Matter in Our Surroundings

Solution 1

The condition for something to be called matter is that it should occupy space and have mass.

Solution 2

Diffusion and Brownian motion.

Solution 3

Diffusion.

Solution 4

The characteristic of matter illustrated by this observation is that the particles of matter have spaces between them.

Solution 5

This displays that each crystal of Potassium Permanganate must be made up of millions of small particles i.e. particles of matter are very very small.

Solution 6

This shows that the particles of matter are constantly moving in all direction.

Solution 7

This displays that the particles of matter attract one another. In case of chalk, the force of attraction between the particles is weak whereas the force of attraction between the particles of iron is very very strong.

Solution 8

Atoms or Molecules.

Solution 10

(a) Solid.

(b) Liquid and Gas.

Solution 11

(a) Gases.

(b) Solids.

(c) Solids.

Solution 12

Liquid.

Solution 13

Gas.

Solution 14

Solid.

Solution 15

Gas.

Solution 16

LPG (Liquefied Petroleum Gas) and Oxygen Gas respectively.

Solution 17

(a) LPG – Liquefied Petroleum Gas.

(b) CNG – Compressed Natural Gas.

Solution 18

Gas diffuses faster.

Solution 19

Copper Sulphate into water.

Solution 20

False.

Solution 21

Diffusion.

Solution 22

Diffusion.

Solution 23

Diffusion.

Solution 24

(a) Diffusion; Brownian motion.

(b) Diffusion.

(c) States.

(d) Much more.

(e) Liquid; Gaseous.

Solution 25

(a) Diffusion:

(i) Matter is made up of tiny particles

(ii) The particles of matter are constantly moving.

(b) Brownian motion:

(i) The particles of matter are very, very small.

(ii) The particles of matter are constantly moving.

Solution 26

Robert Brown suspended extremely small pollen grains in water and observed it through a microscope. It was found that pollen grains were moving very rapidly throughout the water in a very irregular way. He also observed that warmer the water, faster the pollen grains move on the surface of water. This phenomenon is known as the 'Brownian Motion'.

Solution 27

It shows that each potassium permanganate crystal is made up of millions of small particles and particles of water have spaces between them.

Solution 28

Both bromine gas and air is made up of tiny moving particles. When a gas jar containing air is inverted over gas jar containing bromine vapour, both bromine and air molecules move and collide with one another and bounce about in all directions due to which we see a uniform red brown colour in both the jars.

Solution 29

When salt is added to water and stirred, the tiny salt particles break off from each solid salt granule and fill up the spaces available between the particles of water and mix with them.

Solution 30

Air is a gas whose particles are very far apart and there are very weak forces of attraction between them. Extremely weak forces between particles of air can be overcome easily due to which we can move our hand in air. On the other hand, the particles of a solid plank of wood are very closely packed and there are very strong forces of attraction between the particles of wood. Hence, it needs a huge outside force to overcome the strong inter particle attractions which only a karate expert can apply.

Solution 31

If two metal blocks are bound together tightly and kept undistributed for a few years, then the particles of one metal are found to have diffused into the other metal.

Solution 32

The diffusion between solids is a very, very slow process because the particles in solids do not move from their fixed positions.

Solution 33

Solids diffuse the slowest as the particles in solids do not move from their fixed positions.
Gases diffuse the fastest as the particles in gases move very quickly in all directions.

Solution 34

The particles of gases produced by the burning of incense sticks move rapidly in all directions. They collide with the particles of air present in the room, mix with air and reach every part of the room quickly.

Solution 35

Three states of matter are:
(i) The solid state – Ice.
(ii) The liquid state – Water.
(iii) The gas state – Air.

Solution 36

(a) Characteristics of a solid:
(i) Solids have a fixed shape and fixed volume.
(ii) Solids do not flow.
(b) Characteristics of a liquid:
(i) Liquids have a fixed volume but no fixed shape, they take the shape of the vessel in which they are placed.
(ii) They generally flow easily.
(c) Characteristics of a gas:
(i) Gases can be compressed easily.
(ii) Gases fill their container completely.

Solution 37

A gas does not have a fixed shape or fixed volume because the particles of gases do not have fixed positions or fixed spaces between them.

Solution 38

(i) Solids – They have a fixed shape and a fixed volume.
(ii) Liquids – They have a fixed volume but no fixed shape.
(iii) Gases – They neither have a fixed shape nor a fixed volume.

Solution 39

Oxygen<Water<Sugar.

Solution 40

(a) Water is a liquid at room temperature because:

(i) Water has a fixed volume (which does not change on changing its container).

(ii) Water has no fixed shape (it takes the shape of the container in which it is kept).

(b) An iron almirah is a solid because:

(i) It has a fixed shape (which cannot be changed by pressing it with hands).

(ii) It has a fixed volume (which depends on the dimensions according to which it is made).

Solution 41

(a) Diffusion.

(b) The smell of food being cooked reaches the other room by the diffusion of gases released into the air during the cooking of food.

Solution 42

(a) Diffusion in gases shows that their particles move very quickly in all directions and the rate of diffusion of a gas depends on its density. Light gases diffuse faster than heavy gases.

(b) Gases like carbon dioxide and oxygen present in the atmosphere diffuse into water (of ponds, lakes etc) and dissolves in it.

Solution 43

The smell of hot sizzling food reaches us quickly as compared to cold food because the rate of diffusion of hot gases (released by hot sizzling food) into air is faster than that of cold gases released by cold food.

Solution 44

The smell of food being cooked reaches us even from a considerable distance is because of the process of diffusion.

Solution 45

The smell of perfume spreads due to the diffusion of perfume vapours into the air.

Solution 46

The spreading of blue colour of copper sulphate into water, on its own, is due to the diffusion of copper sulphate particles into water.

Solution 47

The force of attraction between the particles of honey is much more than the force of attraction between the particles of water.

Solution 48

(a) Air is used to inflate tyres because when we blow air into a tyre the air particles push the tyre walls from inside and exerts pressure on them.

(b) Steel is used to make railway lines because steel is a rigid object having a definite shape and definite volume.

Solution 49

Diffusion occurs more quickly in gases than in a liquid because the particles in gases move very quickly in all directions whereas the particles in liquids move slowly as compared to the gas particles.

Solution 50

(a) The spreading out and mixing of a substance due to the motion of its particles is called diffusion. For example: Smell of food being cooked in the kitchen reaches us even from a considerable distance.

(b) Gases diffuse very fast because the particles in gases move very quickly in all directions.

(c) Carbon dioxide and Oxygen gas dissolve in water by diffusion. This process is important as these gases are essential for the survival of aquatic plants and animals. The aquatic plants use the dissolved carbon dioxide for preparing food by photosynthesis and aquatic animals use the dissolved oxygen in water for breathing.

Solution 51

(a)

Solids	Liquids	Gases
(i) Solids have a fixed shape and a fixed volume.	(i) Liquids have a fixed volume but no fixed shape.	(i) Gases have neither a fixed volume nor a fixed shape.
(ii) Solids cannot be compressed much.	(ii) Liquids cannot be compressed much.	(ii)Gases can be compressed easily.
(iii) Solids have high densities.	(iii) Liquids have moderate to high densities.	(iii) Gases have very low densities.
(iv) Solids do not fill their container completely.	(iv) Liquids do not fill their container completely.	(iv) Gases fill their container completely.
(v) Solids do not flow.	(v) Liquids generally flow easily.	(v) Gases flow easily.

(b) (i) Wood is a rigid object which has a tendency to maintain its shape when subjected to outside force.

(ii) It has a definite shape and definite volume.

Solution 52

(a) Because of high energy and negligible forces of attraction, the particles of a gas move with high speed in all directions. Thus, the pressure exerted by a gas is due to the constant collisions of the fast moving gas particles against the walls of the container.

(b) The particles of a gas have high kinetic energy and negligible forces of attraction amongst them. Due to this, the particles of a gas are constantly moving with high speeds in all the directions and the gas completely fills the vessel in which it is kept.

(c) Gases can be compressed easily because its particles are far apart and there are large spaces between them (which can be reduced by compression).

Solution 53

(a) Anything which occupies space and has mass is called matter.

Examples: Air, water, sugar, iron.

(b) The characteristics of matter are:

(i) The particles of matter are very, very small.

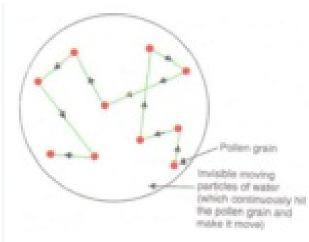
(ii) The particles of matter have spaces between them.

(iii) The particles of matter are constantly moving.

(iv) The particles of matter attract each other.

Solution 54

(a) The zig-zag movement of small particles suspended in a liquid (or gas) is called Brownian motion. Brownian motion increases on increasing the temperature.



(b) These dust particles move in a haphazard way because they are constantly hit by the fast moving particles of air.

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Solution 66

(a) The red brown gas will diffuse from jar A into colorless gas in jar B due to which its red brown colour will also spread into jar B.

(b) Diffusion (in gases).

(c) Bromine vapour.

(d) Air.

(e) Potassium permanganate and water.

Solution 67

Bromine diffuses slowly into air because the motion of bromine molecules is obstructed due to the collisions with the moving molecules of air. Bromine diffuses very rapidly into vacuum because there is 'nothing' in the vacuum to oppose the motion of bromine molecules.

Solution 68

Chlorine will diffuse faster than bromine vapour. This is because light gases diffuse faster than heavy gases.

Solution 69

The molecules in a liquid (the brake oil) can move freely without being compressed much and hence transmit the pressure applied on brake pedal to the brake drum (on moving wheel) efficiently.

Solution 70

The steam is gaseous form of water. The molecules of water in steam move very rapidly in all directions and fill the whole kitchen space with steam. Gases (including steam) fill their container completely.

Solution 71

In both diffusion as well as osmosis, there is movement of particles from a region of higher concentration to a region of lower concentration. Diffusion can take place without there being a membrane or through a permeable membrane. But, Osmosis can take place through a semi-permeable membrane.

(a) Osmosis

(b) Diffusion

(c) Osmosis

(d) Osmosis

(e) Osmosis

(f) Diffusion

(g) Diffusion

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Solution 72

No, the student's conclusion is wrong. The air from the upper jar also diffuses down into the lower gas jar containing bromine vapour. But since the air is colourless it cannot be noticed by the student.

Solution 73

The fast moving molecules of air trapped in the inflated balloon exert continuous pressure on the thin, stretched rubber sheet of balloon and keep on diffusing out gradually through it.

Solution 74

(a) Pollen Grains.

(b) Water.

(c) Brownian motion.

(d) The fast moving water molecules are constantly hitting particles X causing them to move in a zig-zag path.

(e) Robert Brown.

(f) The liquid Y is made up of extremely small particles which are constantly moving.

Solution 75

(a) Dust particles.

(b) Air.

(c) Brownian motion.

(d) The fast moving air molecules are constantly hitting the tiny dust particles causing them to move rapidly in a very haphazard manner.

(e) The gaseous matter 'air' is made up of very tiny particles which are constantly moving.

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Solution 1

373 K.

Solution 2

270 – 273 = -3oC.

Solution 3

573 – 273 = 300oC.

Solution 4

373 + 273 = 646 K.

Solution 5

273 + 78 = 351 K

Solution 6

-273oC

Solution 7

Latent heat.

Solution 8

(a) Degree Celsius – oC

(b) Kelvin – K.

Solution 9

Temp. on Kelvin scale = Temp. on Celsius scale + 273

Solution 10

273.

Solution 11

It means that 3.34 x 105 J of heat has to be supplied to change 1 Kg of ice (at its melting point, 0oC) into water at the same temperature of 0oC.

Solution 12

It means that 22.5 x 105 J of heat is required to change 1 Kg of water (at its boiling point, 100oC) into steam at the same temperature of 100oC.

Solution 13

(a) Boiling point.

(b) Melting point.

Solution 14

Water.

Solution 15

(a) Sublimation.

(b) Sublimation.

Solution 16

Sublimation.

Solution 17

Sublimation.

Solution 18

Dry ice.

Solution 19

Since solid carbon dioxide directly changes into carbon dioxide gas (or sublimes), and does not melt to produce a liquid (like ordinary ice), it is called dry ice.

Solution 20

Lowering temperature (or cooling)

Solution 21

False.

Solution 22

Carbon dioxide (solid).

Solution 23

(a) Pressure; temperature.

(b) Released.

(c) 273.

(d) Plasma; Bose-Einstein Condensate (BEC).

(e) Plasma

Solution 24

The heat energy that has to applied to change the state of a substance is called 'latent heat'. They are of two types:

(i) Latent heat of fusion and (ii) Latent heat of vaporization.

Solution 25

When a solid is heated, the heat energy makes its particles vibrate more vigorously. At the melting point, the particles of solid have sufficient energy to overcome the strong forces of attraction holding them in fixed positions and break to form small groups of particles. This heat energy is kinetic energy.

Solution 26

When a change of state of a substance has to take place the heat given would not raise the temperature.

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Solution 27

The heat energy supplied to ice during the change of state (at its melting point) is all used up in overcoming (or breaking) the force of attraction between its particles without increasing its kinetic energy. Since the heat (or latent heat) supplied during the change of state does not increase the kinetic energy of the ice cubes, therefore no rise in temperature takes place. The temperature remains constant.

