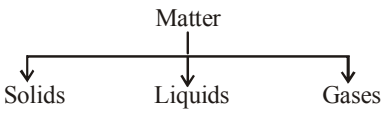
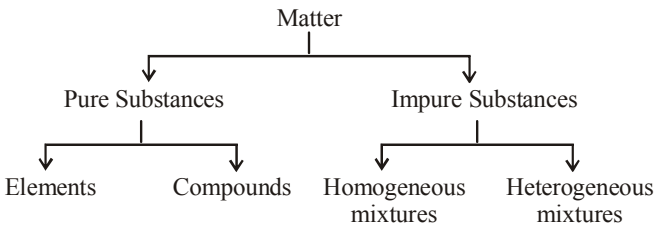
Chapter 1

Matter and Its Classification

- Any thing that has weight and occupies space and can be felt by one of our senses is called matter e.g., air, water, wood, chalk, table, chair etc.
- **Classification of matter :**
  (i) *Based on state (Physical Classification)*



  (ii) *Based on purity/composition (Chemical Classification)*



- **Physical nature of matter :** Every substance has a unique set of property. The properties of matter can be categorised as physical or chemical. Physical properties can be measured without changing the identity and composition of the substance. These properties include colour, odour, density, melting point, boiling point and hardness. Chemical properties describe the way of substance which may change or react to form other substances.
- **Characteristics of particles of matter:**
  (i) Particles of matter have space between them.
  (ii) Particles of matter are continuously moving.
  (iii) As temperature rises particles of matter move faster.
- **Kinetic Theory of Matter :** The main postulates of kinetic Theory of matter are following :
  (i) Matter consists of molecules. These are the smallest particles, which are capable of free existence and retain all the chemical properties of the parent substance.
  (ii) The molecules are always in a state of random continuous motion.
  (iii) The molecules exert forces on one another. These forces depend upon intermolecular distance
  (iv) All collision between the particles of matter are perfectly elastic.

- **States of matter :**
  Matter can exist in three states

(1) Solid state : In solids, particles are bound together by forces strong enough to prevent movement of translation. So that a **solid** has a *definite shape* which remains fixed (in constant conditions) unless sufficient force is supplied to shatter or distort the mass. Particles in a solid may however, show a certain amount of movement of vibration.

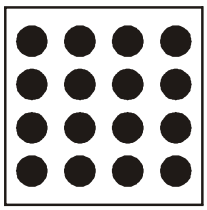
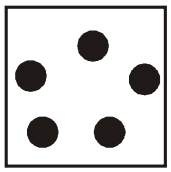
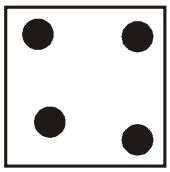
Characteristics of solids :
(i) solids have a fixed shape.
(ii) solids occupy a fixed volume.
(iii) solids can not be compressed.
(iv) solids have a higher density as compared to liquids and gases.

(2) Liquid state : Liquid state of matter is the intermediate state between the gaseous and the solid state. This state arises when the molecules of the matter are held together by strong intermolecular forces in comparison to those in gases.

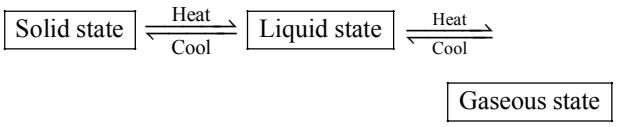
Characteristics of liquids :
(i) This state is characterised as having *fluidity, low compressibility*.
(ii) Liquids have *no definite shape* or *boundaries*. They take the shape of container. Liquids have a *definite volume*.
(iii) Liquids generally have lower densities as compared to solids.
(iv) Liquids are more compressible as compared to solids.
(v) Liquid shows the property of diffusion.
(vi) Particles of liquids have more kinetic energy than those of solids.

(3) Gaseous state:
Gaseous state is the simplest state of matter which is observed when the boiling point of the substance is below the room temperature at atmospheric pressure. The forces of attraction between the molecules is minimum and hence the molecules are far apart from each other and thus their position is not fixed in gaseous state.

Characteristics of gases :
(i) Gases have neither a definite shape nor a definite volume.
(ii) They take the shape of the container in which they are stored and fill the container fully. i.e., the volume of a gas is the same as that of the container.
(iii) Gases can be compressed easily.
(iv) The kinetic energy of particles in gaseous state is maximum.
(v) Gaseous particles move randomly at high speed. They hit each other and also the wall of the container.
(vi) Applying pressure and reducing temperature can liquify gases.

Solids	Liquids	Gas
		
Particles are very closely packed thus rigid in nature	Particles are loosely packed thus can flow	Particles are very loosely packed and expand to large volume
Voids are extremely small therefore incompressible	Voids are relatively larger thus slightly compressible	Voids are very larger thus highly compressible
Particle motion is restricted to vibratory motion	Particle motion is very slow	Particle motion is very rapid and also random
Inter-particle force is very large thus very dense	Inter-particle forces are intermediate resulting in low density	Inter-particle forces are negligible. Thus imparting very low density

- **Plasma :** Plasmas are a lot like gases, but the atoms are different because they are made up of free electrons and ions of the element. Example of plasma is a neon sign. Just like a fluorescent light, neon signs are glass tubes filled with gas.
- **Bose-Einstein Condensates :** Condensation happens when several gas molecules come together and form a liquid. It all happens because of a loss of energy. Gases are really excited atoms. When they lose energy, they slow down and begin to collect.
- **Vapour :** It is used to describe those gases that usually exist as liquid at room temperature e.g., water that exists as liquid at room temperature is called water vapour when it is in gaseous state.
- **Latent heat of vapourisation:** The amount of heat energy that is required to change 1 kg of a liquid into gaseous state at atmospheric pressure without any change of temperature at its boiling point is known as **Latent heat of vapourization**.
- **Interchange of states of matter:**



Note: The state of a matter can change into another state by changing the temperature.

- **Sublimation :** Change of state direct from solid to gas without changing into liquid state (or vice versa) is called sublimation.
- Any substance that shows the property of sublimation is known as sublime substance. Some such substances are Ammonium chloride, Iodine, Benzoic acid, Naphthalene, Camphor etc.
- The solid formed when a sublime substance cools from its gaseous state is called **sublimate**.
- **Evaporation :** It is the phenomenon of change of a liquid into gas at any temperature below its boiling point. It is a surface phenomenon. The particles of a liquid present on the surface gain energy and leave the surface.

  The process of evaporation is always accompanied by a cooling effect. For example, when a liquid evaporates from the skin, a cooling sensation results. The reason for this that only the most energetic molecules of liquid are lost by evaporation, so that the average energy of the remaining molecules decreases.

Factors affecting evaporation :

(i) *Increase in surface area* increases the rate of evaporation.
(ii) *Decrease in humidity* increases the rate of evaporation.
(iii) *Increase in wind speed* increases the rate of evaporation.
(iv) *Increase of temperature* increases the rate of evaporation.

- **Fusion/Melting:** It is the change of solid into liquid state.
- **Latent heat of fusion :** The amount of heat energy that is required to change 1 kg of a solid into a liquid at atmospheric pressure without any change of temperature at its melting point is known as **Latent heat of fusion**.
- Melting point of a solid also depends upon the surrounding pressure. More will be the pressure more lower will be the melting point. Thus solid melts easily at higher pressure.
- **Latent heat of fusion:** The amount of heat energy that is required to change 1 kg of a solid into a liquid at atmospheric pressure without any change of temperature at its melting point is known as **Latent heat of fusion**.
- **Solidification:** It is the change of liquid state to the solid state.
- When the pressure surrounding a substance goes up, the freezing point also goes up. That means it's easier to freeze the substance at higher pressures.
- **Boiling:** It is a bulk phenomenon. Particles from bulk (whole) of the liquid change into vapour state.

