

A filter paper with separated hands of various constituents of a coloured substance is called chromatograph.

ADVANTAGES OF PATER CHROMATOGRAPHY:

It can be carried out by a very small amount of material.

The substances under investigation do not get wasted in chromatographic separation.



Paper Chromatography

7. SEPARATION OF LIQUID-LIQUID MIXTURES

WORK SHEET LEVEL–I MAINS CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

SEPARATING FUNNEL

1. The process of separation of immiscible liquids separate out on account of difference in their densities is called:
   1) Separating funnel 2) Evaporation
   3) Distillation 4) Filtration
2. The mixture of benzene and water are separated by using:
   1) Sedimentation 2) Evaporation
   3) Filtration 4) Separating funnel
3. Turpentine oil and water can be separated by using a separating funnel. On what principle does a separating funnel work?
   1) Difference in melting points 2) Difference in boiling points
   3) Difference in solubilities 4) Difference in their densities

FRACTIONAL DISTILLATION

4. The process of separation of two miscible liquids by the process of distillation, making use of their difference in boiling points, is called:
   1) Sedimentation 2) Evaporation
   3) Filtration 4) Fractional distillation
5. Which of the following technique is used to Liquid - Liquid mixtures?
   1) Winnowing 2) Fractional distillation
   3) Sublimation 4) Sedimentation
6. The boiling point of acetone is:
   1) 56.5^0C 2) 78^0C 3) 64.5^0C 4) 100^0C

CHROMATOGRAPHY

7. The process of separation of different constituents of a mixture by absorbing them over an appropriate absorbent material is:
   1) Filtration 2) Evaporation
   3) Chromatography 4) Sublimation
8. The coloured substance present in the mixture is separated by:
   1) Distillation 2) Fractional distillation
   3) Separating funnel 4) Chromatography

LEVEL–II

SEPARATING FUNNEL

9. Which of the following statements is true for the given mixture of carbon disulphide and water?
   1) Water is a heavier liquid
   2) Carbon disulphide is a lighter liquid
   3) It is an immiscible liquid–liquid mixture
   4) All the above

10. Separating funnel is used to separate, which one of the following mixtures?
    1) Methyl alcohol and water 2) Methyl alcohol and acetone
    3) Ethyl alcohol and water 4) Kerosene oil and water

FRACTIONAL DISTILLATION

11. Which method of separation do you suggest toseparate ethyl alcohol and acetone?
    1) Fractional Crystallisation
    2) Fractional distillation
    3) Sedimentation followed by Decantation
    4) Separating funnel
12. Fractional distillation is used to separate, which one ofthe following mixtures?
    1) Ethyl alcohol and water 2) Methyl alcohol and ethyl alcohol
    3) Ethyl alcohol and chloroform 4) All of these

CHROMATOGRAPHY

13. The adsorbent media used generally in chromatography is:
    1) Alumina 2) Filter paper
    3) Magnesium oxide 4) All of these
14. When a filter paper is used as an adsorbent material for separation of a mixture, this separation technique is called _____.
    1) Column chromatography 2) Paper chromatography
    3) Gas chromatography 4) All of these

LEVEL-III ADVANCED CORNER

SINGLE CORRECT ANSWER TYPE QUESTIONS

15. You are given a mixture of sand, water and mustard oil. How will you separate the components of this mixture?
    1) Evaporation followed by using separating funnel
    2)Filtration followed by using separating funnel
    3) Distillation followed by using separating funnel
    4) Crystallisation followed by using separating funnel
16. Out of the liquid – liquid mixture of methyl alcohol and ethyl alcohol the component that distils first is:
    1) Methyl alcohol
    2) Ethyl alcohol
    3) Neither methyl alcohol nor ethyl alcohol
    4) Both ethyl alcohol and methyl alcohol

17. Mercury and alcohol can be separated by:
1) Filtration 2) Separating funnel
3) Fractional distillation 4) Chromatography

18. Ravi was given four liquids, 1, 2, 3 and 4. He took each liquid at a time and poured some of it in four beakers filled with water He observed the following
Liquid 1 + water gives immiscible liquid. Liquid 2 + water gives miscible liquid
Liquid 3 +water gives immiscible liquid. Liquid 4 + water gives miscible liquid
What could liquids 1,2,3 and 4, respectively be?

1	2	3	4
1) Ink	Juice	Milk	Kerosene
2) Kerosene	Milk	Ink	Mustard oil
3) Mustard oil	Milk	Kerosene	Ink
4) Milk	Ink	Juice	Kerosene

LEVEL–IV

STATEMENT TYPE QUESTIONS

19. Statement-I: Potassium nitrate and Sodium chloride can be separated through fractional crystallisation.
Statement-II: Fractional crystallisation is based on the principle that different solids have different solubilities at a given temperature.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

20. Statement-I: Methyl alcohol and acetone can be separated by fractional distillation.
Statement-II: Methyl alcohol completely dissolves in acetone.
1) Both statements are true
2) Both statements are false
3) Statement I is true, statement II is false
4) Statement I is false, statement II is true

MULTI CORRECT ANSWER TYPE QUESTIONS

21. Which of the following involves fractional distillation?
1) Separation of constituents from liquefied air
2) Separation of constituents from crude petroleum
3) Separation of carbon tetra chloride from water
4) Separation of naphthalene from common salt

22. Which method can be used for purification of liquids?
1) Chromatography 2) Distillation
3) Sublimation 4) Fractional distillation

LEVEL–V

COMPREHENSION TYPE QUESTIONS

PASSAGE:

A mixture of two immiscible liquids can be separated by using a separating funnel. Two liquids which do not mix each other are called immiscible liquids

23. Liquids that do not mix and can be separated in separating funnel are called as
1) Miscible 2) Sublimate 3) Immiscible 4) Residue

24. Separating of iron from slag in blast furnace is:
1) Distillation 2) Separating funnel
3) Fractional distillation 4) Filtration

25. Which of the following is / are immiscible mixtures?
1) Carbon di sulphide and water 2) Ethyl alcohol and water
3) Methyl alcohol and ethyl alcohol 4) All of these

MATRIX MATCH TYPE QUESTIONS

26.

COLUMN – I	COLUMN – II
a) Miscible liquids	p) Separating funnel
b) Immiscible liquids	q) Distillation
c) Magnesium oxide	r) Sublimation
d) Salt and ammonium chloride	s) Fractional distillation
	t) Chromatography