Solution 28

The heat energy supplied to water during the change of state (at its boiling point) is all used up in overcoming (or breaking) the force of attraction between its particles without increasing its kinetic energy. Since the heat (or latent heat) supplied during the change of state does not increase the kinetic energy of the water, therefore no rise in temperature takes place. The temperature remains constant.

Solution 29

This is due to the fact that for melting, each kilogram of ice takes its latent heat of 3.34 x 105 joules from the substance and hence cools the substance more effectively. On the other hand, water at 0o cannot take any such latent heat from the substance.

Solution 30

We would place ice in the water to cool it more quickly because the ice takes its latent heat from the water and hence cools it more effectively. On the other hand, if we keep the water on ice then the latent heat would be taken from the surrounding air hence releasing its coolness to the surrounding and not the water.

Solution 31

Steam causes more severe burns than boiling water because the steam contains more heat, in the form of latent heat, than boiling water. Hence, when steam falls on our skin and condenses to produce water, it gives out 22.5 x 105 Joules per kilogram more heat than boiling water.

Solution 32

The latent heat of fusion of ice is 3.34 x 105 J/Kg. It means that 3.34x 105 joules of heat is required to change 1 Kg of ice at its melting point of 0oC into water at the same temperature (of 0oC). This means that 1 Kg of ice at 0oC has 3.34 x 105 joules of less heat than 1 kg of water at the same temperature of 0oC.

Solution 33

1 Kg of steam at 100oC has more heat than water at the same temperature because when water changes into steam, it absorbs latent heat, but when steam condenses to form water, an equal amount of latent heat is given out.

Solution 34

It is because of the fact that steam at 100oC contains more heat, in the form of latent heat, than boiling water at 100oC. Hence, steam would give out 22.5 x 105 joules per kilogram more heat than boiling water.

Solution 35

Steam causes more severe burns than boiling water because the steam contains more heat, in the form of latent heat, than boiling water. Hence, when steam falls on our skin and condenses to produce water it gives out 22.5 x 105 joules per kilogram more heat than boiling water.

Solution 36

The temperature of a substance remains constant during the change of state because the heat gets used up in changing the state by overcoming the forces of attraction between the particles.

Solution 37

(a) Either solid (as ice) or liquid as 0oC is the melting point of ice as well as the freezing point of water.

(b) Liquid.

(c) Either a liquid or a gas (steam) as 100oC is the boiling point of water as well as the condensation temperature of steam.

(d) Gas.

Solution 38

The temperature of a substance remains constant during the change of state though heat is supplied continuously because the heat gets used up in changing the state by overcoming the forces of attraction between the particles.

Solution 39

The temperature, at which a solid substance melts and changes into a liquid at atmospheric pressure, is called melting point of the substance. The melting point of ice is 0oC.

Solution 40

The temperature, at which a liquid boils and changes rapidly into a gas at atmospheric pressure, is called boiling point of the liquid. The boiling point of water is 100oC.

Solution 41

(a) Melting – The process in which a solid substance changes into a liquid on heating is called melting.

(b) Boiling – The process in which a liquid substance changes into a gas rapidly on heating is called boiling.

Solution 42

(a) Condensation – The process of changing a gas (or vapour) to a liquid by cooling is called condensation.

(b) Freezing – The process of changing a liquid into a solid by cooling, is called freezing.

Solution 43

This happens because naphthalene balls undergo sublimation. The naphthalene balls keep on forming naphthalene vapours slowly which disappear into the air.

Solution 44

Gases can be liquefied by applying pressure and lowering temperature. The temperature needs to be lowered because when the gas is compressed too much, then heat is produced due to compression. Cooling lowers the temperature of the compressed gas and helps in liquefying it.

Solution 45

Ammonia gas is liquefied by applying high pressure and lowering the temperature of the gas. Lowering the temperature is done by continuously pouring water over the coils carrying the compressed gas.

Solution 46

There is a lot of space between the particles of a gas. If enough pressure is applied to the gas, it gets highly compressed. The particles of gas get so close together that they start attracting each other sufficiently to form a liquid. And we say that the gas has liquefied.

Solution 47

On a hot day, when our body temperature tends to rise too much, our sweat glands give out moisture (sweat) on our skin. When this sweat evaporates, it takes the latent heat of vaporization from our body hence making our body cool.

Solution 48

All water on earth does not get evaporated on hot summer days because of the high value of latent heat of vaporization of water.

Solution 49

Liquids like alcohol, petrol and perfume are volatile (which can change into vapours easily). When we apply alcohol to the back of our hand, we find that it dries up quickly and while it is drying, the hands feel cold. This happens due to the fact that to change from liquid to the vapour state, alcohol requires latent heat of vaporization. The alcohol takes this latent heat of vaporization from the hand due to which the hand loses heat and we feel cold.

Solution 50

The cooling in a desert room cooler is caused by the evaporation of water. The higher temperature on a hot day increases the rate of evaporation of water, and the dryness of air also increases the rate of evaporation of water. And due to this increased rate of evaporation of water, a desert room cooler works better on a hot and dry day.

Solution 51

The earthen pot (or matka) has a large number of extremely small pores on its walls. Some of the water kept in the earthen pot continuously keeps seeping through these pores to the outside of the pot. This water evaporates continuously by taking the latent heat of vaporization from the earthen pot and the remaining water. In this way, the earthen pot and remaining water loses heat and gets cooled.

Solution 52

We should wear cotton clothes in hot summer days because we perspire more through the pores of the skin during such days. Since, sweat is mainly water and cotton clothes are good absorber of water, they absorb the sweat quickly and expose it to the atmosphere for evaporation. The evaporation of sweat from the cotton clothes takes the latent heat of vaporization from our skin hence the skin loses heat and makes us feel cool and comfortable.

Solution 53

If the hot tea or milk is taken in a cup, then due to the narrow shape of the cup, the surface area of hot tea in the cup is comparatively small. Due to this, the evaporation of hot tea is slow; cooling caused by evaporation is less and hence the hot tea remains appreciably hot for a much longer time. On the other hand, the saucer has a large surface area due to which the tea taken in the saucer evaporates much faster, thus cooling it quickly and making it convenient to sip or drink.

Solution 54

Acetone (or perfume) is volatile in nature. When we apply it to our palm, we feel cold. This happens due to the fact that to change from liquid to the vapour state, acetone requires latent heat of vaporization. Acetone takes this latent heat of vaporization from the hand due to which the palm loses heat and feels cold.

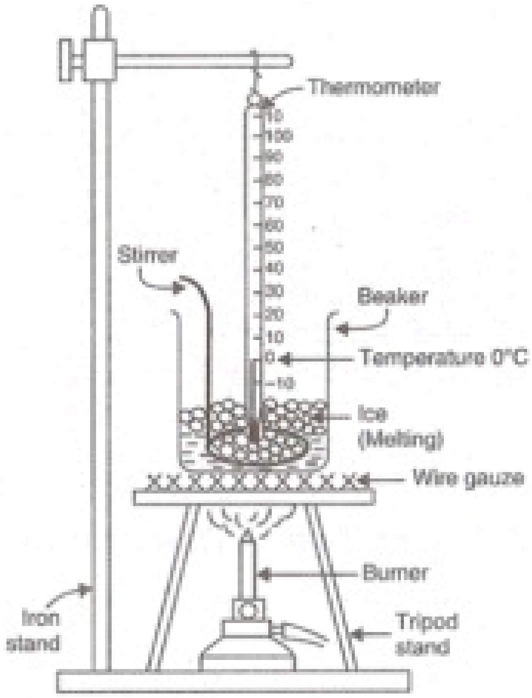
Solution 55

The presence of water vapour in air can be demonstrated by the following experiment: We take a steel tumbler and put some well crushed ice in it. Allow the steel tumbler to stand undisturbed for about 5 minutes with the ice in it. We would observe that a large number of tiny drops of water appear on the outer surface of the steel tumbler. This happens because the air around the steel tumbler contains water vapour in it. When these water vapour come in contact with the cold, outside surface of steel tumbler, they condense to form tiny drops of liquid.

Solution 56

(a) The latent heat of fusion of a solid is the quantity of heat in joules required to convert 1 Kg of the solid (at its melting point) to liquid, without any change in temperature. The latent heat of fusion of ice is 3.34 x 105 J/Kg.

(b)

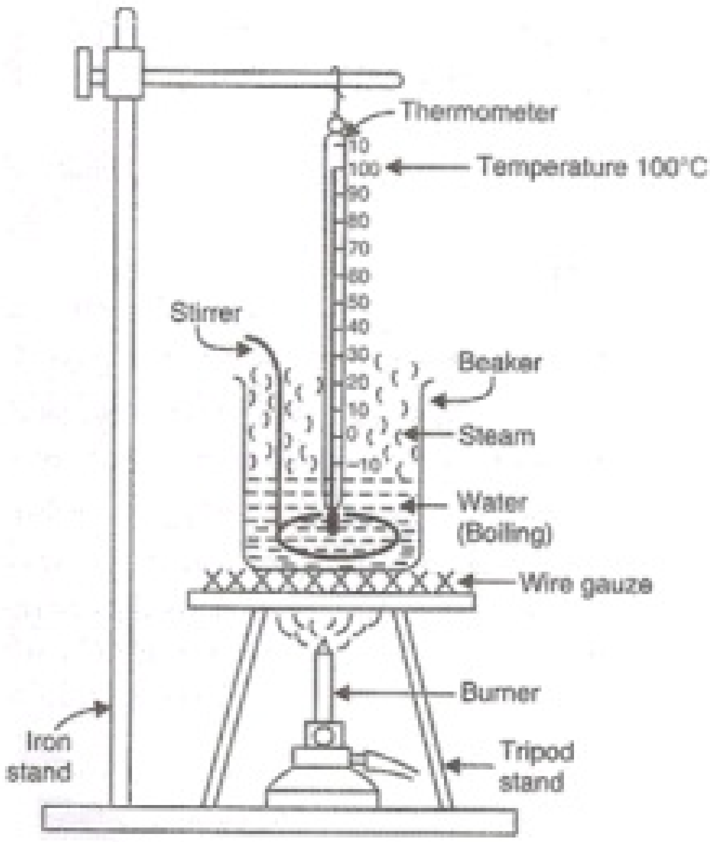


Melting of ice to form water
(solid to liquid change)

Solution 57

(a) The latent heat of vaporization of a liquid is the quantity of heat in joules required to convert 1 Kg of the liquid (at its boiling point) to vapour or gas without any change in temperature. The latent heat of vaporization of water is 22.5 x 105 J/Kg.

(b)

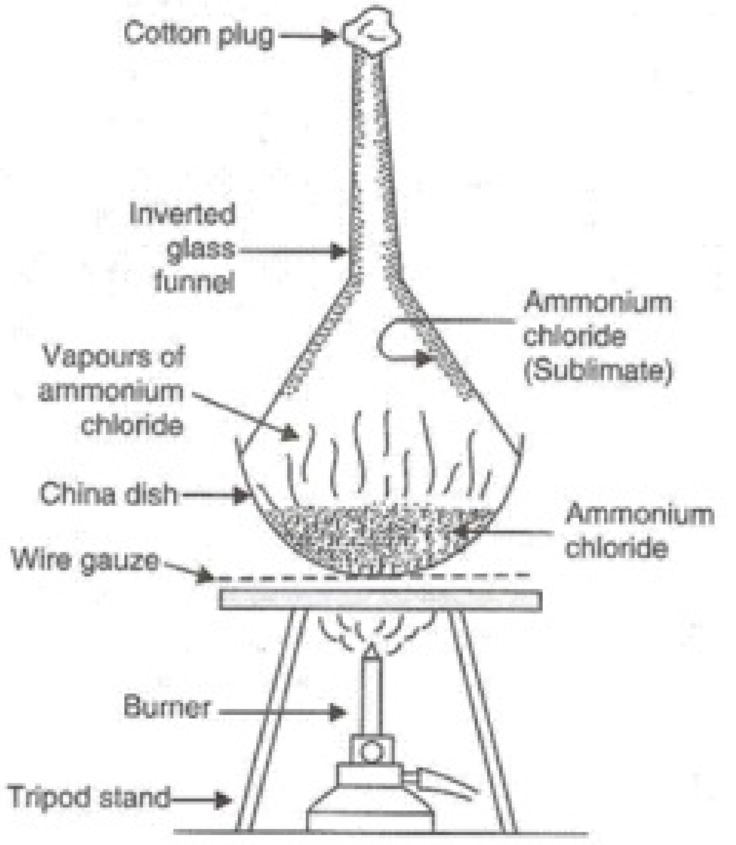


Boiling of water to form steam
(liquid to gas change)

Solution 58

(a) The changing of a solid directly into vapours on heating and of vapours into solid on cooling is known as sublimation. The common substances which undergo sublimation are Camphor and Naphthalene.

(b)

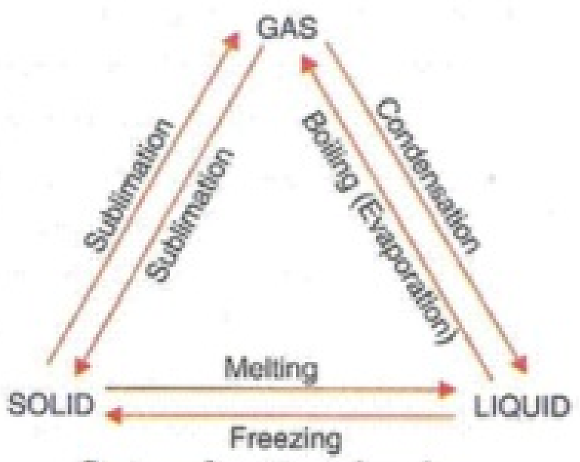


Sublimation of ammonium chloride.