- **Boiling point :** The constant temperature at which a liquid changes into gas/vapour is known as its boiling point. Boiling point of water is 100°C or (273 + 100) = 373 K.
- Condensation point of gas also depends upon the surrounding pressure. More will be the pressure more closer will be molecules and thus greater will be the intermolecular forces of attraction. Thus more will be the surrounding pressure more easily gas gets condensed in to liquid.
- **Difference between Boiling and Evaporation :**
  (1) Boiling takes place only at a particular temperature for a liquid. Whereas evaporation occurs at all temperatures.
  (2) Boiling is Bulk phenomena i.e., the bubble formation occurs even below the surface. Whereas evaporation is surface phenomena, i.e., bubble formation occurs only on the surface of liquid.
- A **"substance"** is a kind of matter that can not be separated into other kinds of matter by any physical process. e.g. gold, silver, iron, sodium chloride, calcium carbonate etc.
- **Pure substance:** is one that is a *single substance* and has a *uniform composition*. Such a substance always have the *same texture* and *taste*. e.g. water, salt, sugar etc. Thus, those substances, which always have the same *colour*, taste or texture at a given temperature and pressure are pure substances.
- The purity of substance can easily be checked by checking its melting points in case of a solid substance or by checking its boiling points is case of a liquid substance.
- **Types of pure substances :**
  (i) **Element:** An element is a substance which can not be split up into two or more simpler substances by usual chemical methods of applying heat, light or electric energy. e. g. hydrogen, oxygen, sodium, chlorine etc.
  (ii) **Compound:** A compound is a substance made up of two or more elements chemically combined in a fixed ratio by weight e.g. H_2O (water), NaCl (sodium chloride) etc.
- A mixture is a substance which consists of two or more elements or compounds not chemically combined together. e.g. Air is a mixture of nitrogen, oxygen, inert gases, water vapour, carbon dioxide etc.
- **Types of mixtures :**
  (i) **Homogeneous mixture:** It has a uniform composition throughout and its components can not be distinguished visually. e.g. a well mixed sample of vinegar.
  (ii) **Heterogeneous mixture:** It is one that is not uniform throughout. Different samples of a heterogeneous mixture may have different composition. e.g. a mixture of salt and pepper.
- **Methods of Separation of the Constituents of Mixtures**
  (i) Decantation or Sedimentation: This separation technique is applicable for a mixture containing one liquid and the other solid component. Sedimentation is the process by which insoluble heavy particles in a liquid, are allowed to settle down.
  (ii) Filteration: This technique is used when a mixture contains two components, of which only one is soluble in a particular solvent. For separation the mixture is shaken with the solvent and then filtered. The soluble component passes through the filter paper as **filtrate** and the insoluble solid component is retained on the filter paper called **residue.**
  (iii) Evaporation: This technique is applied to separate a non-volatile soluble salt from its mixture in volatile liquid. On heating, the volatile liquid evaporates leaving behind the soluble salt.
  (iv) Sublimation: This process is used to separate a mixture containing two components, one of which can form a sublimate i.e., direct change of solid to vapour state on heating, while the other do not.
  (v) Magnetic separation: This method is applied to separate a mixture containing one magnetic component and the other non- magnetic components.
  (vi) Separating funnel: This method is applicable to recover one of the components from aqueous solution of the mixture by extracting the mixture with a suitable solvent. The solvent should be immiscible with water but should dissolve one of the components of the mixture.
  (vii) Crystallisation or Recrystallisation : This is one of the most commonly used techniques for purification of solid organic compounds. It is based on the difference in the solubilities of the compund and the impurities in a suitable solvent. The impure compound is dissolved in a suitable solvent in which it is sparingly soluble at room temperature but appreciably soluble at higher temperature. The solution is concentrated to get nearly a saturated solution. When saturated solution is cooled, crystals of pure substance will separate out which are removed by filtration.
  (viii) Distillation: This technique is commonly applied for the separation of a mixture of liquid components having a large difference in boiling point. The lower boiling point component vapourises first and its vapours are condensed by using water condenser and collected
  (ix) Chromatography : Chromatography is based on the difference in adsorption of different substances on the surface of a solid medium. The technique of separating the components of a mixture in which separation is achieved by the differential movement of individual components through a stationary phase under the influence of a mobile phase.
- **Solution :** It is a homogeneous mixture of two or more substances whose composition can be varied. e. g. solution of common salt in water
- The component of solution that is dissolved and present in smaller quantities in a solution is known as solute. e.g. **common salt** in case of solution of common salt in water and **ammonia** in case of solution of ammonia in water.
- The component of solution in which solute is dissolved is known as solvent. It is always present in larger amount in a solution. e.g. water in case of the solution of common salt or ammonia in water.
- A solution in which no more solute can be dissolved at the same temperature is called *Saturated solution*.
- A solution in which more solute can be dissolved at the same temperature is called unsaturated solution.

- **Properties of solutions :**
  (i) It is a homogeneous mixture.
  (ii) The particles of solution are smaller than 1nm (10^{-9}m) in diameter and can not be seen by naked eye.
  (iii) Particles of solution do not **scatter** a beam of light passing through solution i.e. they do not show **Tyndall** effect.
  (iv) The components of a solution can not be separated by filtration.
  (v) The particles of a solution do not settle when left undisturbed.
- **Types of solution :**
  Solution are of the following types depending upon the state of solute and solvent.

	Type	Solute	Solvent	Example
(i)	gas in gas	gas	gas	Air
(ii)	liquid in gas	liquid	gas	chloroform vapours mixed with nitrogen
(iii)	solid in gas	solid	gas	camphor vapours in nitrogen
(iv)	gas in liquid	gas	liquid	aerated drinks, oxygen dissolved in water
(v)	liquid in liquid	liquid	liquid	vinegar ethanol dissolved in water
(vi)	solid in liquid	solid	liquid	solution of sugar in water
				solution of common salt in water
(vii)	gas in solid	gas	solid	solution of hydrogen in palladium
(viii)	solid in solid	solid	solid	Brass (70% Cu, 30% Zn) In it Zn is solute.
(ix)	liquid in solid	liquid	solid	Amalgam of mercury with sodium.

- *Concentration of a solution* is the amount of solute present in a given amount (mass or volume) of a solution or the amount of solute dissolved in a given mass or volume of a solvent.

$$\text{Concentration} = \frac{\text{Amount of solute}}{\text{Amount of solvent}}$$

The various ways of expressing the concentration of a solution, are : (i) *Mass percentage* and (ii) *Volume percentage*

(i) **Mass percentage:** It is the amount of solute in grams dissolved per 100g of solution.

$$\text{Mass \%} = \frac{\text{Mass of solute (in grams)}}{\text{Mass of solution (in grams)}} \times 100$$

(ii) **Volume percentage:** It is the mass of solute in grams present per 100 ml of solution.

$$\text{Volume \%} = \frac{\text{Mass of solute (in grams)}}{\text{Volume of solution (in ml)}} \times 100$$

- **Solubility :** It is defined as the amount of solute dissolved in 100g of solvent to form a saturated solution.
- **Suspension :** It is a non-homogeneous mixture in which *solids are dispersed in liquids.* The particles in a suspension are of a size larger than 10^{-5}cm (or 10^{-7} m) in diameter and can be seen with naked eye, e.g. muddy water.