Solution 59

(a) The physical states of matter can be changed by changing pressure and changing the temperature.

(b)



States of matter triangle.
It shows the interconversion of the three states of matter.

Solution 60

(a) The process of a liquid changing into vapour (or gas) even below its boiling point is called evaporation. The factors affecting rate of evaporation are:

(i) Temperature.

(ii) Surface area.

(iii) Humidity.

(iv) Wind speed.

(b) Evaporation causes cooling because when a liquid evaporates, it draws or takes the latent heat of vaporisation from 'anything' which it touches and hence the substances or surroundings lose heat and get cooled.

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Solution 81

(a) (i) W – Iodine (ii) X – Sodium Chloride (iii) Y – Naphthalene (iv) Z – Ammonium chloride.

(b) W – Iodine; Y – Naphthalene; Z – Ammonium chloride.

(c) Y – Naphthalene.

(d) Tincture Iodine.

(e) W – Iodine.

Solution 82

(a) (i) Water (ii) Ice (iii) Steam.

(b) Freezing.

(c) 0oC.

(d) Boiling (or vaporisation).

(e) 100oC

Solution 83

(a) (i) Liquid (ii) Gas (iii) Solid (iv) Plasma (v) Bose-Einstein Condensate (BEC).

(b) Ammonium chloride; Sublimation.

(c) Carbon dioxide.

(d) Water.

(e) D (plasma).

Solution 84

(a) 273 K.

(b) Freezing.

(c) Latent heat of freezing.

(d) Melting.

(e) Latent heat of fusion.

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Solution 85

(a) 373 K.

(b) Boiling (or vaporisation).

(c) Latent heat of vaporisation.

(d) Condensation.

(e) Latent heat of condensation.

Is Matter Around Us Pure ?

Solution 01

False

Solution 02

Milk, Paint, Glass

Solution 03

Air is a mixture.

Solution 04

Mercury is a liquid metal and bromine is a liquid non-metal.

Solution 05

Sodium metal is soft and diamond is an extremely hard non-metal.

Solution 06

Diamond is a non-metal which is good conductor of electricity.

Solution 07

Mercury

Solution 08

Carbon is a solid non-metal, bromine is a liquid non-metal and chlorine is a gaseous non-metal.

Solution 09

(a). Malleability

(b). Ductility

Solution 10

Non-metals show brittleness.

Solution 11

This means that metals can be drawn into thin sheets and can also be drawn into wires.

Solution 12

This means that non-metals break into pieces when they are hammered.

Solution 13

This means that metals make a ringing sound when we strike them.

Solution 14

This means that metals are shiny in nature.

Solution 15

Mixtures.

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Solution 16

The given statement best describes a compound.

Solution 17

Copper is an element, water is a compound and air is a mixture.

Solution 18

Mixtures are generally heterogeneous in which there is a boundary separation between different substituents.

Solutions are homogeneous mixtures in which no separation is visible between different materials.

Solution 19

Metalloids

Solution 20

(a).An element is made up of only one kind of atoms.

(b).Brine is a mixture whereas alcohol is a compound.

(c).Brass is an alloy which is considered a mixture.

(d).The three important metalloids are boron ,silicon and germanium.

(e).The elements which are sonorous are called metals.

Solution 21

(i). H2O – Compound

(ii). He – Element

(iii). Cl2 – Element

(iv). CO – Compound

(v). Co – Element

Solution 22

Elements – Iron, Sulphur, Sodium and Carbon

Compounds – Iron sulphide, Chalk, Washing Soda and Urea

Solution 23

Sugar contains carbon, hydrogen and oxygen.

Common salt contains sodium and chlorine.

Solution 24

A pure substance is one which is made up of only one kind of atoms or molecules.

Examples – Oxygen and sugar.

Solution 25

Two types of pure substances –

(i). Pure substance made up of same kind of atoms.

Example – Sulphur

(ii). Pure substance made up of same kind of molecules.

Example – Water

Solution 26

Ice, iron, hydrochloric acid, calcium oxide and mercury are the pure substances

Solution 27

Mixture is another name for impure substances.

Examples – Milk and sea-water.

Solution 28

Elements: Mercury, Iron, Diamond, Nitrogen, Graphite, Hydrogen, Oxygen and chlorine.

Solution 29

Air is a mixture because-

(i). Air can be separated into its constituents like oxygen, nitrogen, etc. by physical process of fractional distillation.

(ii). Air shows the properties of all the gases present in it.

(iii). Liquid air does not have a fixed boiling point.

Water is compound because –

(i). Water cannot be separated into its constituents, hydrogen and oxygen by physical methods.

(ii). Heat and light are given out when water is prepared by burning hydrogen in oxygen.

(iii). Water has standard b.p. of 100oC under standard atmospheric pressure.

Solution 30

Two solid elements at room temp. – Iron and copper

Two liquid elements at room temp. – Mercury and bromine

Two gaseous elements at room temp. – Hydrogen and oxygen

Solution 31

Hydrogen and oxygen cannot be split up into two or more simpler substances by applying heat, light or electric energy.

Whereas, water can be split up into hydrogen and oxygen by applying electric energy, so it is not an element.

Solution 32

All the elements can be divided into following three groups-

(i). Metals ; Iron and copper

(ii).Non-metals ; Carbon and sulphur

(iii).Metalloids ; Boron and silicon

Solution 33

Metals are malleable and ductile whereas non-metals are not.

Solution 34

(i). Malleability – Metals show this property but non-metals don't.

(ii). Ductility – Metals show this property but non-metals don't.

(iii). Electrical conductivity – Metals are good conductors of electricity whereas non-metals are bad conductors except graphite.

Solution 35

Aluminium is malleable, ductile and sonorous, so it is a metal.

Solution 36

(a). Copper is ductile so it is used for making wires.

(b). Graphite is the only non-metal which conducts electricity so it can be used to make electrodes.

Solution 37

We can check this by evaporating the given colourless liquid.

If nothing is left behind then the colourless liquid is pure water.

Solution 38

Sea-water and Soda-water.

Solution 39

Air is a mixture because-

(i). Air can be separated into its constituents like oxygen, nitrogen, etc. by physical process of fractional distillation.

(ii). Air shows the properties of all the gases present in it.

(iii). Liquid air does not have a fixed boiling point.

Solution 40
Water is a compound because –
(i). Water cannot be separated into its constituents, hydrogen and oxygen by physical methods.
(ii). Heat and light are given out when water is prepared by burning hydrogen in oxygen.
Solution 41
A compound is a substance made up of two or more elements chemically combined in a fixed proportion by mass.
NaCl cannot be separated into its constituents by physical process and the properties of NaCl is completely different from that of Na and Cl, so NaCl is a compound and not a mixture.
Solution 42
A mixture is a substance which consists of two or more elements or compounds not chemically combined together.
As energy is neither evolved nor absorbed during the formation of sugar solution and a sugar solution shows properties of both sugar and water so sugar solution is a mixture not a compound.
Solution 43
Brass is a mixture because-
(i). It shows the properties of its constituents, copper and zinc.
(ii). It has a variable composition.
Solution 44

MIXTURES	COMPOUNDS
1. A mixture can be separated into constituents by the physical processes. 2. A mixture shows the properties of its constituents. 3. Energy is usually neither given out nor absorbed in the preparation of a mixture. 4. The composition of a mixture is variable. 5. A mixture does not have a fixed melting point, boiling point,etc.	1. A compound cannot be separated into its constituents by the physical processes. 2. The properties of a compound are entirely different from those of its constituents. 3. Energy is usually given out or absorbed during the preparation of a compound. 4. The composition of a compound is fixed. 5. A compound has a fixed melting, boiling point, etc.

Solution 45
As energy is neither evolved nor absorbed during the formation of salt solution and a salt solution shows properties of both salt and water so salt solution is a mixture not a compound.

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Solution 46
Similarity: In both the cases, the mixture can be separated into their constituents by physical methods.
Difference: No separation is visible in the mixture of sugar and water whereas separation is visible in mixture of sand and sand.
Solution 47
Evaporate both the liquids separately.
A pure compound will evaporate completely, leaving no residue whereas solution will not be evaporated completely, i.e. some residue will be left behind.
Solution 48
(a). Iodine is a lustrous non-metal.

(b). Oxygen is a non-metal required for combustion.

(c). Allotrope of carbon forms good conductor of electricity.

That allotrope is graphite.

(d). Silicon

(e). Carbon

Solution 49

(a). Sodium

(b). Mercury

(c). Mercury

(d). Sodium

(e). Gold

Solution 50

Chlorine gas, Aluminium foil, Iodine vapour, Graphite, Sulphur powder, Diamond are not compounds.

Solution 51

(a). Those mixtures in which the substances are completely mixed together and are indistinguishable from one another, are called homogeneous mixtures. They have a uniform composition throughout its mass. All the homogeneous mixtures are called solutions.

Examples- Sugar solution, salt solution, copper sulphate solution, etc.

Those mixtures in which the substances remain separate and one substance is spread throughout the other substance as small particles, droplets or bubbles, are called heterogeneous mixtures. Heterogeneous mixture does not have a uniform composition throughout its mass.

Example- Starch solution, soap solution.

(b). Homogeneous mixtures – Soda water, air, vinegar, alcohol and water mixture, sugar and water mixture, Copper sulphate solution.

Heterogeneous mixture – Wood, petrol and water mixture, chalk and water mixture.

Solution 52

(a).(i).Elements – An element is a substance which cannot be split up into two or more simpler substances by the usual chemical methods of applying heat, light or electricity.

Ex. Hydrogen, Oxygen

(ii). Compounds – A compound is a substance made up of two or more elements chemically combined in a fixed proportion by mass.

Ex. Sodium chloride, calcium carbonate

(iii). Mixtures – A mixture is a substance which consists of two or more elements or compounds not chemically combined together.

(b). Elements – Gold, Diamond, Graphite

Compounds – Common salt, Sea water, Marble

Mixtures – Brass, Sand, Petroleum, Chalk, Air

Solution 53

(i). METALS – A metal is an element that is malleable, ductile and conducts electricity.

Example – Iron, Copper

(ii). NON-METALS – A non metal is an element that is neither malleable, nor ductile and does not conducts electricity.

Example – Carbon, Sulphur

(iii). METALLOIDS – The elements which show some properties of metals and some other properties of non-metals are called metalloids.

Example – Boron, Silicon, Helium, Magnesium, Copper

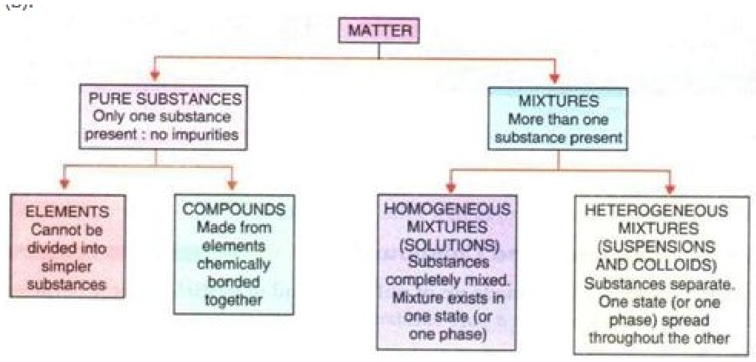
(b). Metals – Mercury, Sodium,

Non-metals – Diamond, Sulphur, Iodine, Carbon, Boron

Metalloids – Silicon, Germanium

Solution 54

(a). Mixtures – A mixture is a substance which consists of two or more elements or compounds not chemically combined together.
Examples – Air, gun powder.
(b). Homogeneous mixtures- Those mixtures in which the substance are completely mixed together and are indistinguishable from one another, are called homogeneous mixtures.
Examples- Sugar solution, copper sulphate solution.
Those mixtures in which the substances remain separate and one substance is spread throughout the other substance as small particles, droplets or bubbles, are called heterogeneous mixtures.
Example- Starch solution, soap solution.
(c). Other name for homogeneous mixtures is SOLUTIONS.
Solution 55
(a). Three general classes of matter are elements, compounds and mixtures.
Element – Hydrogen
Compound – Sodium chloride
Mixtures – Salt solution
(b).



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Solution 71
Steam does not belong to the set. This is because all other are elements while steam is a compound.
Solution 72
(a). B is a mixture (Fe + S)
(b). C is a compound (Iron sulphide)
(c). (i). D is hydrogen sulphide gas
(ii). E is hydrogen gas
(d). Gas D has a rotten egg like smell.
(e). Gas E burns with a 'pop' sound.
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Solution 73
(a). X must be a mixture. Salt solution is a substance like X.
(b). Y must be an element. Oxygen is a substance like Y.
(c). Z must be a compound. Water is a substance like Z.
(d). Formation of Z (a compound) involves absorption or release of an appreciable amount of energy.
(e). The three groups are metals, non-metals and metalloids.
Solution 74
(a). Group of materials P is elements.
(b). Q is a non-metal. Example – Carbon and sulphur.
(c). R is a metal. Example – Copper and Aluminium.

(d). S is a metalloid. Example – Boron and Silicon.

(e). R (metals) are malleable and ductile.

Solution 75

(a). B could be an element. It is mercury.

(b). C could be the mixture. It is a salt solution.

(c). A could be a compound. It is an alcohol.

(d). Solid D is Sodium Chloride.

(e). Liquid E is water.

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Solution 1

(a)Solution

(b)Suspension

Solution 2

Solution

Solution 3

Soap solution will scatter light because in true solution i.e. sugar solution, the solute particles are so small that they cannot scatter light rays while in soap solution particles are big enough to scatter light.

Solution 4

Heterogeneous

Solution 5

Percentage method

Solution 6

Mass of water = Mass of solution – Mass of salt (solute)

= 100 – 15 = 85 g

Solution 7

$$\text{Concentration of solution} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

So, Volume of solution = 100 ml

Volume of water = Volume of solution – Volume of solute (alcohol)

= 100 – 12 = 88 ml

Solution 8

(a)

A 5 per cent sugar solution means that 5g of sugar is dissolved in 95 g of water.

Solution 9

(a)

A 15% alcohol solution means 15mL alcohol and 85mL water

Solution 10

$$\text{Concentration} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

Given: Mass of salt = 2.5 g and mass of water = 50 g

So, total mass of solution = 50 g + 2.5g = 52.5 g.

Hence,

$$\text{Concentration} = \frac{2.5}{52.5} \times 100 = 4.76\%$$

Solution 11

Given mass of urea = 16 g

And, mass of solution = 120 g

So,

$$\text{Concentration of solution} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$
$$= \frac{16}{120} \times 100 = 13.33\%$$

Solution 12

Given volume of alcohol = 5.6 mL

And, volume of water = 75 mL

So, volume of solution = 75 mL + 5.6 mL = 80.6 mL

$$\text{Concentration of solution} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$
$$= \frac{5.6\,\text{mL}}{80.6\,\text{mL}} \times 100 = 6.9\%$$

Solution 13

Given volume of acetone = 25 mL

And, volume of solution = 150 mL

$$\text{Concentration of solution} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$
$$= \frac{25}{150} \times 100 = 16.6\ \%$$

Solution 14

When the temperature of a saturated sugar solution is increased, it becomes unsaturated.

Solution 15

Unsaturated solution contains less solute at a given temperature and pressure.

Solution 16

Physical change-Vaporisation(water changes to water vapour or steam)

Chemical change-Electrolysis(i.e.water forms hydrogen and oxygen)

Solution 17

(a)True

(b)False

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Solution 18

Colloid

Solution 19

Soap solution

Solution 20

(a) Colloidal; true

(b) Heterogeneous; centrifugation

Solution 21

(a)Solute-The substance which is dissolved in a liquid to make a solution is called as solute.

(b)Solvent-The liquid in which solute is dissolved is known as solvent.

Solution 22

A solution is a homogeneous mixture of two or more substances whereas a colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions.

Solution 23

A colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions whereas a suspension is a heterogeneous mixture in which the small particles of a solid are spread throughout a liquid without dissolving in it.

Solution 24

A true solution does not scatter a beam of light passing through it but a colloidal solution scatters a beam of light passing through it and renders its path visible. A true solution is a homogeneous mixture of two or more substances whereas a colloidal solution is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions and is a heterogeneous mixture.

Solution 25

True Solutions – Salt solution and sugar solution

Colloidal Solution – Starch solution, Ink, Blood

Solution 26

The given solution is taken in a beaker. Then, a strong beam of light is allowed to fall on the solution from one side of the beaker in a dark room. If the beam of light is visible in the solution, then it is a colloidal solution.

Solution 27

The path of light beam is illuminated and becomes visible.

Solution 28

A true solution can be distinguished from a colloidal solution by experimenting Tyndall effect. A true solution does not scatter a beam of light passing through it but a colloidal solution scatters a beam of light passing through it.

Solution 29

The particles of a suspension cannot pass through a filter paper whereas particles of colloids can easily pass through filter paper.

Colloidal solutions are quite stable whereas suspensions are very unstable.

Solution 30

Both the given solutions will be kept stationary in different beakers for some time.

The beaker in which the dissolved particles settle down after some time is a suspension and another one is a solution.

Solution 31

Starch solution and milk will show Tyndall effect.

This is because in a milk solution and starch solution (colloidal solutions) the size of solute particles is big enough to scatter the light passing through it.

Solution 32

Types of solution-

(i). Solid in solid.

Example- Brass

(ii). Solid in a liquid

Example- Tincture of iodine

(iii). Liquid in liquid

Example- ethanoic acid

(iv). Gas in a liquid

Example- CO2 in water

(v). gas in gas

Example- Air

Solution 33

Solutions – Brine

Suspensions – Chalk water mixture, milk of magnesia, Muddy river water

Colloids – Milk, blood, ink, shaving cream, smoke in air, soda water

Solution 34

(a). Sol – Sol is a colloid in which tiny solid particles are dispersed in a liquid medium. Examples are ink and soap solution

(b). Aerosol- Aerosol is a colloid in which a solid or liquid is dispersed in a gas. Examples are hairspray and fog.

(c). Emulsion – An emulsion is a colloid in which minute droplets of one liquid are dispersed in

another liquid which is not miscible with it. Examples are milk and butter.
(d). Foam- A foam is a colloid in which a gas is dispersed in a liquid medium. Examples are soap bubbles and shaving cream.

Solution 35

The concentration of a solution is the amount of solute present in given quantity of the solution.

Solution 36

If a saturated solution is heated to a higher temperature, then it becomes unsaturated.
If a saturated solution is cooled to a lower temperature, then some of its dissolved solute will separate out in the form of solid crystals.

Solution 37

According to question-
21.5 g of NaCl dissolves in 60 g of water.
So, amount of NaCl which gets dissolved in 100 g of water = 21.5 x 100 / 60 = 35.8 g
Thus, the solubility of NaCl is 35.8 g at 25oC.

Solution 38

According to question-
9.72 g of KCl dissolves in 30 g of water.
So, amount of KCl which gets dissolved in 100 g of water = 9.72 x 100/30 = 32.4 g
Thus, the solubility of KCl = 32.4 g

Solution 39

i. Cooking of food – Chemical change
ii. Boiling of water – Physical change
iii. Cutting of trees – Physical change
iv. Dissolving salt in water – Physical change
v. Digestion of food – Chemical change
vi. Melting of ice- Physical change

Solution 40

(a) Burning of magnesium wire – Chemical change
(b) Freezing of water – Physical change
(c) Rusting of iron – Chemical change
(d) Glowing of electric bulb – Physical change

Solution 41

(a) Formation of curd from milk – Chemical chang
(b) Condensation of steam – Physical change
(c) Growth of plant – Chemical change
(d) Breaking of a glass tumbler – Physical change

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Solution 42

Physical change – Sublimation of solid, Formation of clouds, making of fruit salad from raw fruits, dissolving CO2 in water
Chemical change – Decomposition of water into H2 and O2 by passing electric current

Solution 43

Physical change – Melting of candle wax, mixing of iron filings and sand, breaking a piece of chalk, cutting a piece of paper
Chemical change – Burning of candle wax, burning of wood, burning of piece of paper

Solution 44

When sea water is a mixture of dissolved salts and water only, it is homogeneous solution.
And if sea water contains suspended impurities like decayed plants or animal material, etc. then it is called heterogeneous solution.

Solution 45

Sugar solution, Salt solution, copper sulphate solution and ammonium chloride solution do not show Tyndall effect.

Solution 46

(a). The change in which no new substance is formed is called a physical change.

Example- Melting of candle wax, mixing of iron filings and sand

(b).The change in which new substance is formed is called a chemical change.

Example- Burning of candle wax, burning of wood

Solution 47

(a).

PHYSICAL CHANGE	CHEMICAL CHANGE
1. No new substance is formed in a physical change. 2. It is a temporary change. 3. It is easily reversible. 4. Very little heat or light energy is usually absorbed or given out in this process. 5. Mass of substance does not alter.	1. New substance is formed in a chemical change. 2. A chemical change is a permanent change. 3. This process is usually irreversible. 4. A lot of heat or light energy is absorbed or given out in this process. 5. Mass of substance does alter in this process.

(b). Chemical change – Coal burning in air, making of cake

Physical change- A glass bottle breaking, wool being knitted into a sweater.

Solution 48

(a). The maximum amount of a solute which can be dissolved in 100 g of a solvent at a specified temperature is known as the solubility of that solute in that solvent .

The solubility of solids in liquids is directly proportional to temperature whereas the solubility of gases in liquids is inversly proportional to temperature.

(b). This statement means that 100 g of water can dissolve a maximum of 20.7 g of copper sulphate at 20oC.

(c). The solubility of solids in liquids increases on increasing the temperature and decreases on decreasing the temperature.

Solution 49

(a). A solution is a homogeneous mixture of two or more substances.

Example- Salt solution, metal alloys.

(b). A suspension is a heterogeneous mixture in which the small particles of a solid are spread throughout a liquid without dissolving in it.

Example- Muddy-water, Milk of magnesia.

(c). A colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions.

Example- Soap solution, milk.

Solution 50

(a). A solution in which no more solute can be dissolved at that temperature is called a saturated solution while a solution in which more quantity of solute can be dissolved without raising its temperature is called an unsaturated solution.

To test the saturation or unsaturation of a solution, more solute may be added to the solution. If that solute gets dissolved in the solution then the solution will be unsaturated.

To test whether a given solution is saturated or not, add some more solute to the solution and try to dissolve it by stirring. If solute does not dissolve in the given solution, then it will be a saturated solution.

(b). Take some water in a beaker and heat it slowly with the help of burner. Now, start adding sodium chloride salt to the hot water with a spoon and stir it with a glass rod continuously so that sodium chloride goes on dissolving in water. Take the temperature of water up to 25oC and then keeping this temperature constant, go on adding sodium chloride till no more sodium chloride dissolves in it and some undissolved crystals will be left at the bottom. The contents of the beaker are now filtered and the clear solution obtained is the saturated solution of sodium chloride at 25oC.

If the temperature is lowered from 25oC to 10oC, then some of the crystals of sodium chloride will separate out from the solution in the form of solute crystals.

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Solution 66

Indigestion mixtures are suspensions so there is an instruction written on the bottle of these mixtures "SHAKE IT WELL BEFORE USE". This is because the particles of indigestion mixture i.e. suspensions are unstable and settle down at the bottom of the bottle after some time.

Solution 67

(a) Mixtures like A are known as suspensions.

(b) Mixtures like B are known as colloids.

(c) Mixtures like C are known as true solutions.

(d) The phenomenon existed by A and B which occurs on passing a beam of light through them is called Tyndall effect.

(e) (i) Chalk-water mixture is like A.

(ii) Soap solution is a mixture like B.

(iii) Salt solution is a mixture like C.

Solution 68

(a) When solid A is dissolved in water, chemical change takes place. This is because the properties of products B and C are entirely different from those of solid A and water and a lot of heat and energy is evolved in the reaction.

(b) Physical change occurs when solid D is dissolved in water. This is because the product E shows the properties of both, solid D and water.

(c) Sodium metal could behave like solid A.

Product B is sodium hydroxide.

Product C is hydrogen.

(d) Solid D is ammonium chloride.

(e) D can be recovered from E by evaporation.

Solution 69

(a) Solution like X are known as unsaturated solution.

(b) Solution like Y are known as saturated solution.

(c) If solution Y at 30oC is cool down to 10oC by keeping the beaker in crushed ice, then some of the dissolved solid will separate out from the solution and settle at the bottom of the beaker as crystals. This is because the solubility of solid decreases on cooling.

(d) Solubility is the term used to denote the amount of solid dissolved in 100 grams of water in a solution.

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Solution 70

According to question:

Solubility at 40oC = 41 g

But, solubility = solid dissolved in 100 grams of water in a solution

So, mass of ammonium chloride needed to make a saturated solution of ammonium chloride in 50 g of water at 40oC= 41/2 g = 20.5 g

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Solution 1

Carbon disulphide

Solution 2

Sublimation

Solution 3

Sublimation

Solution 4

Sublimation

Solution 5

Camphor undergoes sublimation.

Solution 6

Electromagnet.

Solution 7

Iodine undergoes sublimation.

Solution 8

Fractional distillation

Solution 9

Difference in their boiling point.

Solution 10

Acetone and water

Solution 11

Kerosene and water.

Solution 12

(a)False

(b)False

Solution 13

Air

Solution 14

Fractional distillation of liquid air.

Solution 15

He should choose magnetic separation method to separate iron nails from saw-dust.

Solution 16

Salt and camphor.

Solution 17

Mixture of common salt and water.

Solution 18

By filtration.

Solution 19

Filtration

Solution 20

Evaporation

Solution 21

Centrifugation

Solution 22

Centrifugation is used to separate cream from milk.

Solution 23

Filtration

Solution 24

Fractional distillation

Solution 25

Separating funnel

Solution 26

Difference in the densities of oil and water enable their separation by a separating funnel.

Solution 27

(a)Evaporation

(b)Crystallization

Solution 28

Crystallization

Solution 29

(a) Evaporation

(b) Paper chromatography

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Solution 30

Centrifugation

Solution 31

Chromatography

Solution 32

(a) Fractional distillation

(b) Separating funnel

(c) Fractional distillation

(d) Boiling points

(e) Boiling points

(f) Centrifugation

(g) Magnet

Solution 33

Sugar is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and sugar is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while sugar solution is obtained as filtrate.The filtrate is then evaporated to get crystals of sugar.