Properties of a suspension :

(i) It is a heterogeneous mixture.
(ii) The particle size is larger than 10^{-5}cm (100 nm) in diameter.
(iii) Particles in a suspension can be seen by naked eye.
(iv) Particles of a suspension **scatter** a beam of light passing through it and it makes the path visible. i.e. they show **Tyndall effect**.
(v) Particles of a suspension settle down when suspension is left undisturbed i.e. suspension is *unstable.*
(vi) Components of a suspension can be separated by process of filtration.

- **Colloid** is a *heterogeneous mixture.* The size of particles of a colloid is intermediate between *true solutions* and *suspensions* (i.e between 1nm and 100 nm). The particles of a colloid can not be seen with naked eye.

Properties of colloids :

(i) Colloid is a *heterogeneous mixture.*
(ii) The size of colloidal particles lies between 1nm and 100 nm.
(iii) Colloidal particles can not be seen with naked eye.
(iv) Colloidal particles *scatter* a beam of light passing through a colloidal solution and make its path visible i.e. they show **Tyndall effect**.
(v) Colloidal particles can not be separated from the mixture by the process of filtration. However they can be separated by **centrifugation** process.
(vi) Colloidal particles carry charge and move in zig-zag motion. (*Brownian movement*)

- Since colloidal solution is heterogeneous mixture it consists of two *phases*. These are
  (i) *dispersed phase* (colloidal particles)
  (ii) *dispersion medium* (The medium in which colloidal particles are dispersed.)

- **Different Types of colloidal solution :**

Eight different types of colloidal solution on the basis of state of dispersed phase and dispersion medium are:

S.No.	Dispersed phase	Dispersion medium	Name of colloidal solution	Example
1.	Gas	liquid	foam	soap, lather, whipped cream, soda water
2.	Gas	solid	solid foam	pumice stone, foam, rubber, bread.
3.	Liquid	gas	aerosol	mist, fog, cloud, insecticide spray
4.	Liquid	liquid	emulsion	milk, emulsified oil, medicines, rubber latex.
5.	Liquid	solid	gels	jelly, butter, cheese.
6.	Solid	gas	solid aerosols	boot polish, aerosol smoke, dust, storm, volcanic dust, haze.
7.	Solid	liquid	sols	paints, starch dispersed in water, gold sol, muddy water.
8.	Solid	solid	solid	alloys, coloured glass, gem, stones, ruby, glass, minerals.

- Emulsions are colloidal solutions in which both the dispersed phase and dispersion medium are liquids. Emulsions are broadly classified into two types.

(i) Oil in Water Emulsion : In this type of emulsion oil is the dispersed phase, while water is the dispersion medium. Examples are milk and vanishing cream.

(ii) Water in Oil Emulsion : In this type of colloidal system water is the dispersed phase and oil acts as the dispersion medium. Examples of water in oil emulsions are butter, cold cream, cod liver oil and margarine (in which a soyabean product is the emulsifying agent).

- **Application of colloidal solution:** Some important applications are:
  - (i) *To stop bleeding from a cut*: For this purpose we apply alum or ferric chloride solutions on the cuts.
  - (ii) Medicines in colloidal form can be easily absorbed by body.
  - (iii) Cleansing action of soap.
  - (iv) Formations of delta when river comes in contact with sea water.
  - (v) *Blue colour of sky*: It is due to the scattering of sunlight by fine dust particles present in atmosphere.
- **Physical change :** During such a change no new substances is formed and there is no change in the chemical properties of the substances. There is only a change in physical state of the substance and such a change can be easily reversed by a slight change of conditions. Thus it is a temporary change, e.g. change of ice in water, melting of wax etc.
- **Chemical change :** Such a change is accompanied by change in chemical properties and formation of new substances. Such a change can not be easily reversed and so it is a permanent change, e.g. burning of paper, burning of wood, burning of candle etc.

  In addition to formation of new substances, a chemical reaction may be accompanied by one or more of the following chemical changes:

(i) Evolution of gas.

$$\underset{\text{Zinc}}{Zn} + \underset{\substack{\text{Sulphuric}\\\text{acid}}}{H_2SO_4} \longrightarrow \underset{\substack{\text{Zinc}\\\text{Sulphate}}}{ZnSO_4} + \underset{\text{Hydrogen}}{H_2}$$

(ii) Change of colour.

$$\underset{\text{Lead nitrate}}{Pb(NO_3)_2} \xrightarrow{\text{Heat}} \underset{\text{Lead oxide}}{PbO} + \underset{\substack{\text{Nitrogen}\\\text{dioxide}\\\text{(Brown fumes)}}}{NO_2} + \underset{\text{Oxygen}}{O_2}$$

(iii) Formation of precipitate.

$$\underset{\text{Silver nitrate}}{AgNO_3} + \underset{\substack{\text{Sodium}\\\text{chloride}}}{NaCl} \longrightarrow \underset{\substack{\text{Silver}\\\text{chloride}}}{AgCl} + \underset{\substack{\text{Sodium}\\\text{nitrate}}}{NaNO_3}$$

(iv) Heat, light or any other radiation may be absorbed or evolved.

The reactions, during which heat energy is absorbed are called **endothermic reaction**.

Examples :

$$\underset{\text{Nitrogen}}{N_2} + \underset{\text{Oxygen}}{O_2} \xrightarrow{\text{Heat}} \underset{\text{Nitric oxide}}{NO}$$

The reactions, during which heat energy is released are called **exothermic reactions**.

Examples :

$$\underset{\text{Carbon}}{C} + \underset{\text{Oxygen}}{O_2} \longrightarrow \underset{\substack{\text{Carbon}\\\text{dioxide}}}{CO_2} + \text{Heat}$$

(v) Sound may be produced.

When a pinch of baking soda is added to vinegar, carbon dioxide gas with a hissing sound is produced.

$$2\,\underset{\text{Vinegar}}{CH_3COOH} + \underset{\text{Baking soda}}{Na_2CO_3} \longrightarrow \underset{\substack{\text{Carbon}\\\text{dioxide}}}{CO_2} + H_2O + 2CH_3COONa$$

(vi) Change of smell may occur or a new smell may be given off. When we leave cooked food containing fats and oils outside (not refrigerated), it gets spoiled and gives foul smell.

Exercise 1

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which only one is correct.