Solution 34

The difference in the solubility of salt and sand in water is used to separate them from their mixture.

Solution 35

Salt is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and salt is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while salt solution is obtained as filtrate .The filtrate is then evaporated to get crystals of salt.

Solution 36

Sugar is soluble in alcohol but salt is insoluble in alcohol, so a mixture of sugar and salt can be separated by using alcohol as solvent.

Solution 37

Sodium chloride is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and sodium chloride is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while sodium chloride solution is obtained as filtrate .The filtrate is then evaporated to get crystals of sodium chloride.

Solution 38

Potash alum is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and potash alum is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while potash alum solution is obtained as filtrate .The filtrate is then evaporated to get crystals of potash alum.

Solution 39

Sulphur is soluble in carbon disulphide whereas sodium chloride is insoluble in carbon disulphide.The mixture of sulphur and sodium chloride is shaken with carbon disulphide.Sulphur dissolves in carbon disulphide whereas sodium chloride remains undissolved. The solution is then filtered,sodium chloride is obtained as residue.On evaporating the filtrate ,carbon disulphide solvent is eliminated and solid sulphur remains behind.

Solution 40

Mixture of iodine and common salt is heated. Iodine sublimes on heating leaving behind common salt and can be recovered in the form of sublimate by cooling its vapours.

Solution 41

Mixture of camphor and sand is heated. Camphor sublimes on heating leaving behind sand and can be recovered in the form of sublimate by cooling its vapours.

Solution 42

Mixture of iron filings and powdered carbon can be separated by using magnet.A horse-shoe magnet is moved on the surface of the mixture.The iron filings are attracted by the magnet,they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings is done.

Solution 43

Mixture of iron filings and powdered carbon can be separated by using magnet.A horse-shoe magnet is moved on the surface of the mixture.The iron filings are attracted by the magnet,they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings is done.

Solution 44

In factories, scrap iron is separated from the heap of waste materials by using big electromagnets fitted to a crane.When a crane fitted with a powerful electromagnet is lowered on to the heap of waste materials, then the scrap iron objects present in the heap cling to the electromagnet. The crane is then moved up and away to drop these scrap iron objects at a separate place.

Solution 45

In industries, the impurity of iron present in several substances is removed by the use of magnets. Iron objects stick to the magnet leaving behind other objects.

Solution 46

Mixture of iron pins and sand can be separated by using magnet.A horse-shoe magnet is moved on the surface of the mixture.The iron pins are attracted by the magnet,they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron pins is achieved.

Solution 47

At first, the mixture of common salt, sulphur powder and sand is shaken with carbon disulphide. Sulphur dissolves in carbon disulphide whereas common salt and sand remain undissolved. The solution is then filtered, common salt and sand mixture is obtained as residue. On evaporating the filtrate, carbon disulphide solvent is eliminated and solid sulphur remains behind. Now, the common salt and sand mixture is shaken with water. Common salt gets dissolved in water .The solution is then filtered, sand is obtained as residue. The filtrate is then evaporated to get crystals of common salt.

Solution 48

The mixture of water, kerosene and sand is filtered with the help of filter paper first. Sand remains as residue on the filter paper while mixture of water and kerosene is obtained as filtrate .The mixture of water and kerosene is then put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the difference in the densities of water and kerosene. Water is heavier than kerosene. So,water forms lower layer while kerosene forms upper layer.On opening the stop clock of separating funnel,the lower layer of water comes out first and collected in beaker leaving behind kerosene in the separating funnel.

Solution 49

The mixture of common salt,sand and ammonium chloride will be heated first.Ammonium chloride sublimes on heating and can be recovered in the form of sublimate by cooling its vapours leaving behind mixture of common salt and sand.Salt is soluble in water whereas sand is insoluble in water.The mixture of sand and salt is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while salt solution is obtained as filtrate .The filtrate is then evaporated to get crystals of salt.

Solution 50

A horse-shoe magnet is moved on the surface of the mixture of camphor,common salt and iron nails.The iron nails are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron nails occur leaving behind mixture of camphor and common salt. Mixture of camphor and common salt is heated. Camphor sublimes on heating leaving behind common salt and can be recovered in the form of sublimate by cooling its vapours

Solution 51

The mixture of water, groundnut oil and common salt is put in a separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and groundnut oil. Water is heavier than groundnut oil. So, water forms lower layer while groundnut oil forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind groundnut oil in the funel. Now, solution of water and common salt is heated. Water gets evaporated leaving behind solid common salt.

Solution 52

Mixture of chalk powder,iron filings and naphthalene can be separated by using magnet and then by sublimation. A horse-shoe magnet is moved on the surface of the mixture.The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of chalk powder and naphthalene. Then, mixture of chalk powder and naphthalene is heated.Naphthalene sublimes on heating leaving behind chalk powder and can be recovered in the form of sublimate by cooling its vapours.

Solution 53

Mixture of iodine, iron filings and salt can be separated by using magnet and then by sublimation. A horse-shoe magnet is moved on the surface of the mixture.The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of iodine and salt. Then, mixture of iodine and salt is heated. Iodine sublimes on heating leaving behind salt and can be recovered in the form of sublimate by cooling its vapours.

Solution 54

Mixture of iron filings,chalk powder and common salt can be separated by using magnet first.A horse-shoe magnet is moved on the surface of the mixture.The iron filings are attracted by the magnet,they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of chalk powder and common salt.The mixture of chalk powder and common salt is then dissolved in water and then filtered with the help of filter paper. Chalk powder remains as residue on the filter paper while common salt solution is obtained as filtrate .The filtrate is then evaporated to get crystals of common salt.

Solution 55

Mixture of common salt, sand and iron filings can be separated by using magnet first. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of common salt and sand.The mixture of common salt and sand is then dissolved in water and then filtered with the help of filter paper. Sand remains as residue on the filter paper while common salt solution is obtained as filtrate .The filtrate is then evaporated to get crystals of common salt.

Solution 56

The mixture of water and kerosene is put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and kerosene. Water is heavier than kerosene.So, water forms lower layer while kerosene forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind kerosene.

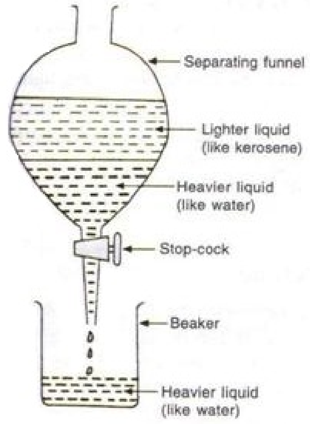

Fig. Separation of kerosene oil and water mixture by separating funnel

Solution 57

The mixture of mustard oil and water is put in separating funnel and allowed to stand for sometime.The mixture separates into two layers according to the densities of water and mustard oil. Water is heavier than mustard oil. So,water forms lower layer while mustard oil forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind mustard oil.

Solution 58

The mixture of cooking oil(groundnut oil) and water is put in separating funnel and allowed to stand for sometime.The mixture separates into two layers according to the densities of water and groundnut oil. Water is heavier than groundnut oil. So,water forms lower layer while groundnut oil forms upper layer. On opening the stop clock of separating funnel,the lower layer of water comes out first and collected in beaker leaving behind groundnut oil.

Solution 59

Mercury, oil and water are immiscible liquids and have different densities. Mixture of mercury, oil and water will be put in separating funnel and allowed to stand for sometimes. The mixture separates into three layers according to the densities of mercury, oil and water. On opening the stop clock of separating funnel, the lower layer formed by mercury comes out first and collected in beaker leaving behind other two layers. Similarly, again on opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind oil in the funnel.

Solution 60

Sulphur is soluble in carbon disulphide whereas iron filing is insoluble in carbon disulphide.The mixture of sulphur and iron filing is shaken with carbon disulphide.Sulphur dissolves in carbon disulphide whereas iron filings remain undissolved. The solution is then filtered, iron filing is obtained as residue.On evaporating the filtrate, carbon disulphide solvent is eliminated and solid sulphur remains behind.

Solution 61

Centrifugation is used to separate cream from milk.Milk is a suspension of tiny droplets of oil in a watery liquid.It is put in closed container in a big centrifuge machine.When machine is switched on,milk is rotated at very high speed in its container.The cream being lighter floats over the skimmed milk and then can be removed.

Solution 62

Impure copper sulphate is dissolved in minimum amount of water in a china dish to make copper sulphate solution. It is then filtered to remove insoluble impurities. Now, copper sulphate solution is heated gently on a water bath to evaporate water and a saturated solution is obtained. Then heating is stopped and saturated solution of copper sulphate is allowed to cool slowly. Crystals of pure copper sulphate will be formed leaving behind impurities. These crystals are then separated and dried.

Solution 63

Crystallisation is better method for recovering sugar from sugar solution than evaporation because-

(a)Sugar decomposes or get charred on heating to dryness during evaporation.There is no such problem in crystallization.

(b)The soluble impurities do not get removed in the process of evaporation. But such impurities get removed in crystallization.

Solution 64

Chromatography is a technique of separating two or more dissolved solids which are present in a solution in very small quantities.Its two applications are-

(a)Chromatography is used to separate solutions of coloured substances(dyes and pigments).

(b)Chromatography is used to separate small amounts of products of chemical reactions.

Solution 65

(a)Water and kerosene mixture can be separated by using a separating funnel because these are immiscible liquids and they have different densities.

(b)Water and acetone mixture can not be separated by by using a separating funnel because these are miscible liquids.

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Solution 66

The mixture of common salt and ammonium chloride is taken in a china dish and placed on a tripod stand. The china dish is covered with an inverted glass funnel. A loose cotton plug is put in the upper, open end of the funnel to prevent the ammonium chloride vapours from escaping into the atmosphere. The china dish is heated by using a burner. On heating the mixture, ammonium chloride changes into white vapours. These vapours rise up and get converted into solid ammonium chloride on coming in contact with the cold, inner walls of the funnel. In this way, pure ammonium chloride collects on the inner sides of the funnel in the form of a sublimate and can be removed. Common salt does not change into vapours on heating, so it remains behind in the china dish and can be separated out.

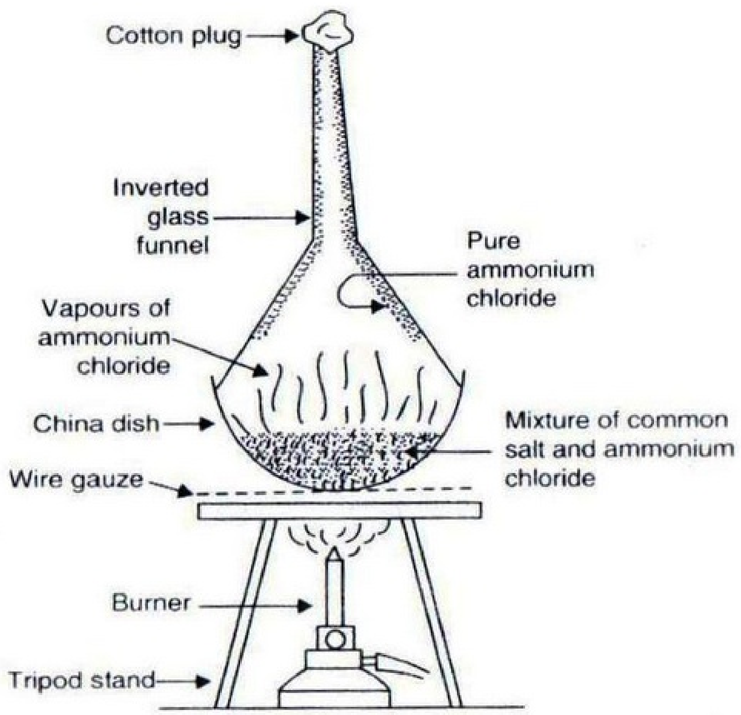

Fig. Separation of mixture of common salt and ammonium chloride by sublimation

Ammonium chloride sublimes on heating whereas common salt does not sublime on heating.

So, we can separate ammonium chloride from a mixture of common salt and ammonium chloride by the process of sublimation.

Solution 67

A mixture of common salt and water can be separated completely by the process of distillation. The distillation can be used to separate a liquid from dissolved non-volatile solids. The salt water mixture is taken in the distillation flask A and heated. Some porcelain pieces are put in the distillation flask to avoid bumping of the solution due to uneven heating. On heating, water forms vapours which rise up and come out through the side tube B of the distillation flask, and go into water condenser C. Cold water from tap is circulated through the outer tube of condenser for cooling the vapours. The hot vapours get cooled in the condenser to form pure water (i.e. distilled water) which trickles down from the condenser and collects in the beaker D. Since the salt is non-volatile, so it remains behind in the distillation flask.

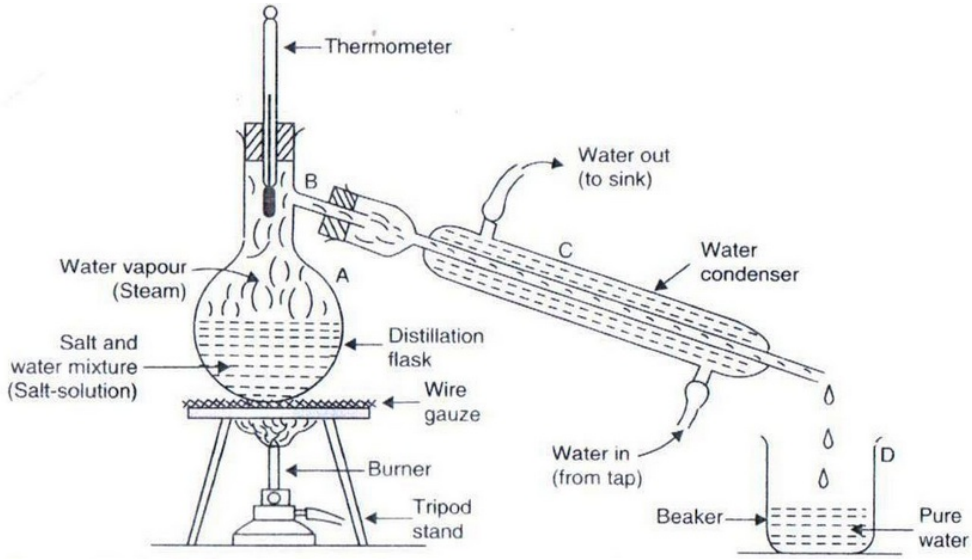

Fig. Separation of mixture of salt and water by distillation

Solution 68

In cities, drinking water is supplied from water works where river or lake water is made free from suspended solid substances and germs. In water works, the methods like sedimentation, decantation, loading, filtration and chlorination etc. are used to remove undesirable materials from water. The source of water supply in a city is either a nearby river or lake (reservoir), from there it is pumped into 'sedimentation tank'. Here it is allowed to stand for sometime so that many of insoluble substances present in water settle down at bottom of the tank. From there, it is sent to a 'loading tank' where some alum is added to water. Here suspended clay particles in water get loaded with alum particles, become heavy and settle down at the bottom of the tank. Then, it is passed through 'filtration tank'. It has three layers: fine sand layer at top, coarse sand layer in middle and gravel as the bottom layer. These act as filters and even the small suspended particles get removed when water passes through these layers. Then, the clear water is passed into a chlorination tank. Here, chlorine is added to water to kill the germs present in it. Now, the clean and disinfected water is pumped by pumping station into high storage tanks and from there, it is supplied to homes and factories through the network of big and small pipes.

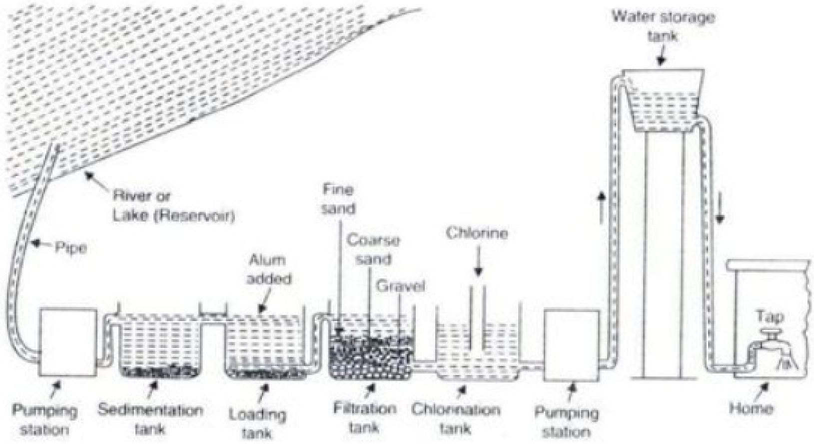

Fig. Water purification process at water works

Solution 69

(a) Fractional distillation is the process of separating two or more miscible liquids (liquids which mix together in all proportions and form a single layer) by distillation, the distillate being collected in fractions boiling at different temperatures. The separation of two liquids by fractional distillation depends on the difference in their boiling points. It is carried out by using a fractionating column.

Fractionating column is a long vertical glass tube filled with glass beads. The glass beads provide a large surface area for hot vapours to cool and condens repeatedly. It provides different temperature zones inside it, the highest temperature being at the bottom of the column and the lowest temperature near its top. It is fitted in the neck of the distillation flask.

(b)

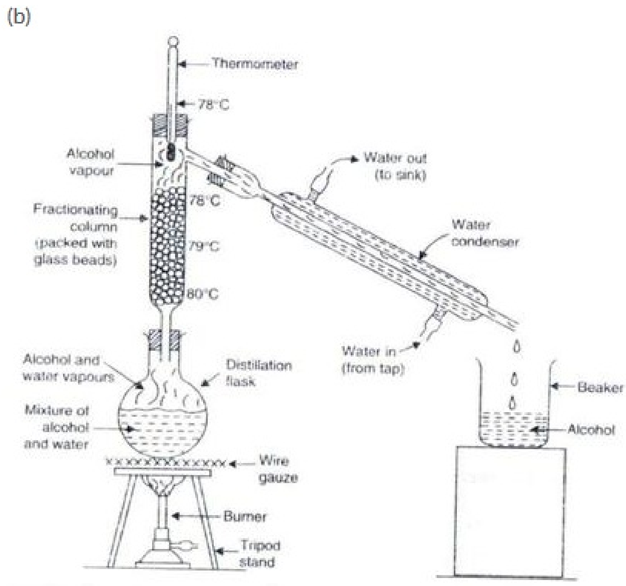

Fig. Separation of mixture of alcohol and water by fractional distillation

Solution 70

(a)Air is mixture of gases like nitrogen, oxygen, argon, carbon dioxide, helium, neon, krypton, xeon etc. The various gases of air are separated from one another by fractional distillation of liquid air. This separation is based on the fact that different gases of air have different boiling points(in liquid form).

The air is first filtered to remove dust, then water vapour and carbon dioxide are removed. Air is compressed to a high pressure and then cooled. The cooled air is then allowed to expand quickly into a chamber through a jet. This cools the air even more. This process of compression, cooling and rapid expansion of air is repeated again and again to make the air more and more cool so that it becomes liquid air. Now, the liquid air is fed into a tall fractionating column and warmed up slowly.

Liquid nitrogen has lowest boiling point of -196oC.So, on warming, it boils off first to form nitrogen gas and is collected at the upper part of the fractional distillation column. Liquid argon has a slightly higher boiling point of -186oC. So, it boils off next and collected as argon gas in the middle part of fractional distillation column. Liquid oxygen has a still higher boiling point of -183 oC. So, liquid oxygen boils off last and collected as oxygen gas at the bottom of fractional distillation column.

(b)

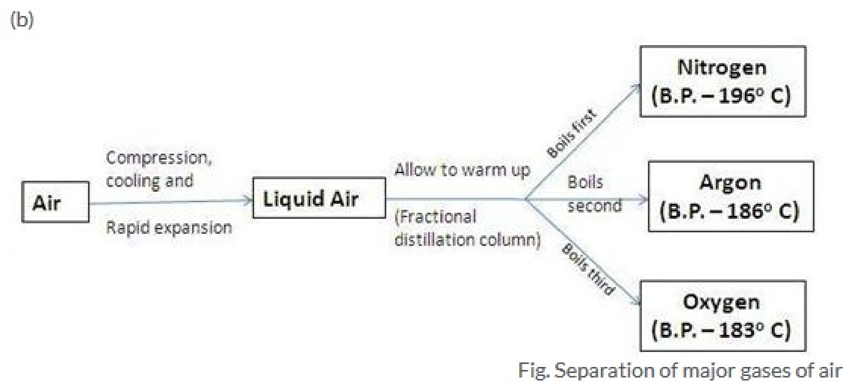

Fig. Separation of major gases of air

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Solution 86

(a) Y will be collected from near the bottom of the fractional distillation column because it has highest boiling point of -183oC.

(b) Z will be collected from the top part of the fractional distillation column because it has lowest boiling point of -196oC.

(c) X will be collected from the middle part of the fractional distillation column because it has a boiling point of -186oC which is lower than that of Y but higher than that of Z.

(d) X is liquid argon; Y is liquid oxygen; Z is liquid nitrogen.

Solution 87

(a) We will use fractional distillation to separate a mixture of A and B.

(b) We will use separating funnel to separate a mixture of B and C.

(c) (i) Alcohol would behave like A.

(ii) Water would behave like B.

(iii) Oil would behave like C.

Solution 88

(a) P is sand; Q is common salt; R is iron fillings; S is ammonium chloride.

(b) We first separate R (iron filings) by using a magnet to attract them. Then, separate S (ammonium chloride) by sublimation. Now, we shake P(sand)and Q(common salt) with water and filter. P(sand) is obtained as residue. Now, we evaporate filtrate to dryness to obtain Q(common salt).

Solution 89

(a) X is alcohol.

(b) Y is iodine.

(c) Process Z is called sublimation

(d) Process used to recover both the components alcohol and iodine from tincture of iodine is distillation.

(e) The process used to recover only component Y from tincture of iodine is evaporation.

Solution 90

(a) (i) Constituent A could be sulphur.

(ii) Liquid D could be carbon disulphide.

(b) (i) Constituent B could be copper sulphate.

(ii) Liquid E could be water.

(c) Liquid C could be vegetable oil.

(d) Filter the mixture of A, B and C. C(oil) being liquid will be obtained as a filtrate. Residue consists of A(sulphur) and B(copper sulphate). Add water to the residue mixture, shake and filter. A(sulphur) is obtained as residue. Now, evaporate filtrate to obtain B(copper sulphate).

Atoms andMolecules

Solution 01

International Union of Pure and Applied Chemistry

Solution 02

(a) Law of conservation of mass – Antonie Lavoisier

(b) Law of constant proportions – Joseph Proust

Solution 03

(a) Law of conservation of mass.

(b) Law of constant proportions.

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Solution 04

John Dalton

Solution 05

Atoms can neither be created nor destroyed.

Solution 06

The elements consist of atoms having fixed mass, and that the number and kind of atoms of each element in a given compound is fixed.

Solution 07

Kanad ; 'parmanu'.

Solution 08

Law of Conservation of mass and law of constant proportions.

Solution 09

Law of constant proportions.

Solution 10

Law of Conservation of mass.

Solution 11

Atoms are the building blocks of matter.

Solution 12

The size of an atom indicated by its radius which is called 'atomic radius'.

Solution 13

The radius of an atom is usually expressed in 'nanometers'.

Solution 14

1 nanometer = 10-9 m

Solution 15

'nm' represents nanometer.

Solution 16

Because they are very very small.

Solution 17

False ; it is Co

Solution 18

The molecular mass of a substance is the relative mass of its molecule as compared with the mass of a Carbon-12 atom taken as 12 units.

Solution 19

This means that a molecule of oxygen is 32 times heavier than 1/12 of a Carbon-12 atom.

Solution 20

(a) 1:8

(b) Conservation of mass

Solution 21

(a) Carbon is used as a standard for atomic mass scale.

(b) Atom with 6 neutrons and 6 protons in its nucleus so that its mass number is 12.

(c) Mass = 12 u

Solution 22

The major drawback of Dalton's atomic theory is that atoms were thought to be indivisible. But, it is not true since atoms are divisible.

Solution 23

No, the statement is not valid because atoms can be divided into subatomic particles called electrons, protons and neutrons.

Solution 24

Yes, 'THE SCANNING TUNNELLING MICROSCOPE' enables people to see atoms. This microscope can produce computer generated images of the surface of elements which show the individual atoms. The atoms show up as blurred images.

Solution 25

The symbol of element is the "first letter" or "first letter and another letter" of the English name or Latin name of the element.

For example, symbol of Hydrogen is "H" and symbol of Calcium is "Ca".

Solution 26

(a)Ca, Mg

(b)Cu, Hg

Solution 27

Hydrogen- H, Helium-He, Lithium-Li , Beryllium-Be, Boron-B

Solution 28

Sodium – Na

Potassium – K

Iron – Fe

Copper – Cu

Mercury – Hg

Silver – Ag

Solution 29

Hg – Mercury

Pb – Lead

Au – Gold

Ag – Silver

Sn – Tin

Solution 30

The number of atoms present in one molecule of an element is called atomicity of that element.

For example, atomicity of sodium is 1 and that of nitrogen is 2.

Solution 31

(a) Oxygen = 2

(b) Ozone = 3

(c) Neon = 1

(d) Sulphur = 8

(e) Phosphorus = 4

(f) Sodium = 1

Solution 32

A chemical formula represents the composition of a molecule of the substance in terms of the symbols of the elements present in the molecule. It is also known as molecular formula.

Chemical formula of element – H_2 for hydrogen

Chemical formula of compound – H_2O for water

Solution 33

(a). Water- H_2O; Elements present are Hydrogen and Oxygen.

(b).Ammonia- NH_3; Elements present are Nitrogen and Hydrogen.

(c).Methane-CH_4; Elements present are Carbon and Hydrogen.

(d).Sulphur dioxide-SO_2; Elements present are Sulphur and Oxygen.

(e).Ethanol-C_2H_5OH; Elements present are carbon, hydrogen and oxygen.

Solution 34

2N represents two separate atoms of nitrogen and N_2 represents one molecule of nitrogen.

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Solution 35

(a) O- one atom of oxygen

(b) 2O- two separate atoms of oxygen

(c) O_2-one molecule of oxygen

(d)$3O_2$-three molecules of oxygen

Solution 36

H2 represents two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.

Solution 37

(a) Oxygen gas occurs as a diatomic molecule in nature.