1. Select the one that is not a matter.
   (1) feeling of hot (2) smoke
   (3) humidity (4) water
2. Which is incorrect statement?
   (1) Matter is continuous in nature.
   (2) Of the three state of matter, the one that is most compact is solid state.
   (3) In solid state interparticles space (i.e., empty space) is minimum.
   (4) The density of solid is generally more than that of a liquid.
3. Select the one that when used would be considered as best condition for liquification of a gas.
   (1) Increasing the temperature.
   (2) Decreasing the pressure.
   (3) Increasing the pressure and decreasing the temperature.
   (4) Decreasing the pressure and increasing the temperature.
4. Select the correct order of evaporation for water, alcohol, petrol and kerosene oil :
   (1) water > alcohol > kerosene oil > petrol
   (2) alcohol > petrol > water > kerosene oil
   (3) petrol > alcohol > water > kerosene oil
   (4) petrol > alcohol > kerosene oil > water.
5. Which one is a sublime substance?
   (1) Table salt (2) Sugar
   (3) Iodine (4) Potassium Iodide
6. The process of change of liquid state into gaseous state at constant temperature is known as
   (1) boiling (2) melting
   (3) fusion (4) evaporation
7. Which one is a surface phenomenon?
   (1) Evaporation (2) Boiling
   (3) Both (1) and (2) (4) None of these
8. Which of the following processes is known as fusion?
   (1) Change of liquid to solid
   (2) Change of solid to liquid
   (3) Change of liquid to vapour
   (4) Change of gaseous state to solid state
9. The evaporation of a liquid can best be carried out in a
   (1) flask (2) china dish
   (3) test-tube (4) beaker
10. The one, in which interparticle forces are strongest, is
    (1) sodium chloride (2) hydrogen
    (3) ether (4) carbon dioxide
11. The melting point temperature of the solid state of a substance is 40°C. The freezing point temperature of the liquid state of the same substance will be
    (1) 35°C (2) 40°C
    (3) 45°C (4) can't predict
12. Which one will help to accelerate the process of evaporation of a liquid kept in an open china dish?
    (1) Keeping dish in open
    (2) Blowing air into the liquid
    (3) Keeping the dish under a running fan
    (4) All of the above
13. When a gas is compressed keeping temperature constant, it results in
    (1) increase in speed of gaseous molecules
    (2) increase in collision among gaseous molecules
    (3) decrease in speed of gaseous molecules
    (4) decrease in collision among gaseous molecules
14. Which of the following in an element ?
    (1) Marble (2) Graphite
    (3) Washing stone (4) Stone
15. An atom is
    (1) The smallest particle of matter known
    (2) The smallest particle of a gas
    (3) The smallest indivisible particle of an element that can take part in a chemical change
    (4) Radioactive emission
16. Which of the following is a compound ?
    (1) Stainless steel (2) Brass
    (3) Iron sulphide (4) Diamond
17. Select the one that has a definite boiling point
    (1) true solution (2) compound
    (3) colloid (4) All of these
18. We can see the particles of a colloidal solution with
    (1) naked eyes
    (2) the help of ultramicroscope
    (3) the help of microscope
    (4) None of these
19. Which of the following will yield a mixture ?
    (1) Crushing of marble tile
    (2) Breaking of ice-cubes
    (3) Addition of sodium metal to water in a china dish
    (4) Agitating a detergent with water in a washing machine.
20. On passing through a colloidal solution, the beam of light gets .....
    (1) reflected (2) refracted
    (3) scattered (4) absorbed
21. The cause of Brownian movement is
    (1) convection current
    (2) heat changes in liquid state
    (3) impact of molecules of dispersion medium on colloidal particles.
    (4) attractive forces between particles of dispersed phase and dispersion medium.
22. Brass is an example of
    (1) compound
    (2) element
    (3) homogeneous mixture
    (4) heterogeneous mixture

23. Air is regarded as mixture because
(1) its pressure may vary
(2) its temperature may vary
(3) its volume changes with change in temperature/ pressure
(4) its composition may vary

24. The size of colloidal particles usually lies in the range
(1) $10^{-5} - 10^{-7}$ cm (2) $10^{-7} - 10^{-9}$ cm
(3) $10^{-3} - 10^{-5}$ cm (4) $10^{-2} - 10^{-6}$ cm

25. Oil and water can form a stable dispersion with the help of a third substance commonly called
(1) emulsifier (2) dispersant
(3) protective colloid (4) None of these

26. The blue colour of water in the sea is due to
(1) absorption of other colour except blue by water molecules
(2) scattering of blue light by sol particles
(3) refraction of blue light by impurities present in sea water
(4) reflection of blue sky by sea water

27. Tails of comets are visible due to
(1) Tyndall Effect
(2) Reflection
(3) Brownian movement
(4) None of these

28. Why is helium preferred over hydrogen for use in airships ?
(1) Helium has a low density
(2) Helium has a high density
(3) Helium is chemically less reactive
(4) Helium is chemically more reactive

29. Which one of the following mixtures is homogeneous?
(1) Starch and sugar
(2) Methanol and water
(3) Graphite and charcoal
(4) Calcium carbonate and calcium bicarbonate

30. During summer, water kept in an earthen pot becomes cool because of the phenomenon of
(1) diffusion (2) transpiration
(3) osmosis (4) evaporation

31. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement?
(1) Water, air, wind (2) Air, sugar, oil
(3) Oxygen, water, sugar (4) Salt, juice, air

32. The boiling points of diethyl ether, acetone and n-butyl alcohol are 35°C, 56°C and 118°C respectively. Which one of the following correctly represents their boiling points in kelvin scale?
(1) 306 K, 329 K, 391 K (2) 308 K, 329 K, 392 K
(3) 308 K, 329 K, 391 K (4) 329 K, 392 K, 308 K

33. In which of the following conditions, the distance between the molecules of hydrogen gas would increase?
(i) Increasing pressure on hydrogen contained in a closed container
(ii) Some hydrogen gas leaking out of the container
(iii) Increasing the volume of the container of hydrogen gas
(iv) Adding more hydrogen gas to the container without increasing the volume of the container
(1) (i) and (iii) (2) (i) and (iv)
(3) (ii) and (iii) (4) (ii) and (iv)

34. Which of the following statements are true for pure substances?
(i) Pure substances contain only one kind of particles
(ii) Pure substances may be compounds or mixtures
(iii) Pure substances have the same composition throughout
(iv) Pure substances can be exemplified by all elements other than nickel
(1) (i) and (ii) (2) (i) and (iii)
(3) (iii) and (iv) (4) (ii) and (iii)

35. A mixture of sulphur and carbon disulphide is
(1) heterogeneous and shows Tyndall effect
(2) homogeneous and shows Tyndall effect
(3) heterogeneous and does not show Tyndall effect
(4) homogeneous and does not show Tyndall effect

36. Tincture of iodine has antiseptic properties. This solution is made by dissolving
(1) iodine in potassium iodide
(2) iodine in vaseline
(3) iodine in water
(4) iodine in alcohol

37. Two substances, A and B were made to react to form a third substance, A_2B according to the following reaction
$2A + B \rightarrow A_2B$
Which of the following statements concerning this reaction are incorrect?
(i) The product A_2B shows the properties of substances A and B
(ii) The product will always have a fixed composition
(iii) The product so formed cannot be classified as a compound
(iv) The product so formed is an element
(1) (i), (ii) and (iii) (2) (ii), (iii) and (iv)
(3) (i), (iii) and (iv) (4) (iii) and (iv)

38. Two chemical species X and Y combine together to form a product P which contains both X and Y
$X + Y \rightarrow P$
X and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y and P are correct?
(i) P is a compound
(ii) X and Y are compounds
(iii) X and Y are elements
(iv) P has a fixed composition
(1) (i), (ii) and (iii) (2) (i), (ii) and (iv)
(3) (ii), (iii) and (iv) (4) (i), (iii) and (iv)

39. A student, carefully observed the colloidal of starch in water, human blood and cow milk. On the basis of observations, he made certain conclusions given below. Choose the wrong conclusion about colloidal solution
(1) Translucent
(2) Components can be separated by ordinary filteration.
(3) Homogeneous and stable
(4) Show tyndal effect

40. There are four test tubes A, B, C and D half filled with water. A considerable quantity of sugar, milk, egg white and common salt was added in them respectively with stirring the contents of each tube.
True solution will be obtained in
(1) Only A (2) Only D
(3) Both B and C (4) Both A and D

41. Choose the incorrect statement about true solution
(1) Its components can not be separated by filteration.
(2) It is opaque and unstable.
(3) Its particles can not be seen through naked eye.
(4) It does not show tyndal effect.