(b) Noble gases occur as monoatomic gases in nature.

Solution 38

2H represents two separate atoms of hydrogen and H_2 represents one molecule of hydrogen.

Solution 39

(a) N – one atom of nitrogen

(b) 2N – two separate atoms of nitrogen

(c) N_2 – one molecule of nitrogen

(d) $2N_2$ – two molecules of nitrogen

Solution 40

Significance of formula of a substance-

1. Formula represents the name of the substance.
2. Formula represents one molecule of a substance.
3. Formula gives the number of atoms of each element present in one molecule.
4. Formula also represents one mole of molecules of the substance.

Solution 41

Significance of the formula H_2O-

1. H_2O represents water.
2. It represents one molecule of water.
3. H_2O also represents 6.022 x 1023 molecules of water.
4. It represents 18gm of water.

Solution 42

Molecular formula of glucose = $C_6H_{12}O_6$

Molecular mass of glucose = (6xC)+(12xH)+(6xO) =72 + 12 + 96 = 180u.

Solution 43

(a).Molecular mass of Hydrogen (H_2) = 2 x H = 2 x 1 u = 2 u

(b).Molecular mass of oxygen (O_2) = 2 x O = 2 x 16 u = 32 u

(c).Molecular mass of chlorine (Cl_2) = 2 x Cl = 2 x 35.5 = 71 u

(d).Molecular mass of Ammonia (NH_3) = 1 x N + 3 x H = 14 + 3 = 17 u

(e).Molecular mass of carbon dioxide (CO_2) = 1 x C + 2 x O = 12 + 32 = 44 u

Solution 44

(a). Molecular mass of methane (CH_4) = 12 + 4 = 16 u

(b). Molecular mass of ethane (C_2H_6) = 2 x 12 + 6 x 1 = 30 u

(c). Molecular mass of ethane (C_2H_4) = 2 x 12 + 4 x 1 = 28 u

(d). Molecular mass of ethyne (C_2H_2) = 2 x 12 + 2 x 1 = 26 u

Solution 45

(a) Molecular mass of Methanol(CH_3OH) =

1xC + 3xH + 1xO +1xH = (12+3+16+1)u = 32u

(b) Molecular mass of Ethanol (C_2H_5OH) = 2xC + 5xH + 1xO +1xH

= (24 + 5 + 16 + 1) = 46u

Solution 46

Molecular mass of ethanoic acid (CH_3COOH)

= 1xC + 3xH + 1xC + 2xO +1xH = 12+3+12+32+1 = 60u

Solution 47

Molecular mass of Nitric acid (HNO_3) = 1xH + 1xN + 3xO

= (1 + 14 +48) u = 63 u

Solution 48

Molecular mass of chloroform ($CHCl_3$) = 1 x C + 1 x H + 3 x Cl

= (12 + 1 + 106.5)u = 119.5 u

Solution 49

Molecular mass of hydrogen bromide (HBr) = 1 x H + 1 x Br

= (1 + 80) u = 81u

Solution 50

(a).Molecular mass of hydrogen sulphide (H_2S) = 2xH + 1xS

= (2+32) u = 34u

(b). Molecular mass of Carbon disulphide (CS_2) = 1xC + 2xS = (12+2 x 32) u = 76 u

Solution 51

Law of conservation of mass by LAVOISIER states that: “Mass can neither be created nor be destroyed in a chemical reaction”. So, in a chemical reaction, the total mass of reactants must be equal to the total mass of products.

For example: When calcium carbonate is heated, a chemical reaction takes place to form calcium oxide and calcium carbonate. If 100 gms of calcium carbonate is decomposed completely, then 56 gms of calcium oxide and 44 gms of carbon dioxide are formed.
In the above example: the total mass of products = 56 gms (CaO) + 44gms (CO2) = 100 gms.
As total mass of products is equal to the total mass of reactant so, the law of conservation of mass is satisfied.

Solution 52

Law of constant proportion given by PROUST states that "A chemical compound always consists of the same elements combined together in the same proportion by mass."
For example: If we decompose 100 gms of pure water by passing electricity through it, then 11 gms of hydrogen and 89 gms of oxygen are obtained. Now, if we repeat this experiment by taking pure water from different sources (like river, sea, well, etc.), the same masses of hydrogen and oxygen elements are obtained in each case. They are always combined together in the same constant proportion of 11:89 or 1:8 by mass. And this is the law of constant proportions.

Solution 53

[a]. Postulates of Dalton's atomic theory:
a) All the matter is made up of very small particles called 'atoms'.
b) Atoms cannot be divided.
c) Atoms can neither be created nor be destroyed.
d) Atoms are of various kinds. There are as many kinds of atoms as are elements.
e) All the atoms of a given element are identical in every respect, having the same mass, size and chemical properties.
f) Atoms of different elements differ in mass, size and chemical properties.
g) The 'number' and 'kind' of atoms in a given compound is fixed.
h) During chemical combination, atoms of different elements combine in small whole numbers to form compounds.
i) Atoms of the same elements can combine in more than one ratio to form more than one compound.
[b]. The postulate "The elements consists of atoms and that atoms can neither be created nor destroyed" can be used to explain the law of conservation of mass.
[c]. The postulate "The elements consist of atoms having fixed mass, and that the number and kind of atoms of each element in a given compound is fixed" can be used to explain the law of constant proportions.

Solution 54

(a).Significance of symbol of element –
i. It represents name of the element.
ii. It represents one atom of the element.
iii. It represents a definite mass of the element.
iv. It represents one mole of atoms of the element.
For example – C represents one atom of the element Carbon. It also represents 12 gms of Carbon.
(b). Significance of symbol H –
i. It represents Hydrogen element.
ii. It represents one atom of Hydrogen element.
iii. It represents one mole of Hydrogen atoms.
iv. It represents 2 gms of Hydrogen.

Solution 55

a) An atom is the smallest particle of an element that can take part in a chemical reaction. They usually exist in combination with the atoms of same element or another element.
b) A molecule is an electrically neutral group of two or more atoms chemically bonded together.

For example- Ozone gas has three oxygen atoms combined together, so ozone exists in the form of O3 molecule.

c) The molecule of an element contains two or more similar atoms chemically bonded together.

For example- A molecule of hydrogen element consists of 2 hydrogen atoms combined together.

Whereas the molecule of compound contains two or more different type of atoms chemically bonded together.

For example- The molecule of hydrogen chloride(HCl) contains two different type of atoms, i.e. H and Cl.

Solution 56

(a) One atomic mass unit is defined as exactly one-twelfth the mass of an atom of carbon-12. Its symbol is 'u'.

(b) The atomic mass of an element is the relative mass of its atom as compared with the mass of a carbon-12 atom taken as 12 units.

(c) It means that one atom of oxygen is 16 times heavier than 1/12 of a C-12 atom.

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Solution 75

According to question-

$$\underset{(15.95gm)}{CuSO_4} + \underset{(8gm)}{2NaOH} \rightarrow \underset{(9.75gm)}{Cu(OH)_2} + \underset{(14.2gm)}{Na_2SO_4}$$

Clearly, in this case

total mass of reactants = (15.95 gm + 8 gm) = 23.95 gm

total mass of products = (9.75 gm + 14.2 gm) = 23.95 gm

Hence, Law of conservation of mass is valid here.

Solution 76

According to question-

$$\underset{(24.5gm)}{\text{Potassium chlorate}} \rightarrow \underset{(14.9gm)}{\text{Potassium chloride}} + \underset{(x\ gm)}{\text{Oxygen}}$$

Let, x gm of oxygen is formed

Then, according to law of conservation of mass-

24.5 gm = 14.9 gm + x gm

So, x = (24.5 � 14.9) gm = 9.6 gm.

Thus, 9.6 gm of oxygen is formed in the reaction

Solution 77

According to question-

Reaction 1-

$$\underset{(3.92\ gm)}{2\ Cu} + \underset{(4.90-3.92\ =\ 0.98gm)}{O_2} \rightarrow \underset{(4.90\ gm)}{2CuO}$$

$$\frac{3.92}{3.92} = 1,\ \frac{0.98}{3.92} = 0.25,\ \frac{4.90}{3.92} = 1.25$$

So, 1 equivalent of Cu reacts with 0.25 equivalent of O_2 to form 1.25 equivalent of copper oxide.

Reaction 2-

$$\underset{(4.55\ gm)}{2\ CuO} \rightarrow \underset{(3.64\ gm)}{2\ Cu} + \underset{(4.55-3.64\ =\ 0.91\ gm)}{O_2}$$

$$\frac{4.55}{3.64} = 1.25,\ \frac{3.64}{3.64} = 1,\ \frac{0.91}{3.64} = 0.25$$

Here again, one can see that 1.25 equivalent of CuO decomposed to form 1 equivalent of Cu

and 0.25 equivalent of oxygen.
Hence, law of constant proportion is verified.

Solution 78

According to question-

```
Magnesium + Oxygen  →  Magnesium oxide
    3x         2x             x
```

i.e. three equivalents of Mg reacts with 2 equivalents of O2 to form 1 equivalent of MgO.
When mass of Mg = 3x = 24 gm
So, x = 8 gm
Then, mass of oxygen required = 2x = 16 gm

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Solution 79

When 5 gm of calcium is burnt in 2 gm of oxygen, then 7 gm of calcium oxide is formed. So, calcium and oxygen combine in the fixed proportion of 5:2 by mass.
Now, when 5 gm of calcium is burnt in 20 gm of oxygen, then also 7gm of calcium oxide will be formed because chemical reactions follows law of constant proportion.
As a result, 18 gm of oxygen will be left unreacted.

Solution 80

According to question-

```
X (liquid)  →  Y (gas)  +  Z (gas)
 200gm          178gm       22gm
```

(a) Liquid X – Water
Gas Y – Oxygen
Gas Z – Hydrogen
(b) mass of Z / mass of Y = 22gm / 178 gm = 1:8
(c) Law of constant proportion is illustrated by this example.
(d) Two sources of liquid X – Sea, Well
(e) Gas Y (oxygen) is necessary for breathing.

Solution 81

According to question-

```
P (solid) →  Q (gas) + R (solid)
 50 gm        22gm      28 gm
```

(a) Solid P – Calcium Carbonate (CaCO3)
Gas Q – Carbon dioxide (CO2)
Solid R – Calcium oxide (CaO)
(b) Total mass of Q and R = 22gm + 28gm = 50gm
(c) Total mass of Q and R (50gm) is equal to mass of reactant (50gm).
(d) The law of conservation of mass is followed, i.e. total mass of product is equal to mass of reactant.
(e) Law of conservation of mass is illustrated by the example.

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Solution 01

Ions

Solution 02

(a). Anions ; (b). Cations

Solution 03

The formula mass of an ionic compound is the relative mass of its 'formula unit' as compared with the mass of a Carbon-12 atom taken as 12 units.

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Solution 04

(a) Anions are formed by the gain of electrons by atoms

(b) Cations are formed by the loss of electrons by atoms

Solution 05

(a) False

(b) True

Solution 06

(a). Calcium oxide – CaO

(b). Magnesium hydroxide – Mg(OH)2

Solution 07

Valency of element Z = 3

Valency of oxygen = 2

So, formula of oxide of element = Z2O3

Solution 08

Its Na+ , the sodium ion.

Solution 09

Its Cl-, the chloride ion.

Solution 10

(a) Anion

(b) Cation

(c) Ion

(d) Electrons ; protons

(e) Protons ; electrons

Solution 11

Water is made up of Hydrogen and oxygen.

Valency of hydrogen is +1 ; Valency of oxygen is -2.

Chemical formula of water is H2O.

Solution 12

Symbols : H N

Valencies : +1 -3

So, chemical formula of ammonia is NH3.

Solution 13

Symbols : S O

Valencies : +4 -2

Chemical formula of sulphur dioxide is SO2.

Solution 14

According to question-

Symbols : C S

Valencies : +4 -2

Name and formula of the resulting compound is Carbon disulphide; CS2.

Solution 15

As the valency of element X is 4 and that of Y is 1, so the resulting formula is XY4.

Solution 16

When the valency shown by B is 4, then-

Symbols : B O

Valencies : +4 -2

The resulting compound is BO_2.

When the valency shown by B is 6, then-

Symbols : B O

Valencies : +6 -2

The resulting compound is BO_3.

Solution 17

Symbols : X Y

Valencies : 3 2

Thus, the resulting compound is X_2Y_3.

Solution 18

Symbols : Mg HCO3

Valencies : +2 -1

Thus, the resulting compound is $Mg(HCO_3)_2$

Solution 19

(a). Bromide of element-

As valency of bromine is -1 and that of element X is +2 so, the resulting compound is XBr2.

(b). Oxide of element-

As valency of oxygen is -2 and that of element is +2 so, the resulting compound is XO.

Solution 20

(a). Sodium oxide-

Symbols : Na O

Valencies : +1 -2

Thus, the formula of sodium oxide is Na_2O.

(b). Calcium carbonate-

Symbols : Ca CO3

Valencies : +2 -2

Thus, the resulting compound is $CaCO_3$.

Solution 21

(a).Molecular mass of Na2O = (2 x Na) + (1 x O) = (2 x 23) + (1 x 16) = 62u

(b). Molecular Mass of Al2O3 = (2 x Al) + (3 x O) = (2 x 27) + (3 x 16) = 102u

Solution 22

(a). CuSO4 : Copper sulphate; Cu+2 and SO4-2

(b). (NH4)2SO4 : Ammonium sulphate; NH4+ and SO4-2.