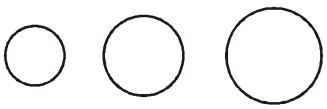
42. Barium sulphate ($BaSO_4$) dispersed in water used diagnostic X-rays is a
(1) Colloid (2) Solution
(3) Suspension (4) Foam

43. The example of solution of liquid in gas is
(1) Dry air (2) Sugar in water
(3) Mercury in gold (4) Moist air.

44. The component of a solution which is present in larger amount is referred to as
(1) Solute (2) Solvent
(3) Both (1) and (2) (4) Neither (1) nor (2)

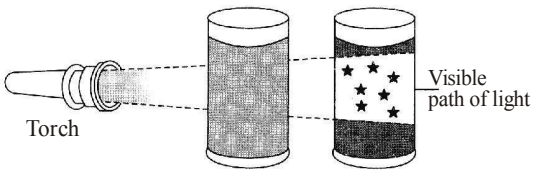
45. You have prepared four different mixtures in water using 1. Charcoal powder, 2. Chalk powder, 3. Slaked lime and 4. Detergent powder. If you filter these mixtures through a filter paper, there will be no residue left after filtration in the case of
(1) charcoal powder (2) chalk powder
(3) slaked lime (4) detergent powder.

46. What is the correct designation of A, B and C respectively for the size of the particles in the figures given below?



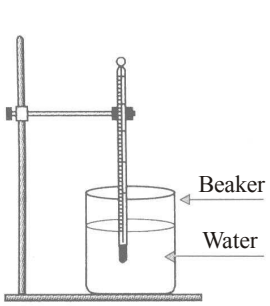
(1) A = Solution B = Gel C = Suspension
(2) A = Gel B = Solution C = Suspension
(3) A = Suspension B = Solution C = Gel
(4) A = Solution B = Suspension C = Gel

47. When light is passed through samples A and B placed in a line in a dark room, the effects observed are as shown in the figure.

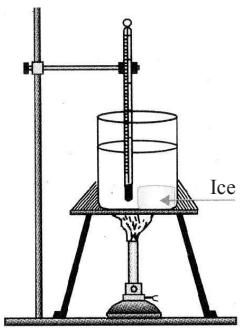


Which one of the following pairs is the correct description of both the samples?
(1) A = Gel and B = Gel
(2) A = Solution and B = Solution
(3) A = Gel and B = Suspension
(4) A = Solution and B = Gel.C = Gel

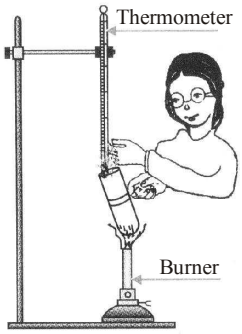
48. Which one of the following experimental set up is correct for studying the cooling caused by evaporation of water?



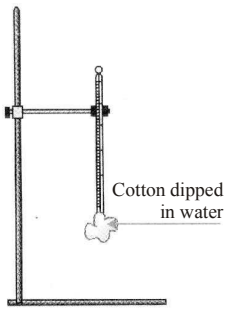
(I)



(II)



(III)

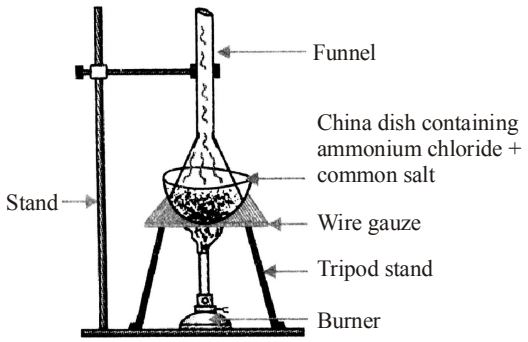


(IV)

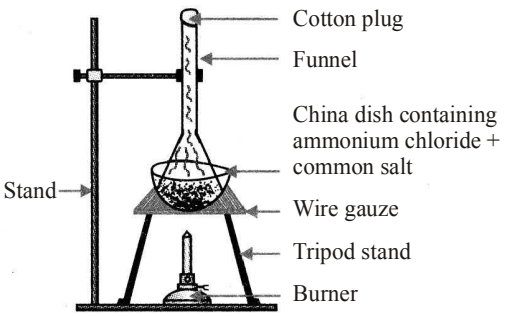
(1) I (2) II
(3) II (4) IV

49. Which of the following is the correct arrangement for separation a mixture of common salt and ammonium chloride ?

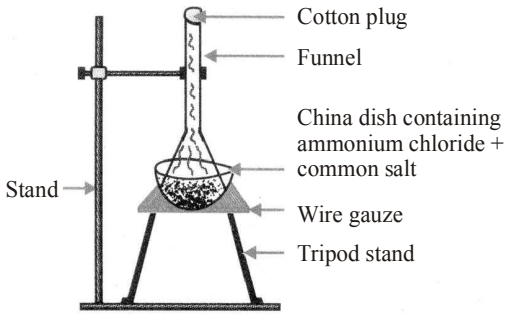
(I)



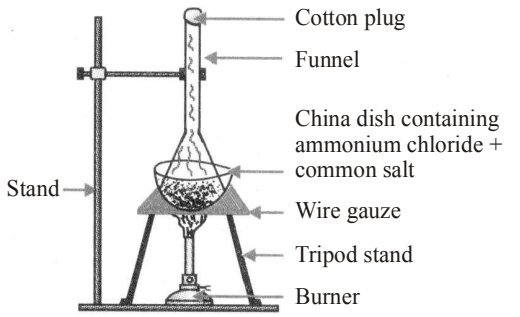
(II)



(III)



(IV)



(1) I (2) II
(3) III (4) IV

50. The state of matter which consists of super energetic particles in the form of ionized gases is called
(1) gaseous state
(2) liquid state
(3) Bose-Einstein condensate
(4) plasma state

51. Non-reacting gases have a tendency to mix with each other. This phenomenon is known as
(1) chemical reaction (2) diffusion
(3) effusion (4) explosion

52. A gas can be compressed to a fraction of its volume. The same volume of a gas can be spread all over a room. The reason for this is that
(1) the volume occupied by molecules of a gas is negligible as compared to the total volume of the gas.
(2) gases consists of molecules which are in a state of random motion
(3) gases consist of molecules having very large inter-molecular space which can be reduced or increased under ordinary conditions
(4) None of these

53. Which has the least energetic molecules?
(1) Solids (2) Liquids
(3) Gases (4) Plasmas

54. The process used to separate oil and water is
(1) distillation (2) sublimation
(3) separating funnel (4) chromatography

55. A mixture of common salt, sulphur, sand and iron filings is shaken with carbon disulphide and filtered through a filter paper. The filtrate is evaporated to dryness in a china dish. What will be left in the dish after evaporation?
(1) Sand (2) Sulphur
(3) Iron filings (4) Common salt

56. A mixture of $ZnCl_2$ and $PbCl_2$ can be separated by
(1) distillation (2) crystallization
(3) sublimation (4) adding acetic acid

57. White gold is used in jewelry and contains two elements, gold and palladium. A jeweler has two different samples that are both identical in appearance and have a uniform composition throughout. What can be said about the samples?
(1) They are homogeneous mixtures and be classified as metallic alloys.
(2) The materials are heterogeneous mixtures and can be classified by their components
(3) The samples have variable compositions and are classified as metallic solutions.
(4) The samples are heterogeneous mixtures that can be separated using magnetic properties.

58. Which flow chart correctly describes a homogeneous material?
(1) Unknown — density — 3 layers
(2) Unknow — filtration — two substances
(3) Unknown — magnet — two substances
(4) Unknown — boiling — one temperature

59. Magnetism is most beneficial for separating
(1) gases and non-metallic liquids
(2) magnetic solids and solids such as sulfur
(3) non-metallic solids and solids such as sulfur
(4) non-magnetic solids from non-magnetic liquids

60. Distillation is a good separation technique for
(1) solids (2) liquids
(3) solid alloys (4) gases

61. Solubility is a good separation technique for
(1) pure metals (2) noble gases
(3) different salts (4) metallic alloys

62. 40 g of common salt is dissolved in 320 g of water. The mass percentage of salt is
(1) 11.1% (2) 12.5%.
(3) 15% (4) 10%

63. Select the correct alternative(s).
(i) Melting of ice is a physical change.
(ii) A physical change is due to change in physical properties of a substance.
(iii) A physical change is always irreversible in nature.
(iv) Burning of candle is an example of physical change.
(1) (i) & (ii) (2) (i) & (iv)
(3) (i), (ii) & (iv) (4) (ii) & (iii)

64. Pick out physical changes from the following
(i) rusting of iron
(ii) dissolving salt in water
(iii) change of water to ice
(iv) cooking of food
(1) (i) & (ii) (2) (ii) & (iii)
(3) (i), (ii) & (iii) (4) (iii) & (iv)

65. Water is boiling in open fry pan represents which type of change?
(1) Physical and irreversible
(2) Chemical and irreversible
(3) Physical and reversible
(4) Chemical and reversible

66. Chemical change is always accompanied by
(i) production of sound
(ii) heat and light
(iii) change in mass
(iv) change in colour
(1) (i) (ii) & (iii) (2) (ii) & (iv)
(3) (i) only (4) (i) , (ii) & (iv)

67. The gas you use in kitchen is called liquified petroleum gas (LPG). In the cylinder, it exists as a liquid. When it comes out of the cylinder, it becomes a gas (process A), then it burns (process B). Choose the correct statement.
(1) Process A is a chemical change.
(2) Process B is a chemical change.
(3) Both processes A and B are chemical changes.
(4) None of these processes is a chemical change.

68. Anaerobic bacteria digest animal waste and produce biogas (change A). The bio gas is burnt as fuel (change B). Choose the correct staement.
(1) Change A is a chemical change.
(2) Change B is a chemical change.
(3) Both changes A and B are chemical changes.
(4) None of these changes is a chemical change.

69. Which of the following is a chemical change?
(1) Dent produced on car body by cricket ball
(2) Streching of rubber band
(3) Brinjals and apples become dark on exposure to atmosphere
(4) Formation of salts by collecting sea water in shallow pits

Exercise 2

Matching Based MCQ

DIRECTIONS(Qs.1 to 7) : Match Column-I with Column-II and select the correct answer using the codes given below the columns.

1.

	Column I		Column II
(A)	Liquid metal	(p)	Camphor
(B)	Sublime substance	(q)	Hg
(C)	Metallic crystal	(r)	Five
(D)	No. of states of matter	(s)	Kelvin
(E)	SI unit of temperature	(t)	Good conductor of heat & electricity

(1) A – (q); B – (p); C – (t); D – (r); E – (q)
(2) A – (p); B – (q); C – (t); D – (r); E – (q)
(3) A – (q); B – (p); C – (t); D – (s); E – (r)
(4) A – (q); B – (t); C – (p); D – (r); E – (s)

2.

	Column I		Column II
(A)	Liquid	(p)	definite shape
(B)	Solid	(q)	definite volume
(C)	Plasma	(r)	super low density
(D)	Bose-Einstein condensate	(s)	super energetic

(1) A – (p); B – (r); C – (s); D – (q)
(2) A – (r); B – (p); C – (s); D – (q)
(3) A – (r); B – (p); C – (s); D – (q)
(4) A – (q); B – (p); C – (s); D – (r)

3.

	Column - I		Column - II
(A)	Miscible mixture of liquids	(p)	Homogeneous mixture
(B)	Cutting of trees	(q)	Pure substance
(C)	Soda water	(r)	Fractional distillation
(D)	Hydrochloric acid (HCl)	(s)	Compound
(E)	Methane (CH_4)	(t)	Chemical change

(1) A – (t); B – (p); C – (r); D – (q); E – (s)
(2) A – (r); B – (p); C – (t); D – (q); E – (s)
(3) A – (r); B – (t); C – (p); D – (q); E – (s)
(4) A – (t); B – (r); C – (p); D – (q); E – (s)

4.

	Column I		Column II
(A)	Pressure	(p)	cubic metre
(B)	Temperature	(q)	kilogram
(C)	Density	(r)	pascal
(D)	Mass	(s)	kelvin
(E)	Volume	(t)	kilogram per cubic metre

(1) A – (s); B – (r); C – (t); D – (q); E – (p)
(2) A – (r); B – (t); C – (s); D – (q); E – (p)
(3) A – (p); B – (s); C – (t); D – (q); E – (r)
(4) A – (r); B – (s); C – (t); D – (q); E – (p)

5.

	Column I		Column II
(A)	degree celsius	(p)	kilogram
(B)	centimetre	(q)	pascal
(C)	gram per centimetre cube	(r)	metre
(D)	bar	(s)	kelvin
(E)	milligram	(t)	kilogram per metre cube

(1) A – (r); B – (s); C – (t); D – (q); E – (p)
(2) A – (s); B – (r); C – (t); D – (q); E – (p)
(3) A – (p); B – (r); C – (t); D – (q); E – (s)
(4) A – (t); B – (r); C – (s); D – (q); E – (p)

6.

	Column I		Column II
(A)	Evaporation	(p)	Solid
(B)	Sponge	(q)	Diffusion
(C)	Spreading of virus on sneezing	(r)	Liquid into vapours above room temperature
(D)	Fusion	(s)	Liquid into vapours
(E)	Boiling	(t)	Melting

(1) A – (s); B – (q); C – (p); D – (t); E – (r)
(2) A – (s); B – (p); C – (q); D – (t); E – (r)
(3) A – (p); B – (s); C – (q); D – (t); E – (r)
(4) A – (s); B – (p); C – (q); D – (r); E – (t)

7.

	Column I		Column II
(A)	Iodine	(p)	Temperature below 0 °C
(B)	Iron + Sulphur	(q)	100 °C (Boiling point)
(C)	Sea water	(r)	Sublimation
(D)	Pure water	(s)	Mixture of two elements
(E)	Ice + Common salt	(t)	Boiling point > 100°C

(1) A – (r); B – (s); C – (t); D – (q); E – (p)
(2) A – (s); B – (r); C – (t); D – (q); E – (p)
(3) A – (r); B – (s); C – (q); D – (t); E – (p)
(4) A – (r); B – (s); C – (t); D – (p); E – (q)

Statement Based MCQ

8. Consider the following statements :
(a) All homogeneous mixtures are called solutions.
(b) A suspension of chalk in water is a homogeneous mixture.
Which of the statement(s) given above is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

9. Consider the following statements :
(a) Boiling is a bulk phenomenon.
(b) Evaporation is a surface phenomenon.
Which of these statement(s) is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

10. Consider the following statements :
(a) Water at room temperature is a liquid.
(b) When a liquid is cooled very quickly, it always forms a crystal.
(c) Atoms in a liquid are farther apart than the atoms in a gas.
Which of these statement(s) is/are correct ?
(1) (a) and (b) (2) (b) and (c)
(3) Only (a) (4) Only (c)

11. Consider the following statements :
(a) The rate of evaporation depends only on the surface area exposed to the atmosphere.
(b) Latent heat of vaporisation is the heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its melting point.
Which of these statement(s) is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

12. Consider the following statements :
(a) The molecules in a gas are in constant motion.
(b) Gases have the same pressure throughout the entire atmosphere.
(c) Gas molecules are always evenly distributed in the atmosphere.
Which of these statement(s) is/are correct ?
(1) (a) and (b) (2) (b) and (c)
(3) Only (a) (4) Only (b)

13. Consider the following statements :
(a) Colloids shows the property of tyndall effect
(b) We can regard solutions as homogeneous mixture.
Which of these statement(s) is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

14. Consider the following statements :
(a) Element is always metal.
(b) Both fog and clouds are solid in gas type of colloids.
(c) A colloidal solution is a heterogenous mixture.
Which of these statement(s) is/are correct ?
(1) (a) and (b) (2) (b) and (c)
(3) (a) and (c) (4) All are correct

15. Consider the following statements :
(a) Melting of ice is a chemical change.
(b) We can separate all mixtures by filteration.
Which of these statement(s) is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

16. Consider the following statements :
(a) Substance is a kind of matter that can not be seperated into other kinds of matter by any physical process.
(b) Solubility of a substance may be same in different solvents.
Which of these statement(s) is/are correct ?
(1) (a) only (2) (b) only
(3) Both (a) and (b) (4) Neither (a) nor (b)

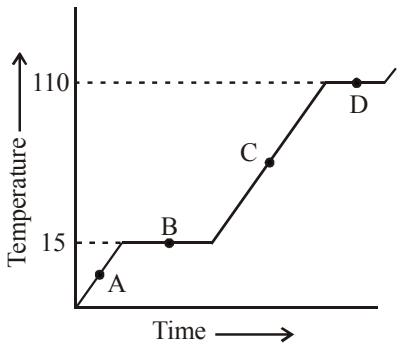
17. Consider the following statements :
(a) Like solids solubility of gases also increases with increase in temperature.
(b) Mechanical stirring increases the solubility.
(c) All solutions are mixtures, but not all mixtures are solutions.
Which of these statement(s) is/are correct ?
(1) (a) and (b) (2) (b) and (c)
(3) (a) and (c) (4) All are correct

Passage Based MCQ

DIRECTIONS (Qs. 18 to 28) : Read the passage(s) given below and answer the questions that follow.

PASSAGE - 1

The graph alongside shows the heating curve for a pure substance. The temperature rises with time as the substance is heated :



18. What is the physical state of substance at the point A ?
(1) Solid (2) Liquid
(3). Gaseous (4) Both (1) and (2)

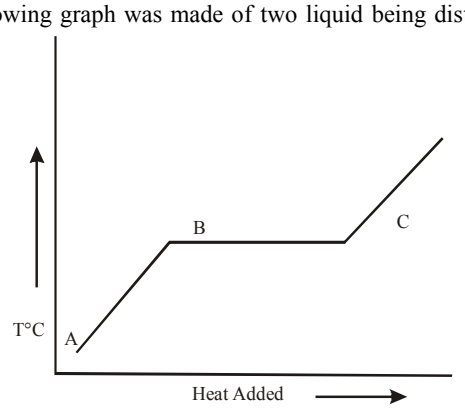
19. What is the physical state of substance at the point B ?
(1) Solid (2) Liquid
(3) Gaseous (4) Both (1) and (2)

20. What is the physical state of substance at the point C ?
(1) Solid (2) Liquid
(3) Gaseous (4) Both (2) and (3)

21. What is the physical state of substance at the point D ?
(1) Solid (2) Liquid
(3) Gaseous (4) Both (2) and (3)

PASSAGE - 2

The following graph was made of two liquid being distilled.



22. What observation can be made regarding point B?
(1) The first liquid component is boiling
(2) The second component has already boiled
(3) The mixture is homogeneous
(4) Energy is being removed from the liquid

23. What observation can be made regarding point C?
(1) The second component has already boiled
(2) The temperature of first component starts increasing
(3) The temperature of second component starts increasing
(4) None of the above

24. What is the minimum temperature difference required between boiling points of two liquids to be distilled?
(1) 10 – 20 K (2) 10ºC – 20ºC
(3) 5 – 15 K (4) 5ºC – 15ºC

PASSAGE - 3

A change in which two or more substances (reactants) combine to produce one or more new substances (products) that has/ have different chemical properties than the reactants is called chemical change.

In a chemical change new products are formed. The characteristics of a chemical change are following :

1. Heat, light or any other radiation (ultraviolet) may be given off or absorbed.
2. Sound may be produced.
3. A change in smell may take place or a new smell may be given off.
4. A colour change may take place.
5. A gas may be formed.

Change in which only physical properties of any substances get changed and no new substance is formed is called a physical change. Such as shape, size, colour and state, is known as physical change. A physical change is mostly reversible and during physical change no new substances are formed.

25. When we add sugar to water, it becomes sweet. Which of the following statements is TRUE regarding this change?
    (1) It is a chemical change because a new substance is formed
    (2) It is a chemical change because there is exchange of heat.
    (3) It is a physical change because the original substance can be recovered.
    (4) It is a chemical change because there is only change in colour.
26. Which of the following statements is not correct?
    (1) In a chemical change, colour of the object may change.
    (2) In a chemical change, heat will always be released.
    (3) A chemical change always involves physical change.
    (4) Rusting of iron becomes faster when humidity is high.
27. Which of the following is a chemical change?
    (1) Foul smell comes when food gets spoiled
    (2) Pollution of air due to explosion of fire-work.
    (3) Change in colour of a cut apple if left out side.
    (4) All of the above.
28. The reason for a physical change to be named as such is that the
    (1) change occurs only in physical properties
    (2) transfer of energy occurs
    (3) is a reversible change
    (4) All the above are correct

Assertion Reason Based MCQ

DIRECTIONS (Qs. 29 to 36) : Following questions consist of two statements, one labelled as the **'Assertion'** and the other as **'Reason'**. You are to examine these two statements carefully and select the answer to these items using the code given below.

Code :

(1) Both A and R are individually true and R is the correct explanation of A:
(2) Both A and R are individually true but R is not the correct explanation of A.
(3) A is true but R is false
(4) A is false but R is true.

29. **Assertion :** Naphthalene balls dissappear completely after few days.
    Reason : They are highly volatile (sublimate) and change into vapours completely.
30. **Assertion :** Pure substances have fixed melting point.
    Reason : The properties of compound are similar to that of its components.
31. **Assertion :** At room temperature, the evaporation of a liquid takes place at constant rate.
    Reason : During evaporation of a liquid, the temperature of the liquid remains unaffected.
32. **Assertion :** Refining of petroleum involves fractional distillation.
    Reason : Fractional distillation involves repeated evaporation and distillation.
33. **Assertion :** Pure substances in which molecules are made up of only one kind of atoms are known as elements.
    Reason : Hydrogen, oxygen and nitrogen are elements.
34. **Assertion :** Colloidal solution is electrically neutral.
    Reason : Due to similar nature of the charge carried by the particles, they repel each other and do not combine to form bigger particles.
35. **Assertion :** Soaps and detergents belong to the category of macro-molecular colloids.
    Reason : The molecules of soaps and detergents are not of big size.
36. **Assertion :** Water is a compound but not a mixture.
    Reason : Water can be separated into its constituents hydrogen and oxygen by physical methods.

Correct Definition Based MCQ

37. Latent heat of vaporization is
    (1) amount of heat energy required to change 1g of a liquid into gaseous state at atmosphere pressure without change of temperature at its boiling point.
    (2) amount of heat energy required to change 1 kg of a liquid in to gaseous state at atmosphere pressure without any change of temperature at its boiling point.
    (3) amount of heat energy required to change 1 kg of solid into gaseous state at atmospheric pressure without any change of temperature at its melting point.
    (4) amount of heat energy required to change 1g of a liquid into gaseous state at STP without any change of temperature at its boiling point.
38. Solution is a
    (1) homogeneous mixture of two or more substances whose composition can be varied
    (2) heterogeneous mixture of two or more subtances whose composition can be varied
    (3) homogeneous mixture of two or more substances having fixed composition
    (4) heterogenous mixture of two or more substances having fixed composition.
39. Volume percentage is the
    (1) mass of solute in grams present per 1000 ml of solution
    (2) mass of solute in kilograms present per 1000 ml of solution
    (3) mass of solute in kilograms present per 100 ml of solution
    (4) mass of solute in grams present per 100 ml of solution

40. Chemical change is
(1) accompanied by change in chemical properties and formation of new substances.
(2) accompanied by change in chemical properties and no new substance is formed
(3) accompanied by change in physical properties and formation of new substance occurs.
(4) accompanied by change in physical properties and no new substance is formed.

Feature Based MCQ

41. On the basis of following features identify correct option
I. It is a surface phenomena
II. It occurs below boiling point of liquid
III. This results in cooling
(1) Condensation (2) Evaporation
(3) Boiling (4) Melting

42. On the basis of following features identify correct option
I. Heat is absorbed
II. Change of colour is obsersed.
(1) Physical change
(2) Reversible change
(3) Exothermic chemical change
(4) Endothermic chemical change

43. On the basis of following features identify correct option
I. Solid - solid solution
II. Homogeneous mixture of metals
(1) Aerated drinks (2) Brass
(3) Na/Hg amalgam (4) Gemstones

44. On the basis of following features identify correct option
I. This technique is used for purification of solid organic compounds.
II. It is based on difference in solubilities of compound and impurities.
(1) Chromatography (2) Separating funnel
(3) Crystallisation (4) Distillation

Hints & SOLUTIONS

Exercise 1

1. **(1)** **2.** **(1)** **3.** **(3)** **4.** **(4)**
5. **(3)** Solid iodine gets directly converted into vapours.
6. **(1)**
7. **(1)** Boiling is a bulk phenomena
8. **(2)** **9.** **(2)**
10. **(1)** As sodium chloride is ionic solid.
11. **(2)** **12.** **(4)** **13.** **(4)** **14.** **(2)**
15. **(3)**
16. **(3)** Iron sulphide (Fe_2S_3) is a compound of Iron and sulphur
17. **(2)** **18.** **(3)** **19.** **(4)**
20. **(3)** This is due to scattering of light by colloidal particles called Tyndall effect.
21. **(3)** **22.** **(3)** **23.** **(4)** **24.** **(1)**
25. **(1)** **26.** **(2)** **27.** **(1)**
28. **(3)** Though H_2 has a lower density and is cheaper but Helium is preferred in filling of balloons and air ships since it is non-inflammable. Thus, on safety grounds He is used in preference to H_2 in airships.
29. **(2)** A mixture of methanol (a liquid) and water (a liquid) is homogeneous.
30. **(4)** **31.** **(3)** **32.** **(3)**
33. **(3)** Increase of pressure and addition of more H_2 both decreases intermolecular distance.
34. **(2)** **35.** **(4)** **36.** **(4)** **37.** **(3)**
38. **(4)** **39.** **(3)**
40. **(4)** Both sugar and salt are completely miscible with water.
41. **(2)** True solutions are transparent and stable.
42. **(3)**
43. **(4)** Moist air contains H_2O vapours dispersed in air.
44. **(2)** **45.** **(4)** **46.** **(1)** **47.** **(4)**
48. **(4)** Only in this set up, the bulb is in direct contact with the liquid undergoing evaporation and hence extent of cooling can be correctly determined.
49. **(4)** This is correct arrangement because of presence of lighted burner, wire gauze and cotton plug.
50. **(4)**
51. **(3)** Effusion is the process in which individual molecules flow through a hole without collisions between molecules.
52. **(3)**
53. **(1)** As order of energy for different states of matter is following Bose-Einstein < Solids < Liqiuds < Gases < plasmas condensate.
54. **(3)** As oil being less denser than water it forms upper layer. Thus mixture of oil and water can be separated by using separating funnel.
55. **(2)** Sulphur will left behind. As in given mixture only sulphur gets dissolved in carbon disulphide.
56. **(2)**
57. **(1)** As they have uniform composition throughout they are considered as homogeneous mixture. Both samples are mixture of two metals (gold and palladium) thus are alloys.
58. **(4)** Homogeneous liquid have a particular boiling point.
59. **(2)** Magnetism is useful for separation of magnetic and non-magnetic substances.
60. **(2)** Distillation is a separation techniques used for separation of miscible liquids having different boiling point.
61. **(3)** Different salts have different solubility in a particular solvent. Thus on this basis mixture of different salts can be separated.
62. **(1)**

63. **(1)** Physical changes are those in which the physical properties are altered and melting of ice is a physical change. Some physical changes are irreversible while most of them are reversible. Burning of candle is a chemical change as the components lost in air can not be recovered. Candle is made up of carbon and hydrogen which react with oxygen to form carbon dioxide and water which is lost in air.

64. **(2)** Rusting of iron and cooking of food is a chemical change because the properties of rust are different from those of iron and the properties of cooked food are different from raw vegetables, etc.

65. **(1)** As on boiling water gets converted into steam which is a physical change but this steam is lost in to atmosphere as the pan is open. Thus the lost steam can not be condensed back to water therefore change is irreversible.

66. **(4)** A chemical change produces heat, light, sound and the products are of different colour than the reactants.

67. **(2)** This is because process A involves change of state from liquid to gas and is a physical change. While process B involves change of a gas into heat and light, which is a chemical change.

68. **(3)** This is because both changes A and B involves formation of new substances.

69. **(3)** Brinjals and apples becomes dark due to chemical changes rest all options represents physical changes only.

Exercise 2

1. **(1)** **2.** **(4)** **3.** **(3)** **4.** **(4)**

5. **(2)** **6.** **(2)** **7.** **(1)**

8. **(1)** A suspension is a heterogenous mixutre.

9. **(3)**

10. **(3)** Interatomic space in more in gases as compared to liquids.

11. **(4)** **12.** **(3)** **13.** **(3)**

14. **(2)** Element can be metal, non-metal and metalloid.

15. **(4)** Melting of ice is a physical change and all mixture cannot be separated by filteration .

16. **(1)** A substance have different solubilities in different solvents.

17. **(2)**

18. **(1)** **At point A :** The substance is in the solid state.

19. **(4)** **At point B :** The substance has started melting. It exists both in the solid and liquid states.

20. **(2)** **At point C :** The substance is in the liquid state.

21. **(4)** **At point D :** The substance has started boiling. It exists both in the liquid and gaseous states.

22. **(1)** The constant temperature at point B indicates boiling point of first liquid out of two.

23. **(3)** When first component of mixture is boiled off the temperature of second component starts increasing.

24. **(1)**

25. **(3)** Sugar can be recovered back from solution by crystallisation.

26. **(2)** In a chemical change heat can also be absorbed. For example in case of endothermic reaction.

27. **(4)** Change of smell, formation of new products and change of colour all are signs of a chemical change.

28. **(1)** **29.** **(1)**

30. **(3)** Properties of compound are different from its components.

31. **(3)** Duration evaporation of a liquid, the temperature of the liquid falls.

32. **(2)** As different fractions of petroleum have very less difference in their boiling points. Thus refining of petroleum is done via fractional distillation.

33. **(2)** Hydrogen, oxygen and nitrogen are elements as they all are made up of similar kind of atoms only.

34. **(2)** The particles of the colloids are electrically charged and carry positive or negative charge but colloidal solution as whole is neutral. The dispersion medium has an equal and opposite charge making the system neutral as a whole.

35. **(4)** Soaps and detergents are colloidal electrolytes and can not be regarded as macromolecules as they have individual molecules of very big size.

36. **(3)** A compound is a substance consisting two or more elements in definite proportion. Water is a compound of hydrogen and oxygen. Only mixture can be separated into its constituents by simple physical technique and not compounds.

37. **(2)** **38.** **(1)** **39.** **(4)** **40.** **(1)**

41. **(2)** **42.** **(4)** **43.** **(2)** **44.** **(3)**