(c). Na2O : Sodium oxide; Na+ and O-2

(d). Na2CO�3 : Sodium carbonate; Na+ and CO4-2.

(e). CaCl2 : Calcium chloride; Ca+2 and Cl-.

Solution 23

(a). CH3COONa : Na+ (cation) and CH3COO- (anion)

(b). NaCl : Na+ (cation) and Cl- (anion)

(c). H2 : It is a covalent molecule. So, cation and anion are not present.

(d). NH4NO3 : NH4+ (cation) and NO3- (anion)

Solution 24

(a). Element : Ca F

Valencies : +2 -1

Thus, the resulting compound is CaF_2.

(b). Element : H S

Valencies : +1 -2

Thus, the resulting compound is H_2S.

(c). Element : N H

Valencies : -3 +1

Thus, the resulting compound is NH_3.

(d). Element : C Cl

Valencies : +4 -1

Thus, the resulting compound is CCl_4.

(e). Element : Na O

Valencies : +1 -2

Thus, the resulting compound is Na_2O.

(f). Element : C O

Valencies : +4 -2

Thus, the resulting compound is CO_2.

Solution 25

i. Ionic compounds- The compounds which are formed by combination of metals and non-metals are called ionic compounds. For ex: CaCl2 and CaCO3.

ii. Molecular compounds- These compounds are formed by the combination between two non-metal elements. For ex. HCl and H2S.

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Solution 26

(a). An ion is a positively or negatively charged atom (or group of atoms). An ion is formed by the loss or gain of an electrons by an atom, so it contains an unequal number of protons and electrons.

EXAMPLE- (1). Sodium ion, Na^+, formed by loss of one electron.

(2). Chloride ion, Cl^-�, formed by gain of one electron.

(b).

i. Sodium phosphate - Na_3PO_4

ii. Ammonium sulphate - $(NH_4)_2SO_4$

iii. Calcium Hydroxide - $Ca(OH)_2$

iv. Lead bromide - $PbBr_2$

Solution 27

(a)A cation is formed by the loss of one or more electrons by an atom. For ex. Magnesium loses 2 electron to form Mg+2.

An anion is formed by the gain of one or more electrons by an atom. For Ex. Chlorine loses one electron to form Cl-.

(b) (i). Na2S

(ii). Cu (NO3)2

Solution 28

(i).

$$Na\ (11\ protons,\ 11\ electrons) \xrightarrow{-1\ electron} Na^+\ (11\ protons,\ 10\ electrons)$$

The reason for positive charge on sodium is the loss of electron.

(ii).

$$Cl\ (17\ protons,\ 17\ electrons) \xrightarrow{+1\ electron} Cl^-\ (17\ protons,\ 18\ electrons)$$

The reason for negative charge on chlorine is the gain of electron.

Solution 29

(a). Simple ions: Br- and Na+ ; Compound ions: NH4+ and Al+3
(b). (i). YCl4 (ii). YO2 (iii). Y (SO4)2 (iv). Y (CO3)2 (v). Y (NO3)4

Solution 30

(a). The simplest combination of ions that produces an electrically neutral unit, is called 'formula unit' of the ionic compound.

Formula unit of sodium chloride – NaCl

Formula unit of magnesium chloride – MgCl2

(b).

(i). Formula Mass of Calcium chloride (CaCl2) = 1xCa + 2xCl = (40+71) u = 111 u

(ii). Formula Mass of Sodium carbonate (Na2CO3) = 2xNa + 1xC + 3xO= (2×23 + 1×12 + 3×16) u = 106 u

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Solution 46

(a). Let the valency of element A be y, then

2y + 5(-2) = 0

So, y = valency of element A = 5

(b). As valency of element A is 5 and valency of chlorine is -1,

So, the formula of chloride of A is ACl5.

Solution 47

Valency of X –

(i). In H2X : -2

(ii).In CX2 : -2

(iii).In XO2 : +4

(iv).In XO3 : +6

Solution 48

Let the valency of X be y, then

2 x (+3) + 3 x y = 0

So, valency of X = y = -2

As valency of Mg is +2 and that of X is -2 so the formula of Magnesium salt of X will be MgX.

Solution 49

According to formula M2CO3, valency of M is +1.

(a). formula of iodide = MI (as valency of iodine is -1)

(b). formula of nitride = M3N (as valency of nitrogen is -3)

(c). formula of phosphate = M3PO4

Solution 50

(a). Anion will be formed by element X ; Symbol : X-

(b). (i). No. of protons in X = 17

(ii). No. of electrons in X = 18

(iii). No. of neutrons in X = 18

(c). Cation will be formed by element Y ; Symbol : Y+

(d). (i). No. of protons in Y = 11

(ii). No. of electrons in Y = 10

(iii). No. of neutrons in Y = 12

(e).Atomic mass of X = No. of protons(17) + No. of neutrons(18) = 35 u

Atomic mass of Y = No. of protons (11) + No. of neutrons (12) = 23 u

(f). Element X is Chlorine (Cl).

Element Y is Sodium (Na).

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Solution 1

A mole

Solution 2

1 mole

Solution 3

6.022×10^{23}

Solution 4

One mole of atoms (6.022×10^{23} atoms)

Solution 5

6.022×10^{23}

Solution 6

Avogadro number

Solution 7

Given mass of oxygen = 12g

Molar mass of oxygen = 32g

No. of moles = Given mass / Molar mass = 12g /32g = 0.375

Solution 8

No. of moles = 3.6g / 18g = 0.2 mole

Solution 9

Mass of 0.2 moles of oxygen atoms = 0.2 x 16 = 3.2g

Solution 10

Mass of 2 moles of nitrogen atoms = 2 x 14 = 28g

Solution 11

Given mass of CaCO3 = 10g

Molar mass of CaCO3 = 1xCa + 1xC + 3xO = (40+12+48)gm = 100gm

So, no. of moles of CaCO3 = Given mass/Molar mass = 10/100 = 0.1 moles

Solution 12

(a). 6.022×10^{23} atoms

(b). One Mole

(c). Avogadro's number

Solution 13

One mole of O_2 = 32 gm

6.022×10^{23} molecules of O_2 have mass = 32 gm

So, 12.044×10^{25} molecules of O_2 will have mass = 6400 gm = 6.4 Kg

Solution 14

One mole of ammonia contains = 6.022×10^{23} molecules of ammonia.

So, 1.5 moles of ammonia contains = $1.5 \times 6.022 \times 10^{23}$ molecules

= 9.033×10^{23} molecules of ammonia.

Solution 15

Given mass of $CaCO_3$ = 10g

Molar mass of $CaCO_3$ = 1xCa + 1xC + 3xO = (40+12+48)gm = 100gm

So, no. of moles of $CaCO_3$ = Given mass/Molar mass = 10/100 = 0.1 moles

Solution 16

One mole of O_2 contains = 6.022×10^{23} molecules of oxygen

So, 1 molecule of O_2 has = $1/6.022 \times 10^{23}$ moles of O_2

Therefore, 1.2×10^{22} molecules of O_2 will have = $1.2 \times 10^{22} / 6.022 \times 10^{23}$ moles of O_2

= 0.0199 moles of O_2

Solution 17

6.022×10^{23} molecules of N_2 weigh = 28 gm

So, 1 molecule of N_2 will weigh = $28 / 6.022 \times 10^{23}$ grams of N_2

= 4.648×10^{-23} grams of N_2

Solution 18

1 mole of sodium weighs = 23 gm

So, 1 gm of sodium will have = 1/23 moles of sodium

Therefore, 34.5 gm of sodium will have = 34.5/23 = 1.5 moles of sodium.

Solution 19

1 mole of Zn = 65gm of zinc = 6.022×10^{23} atoms of zinc

Given mass of zinc = 10gm

No. of moles of zinc = 10/65 = 0.15 moles of zinc

Total no. of atoms in 0.15 moles = $0.15 \times 6.022 \times 10^{23}$ atoms of Zn

= 9.264×10^{22} atoms of Zn

Solution 20

Mass of 6.022×10^{23} atoms of Carbon = 12 g

So, Mass of 1 Carbon atom = $12/6.022 \times 10^{23}$ g

Hence, mass of 3.011×10^{24} atoms of Carbon = $3.011 \times 10^{24} \times 12 / 6.022 \times 10^{23}$ = 60 g

Solution 21

6.022×10^{23} atoms of Oxygen weigh = 16 g

So, mass of 1 atom of Oxygen = $16/6.022 \times 10^{23} = 2.656 \times 10^{-23}$ g.

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Solution 22

1 mole of hydrogen has = 6.022×10^{23} atoms of hydrogen

So, 0.25 moles of hydrogen will have = $6.022 \times 10^{23} \times 0.25 = 1.50 \times 10^{23}$ atoms of hydrogen.

Solution 23

6.022×10^{23} atoms of phosphorus has = 1 mole of phosphorus

So, 12.044×10^{25} atoms of phosphorus will have = $12.044 \times 10^{25}/6.022 \times 10^{23}$

= 200 moles

Solution 24

Given mass of $CHCl_3$ = 0.0239 g

Molar mass of $CHCl_3$ = 1 x C + 1 x H + 3 x Cl = 119.5 g

No. of moles = Given mass/ Molar mass

No. of moles = 0.0239/119.5 = 0.0002

So, no. of molecules present in 0.0239 g of chloroform = 0.0002 x 6.022 x 10^{23}

= 12.044 x 10^{19} molecules

Solution 25

1 mole of Na_2CO_3 = 106g

So, 5 x mole of Na_2CO_3 = 5 x 106g = 530g

Solution 26

32 g of oxygen (1 mole of oxygen) has = 6.022 x 10^{23} molecules of oxygen

So, 4 g of oxygen will have = 6.022 x 10^{23} x 4/32 = 7.528 x 10^{22} molecules of oxygen.

Solution 27

Molar mass of glucose = 180 g

180 g of glucose has = 1 mol

So, 100 g of glucose will have = 1 x 100/180 = 0.55 moles

Solution 28

1 mole of H_2S weighs = 34 g

So, 0.17 mole of H_2S will weigh = 34 x 0.17 g = 5.78 g

Solution 29

Molar mass of CO_2 = 44g

Molar mass of H_2O = 18g

Mass of 5 mole of H_2O = 5 x 18g = 90 g

Mass of 5 mole of CO_2 = 5 x 44g = 220 g

So, 5 mole of H_2O and 5 mole of CO_2 do not have same mass.

And the difference in their masses = 220 g - 90 g = 130 g

Solution 30

240g of calcium has = 240/40 = 6 moles

240g of magnesium has = 240/24 = 10 moles

So, required mole ratio = 6:10 = 3:5

Solution 31

(a). A group of 6.022 x 10^{23} particles (atoms, molecules or ions) of a substance is called a mole of that substance. One mole represents the amount of a substance equal to its 'GRAM ATOMIC MASS' or 'GRAM MOLECULAR MASS' and 6.022 x 10^{23} no. of particles of the substance.

(b). 1.5 moles of Na_2SO_3 has 3 moles of Na, 1.5 mole of S and 4.5 moles of O.

Thus, mass of sodium = 3 x 23 g = 69g

Mass of sulphur = 1.5 x 32 = 48g

Mass of oxygen = 4.5 x 16 g = 72g

Solution 32

(a) A mole of carbon atoms means a carbon sample weighing 12 g and containing 6.022 x 10^{23} carbon atoms.

(b) 1 mole of aluminium weighing 27g has = 6.022 x 10^{23} atoms of Al

So, 1g of Al has = 0.22 x 10^{23} atoms of Al

Hence, 50g of Al will have = 50 x 0.22 x 10^{23} atoms of Al

= 11 x 10^{23} atoms of Al

1 mole of iron weighing 56g has = 6.022 x 10^{23} atoms of Fe

So, 1g of Fe has = 0.10 x 10^{23} atoms of Fe

Hence, 50g of Fe will have = 50 x 0.10 x 10^{23} atoms of Fe = 5 x 10^{23} atoms of Fe

Thus, 50g of Al has more no. of atoms as compared to 50g of Fe.

Solution 33

(a). The amount of substance whose mass in grams is numerically equal to its atomic mass, is called gram atomic mass of that substance.

Gram atomic mass of oxygen is 16g.

(b). Moles of oxygen atom are -

(i). Al_2O_3 : 3 mole

(ii). CO_2 : 2 mole

(iii).Cl_2O_7 : 7 mole

(iv). H_2SO_4 : 4 mole

(v). $Al_2(SO_4)_3$: 12 mole

Solution 34

(a). The amount of substance whose mass in grams is numerically equal to its molecular mass is called gram molecular mass of that substance.

Gram molecular mass of the oxygen is 32g.

(b). Given mass of sulphur = 100g

Molar mass of S_8 = 32 x 8 g = 256g

No. of moles = Given mass / Molar mass = 100/ 256 = 0.39 moles.

Solution 35

(a). The molar mass of the substance is the mass of 1 mole of that substance. Molar mass is generally expressed in grams or 'g'.

(b).

(i). Molar mass of ozone (O_3) = 3 x gram atomic mass of O = 3 x 16 g = 48 g/ mole

(ii). Molar mass of Ethanoic acid (CH_3COOH) = 2xC + 4xH + 2xO

= (24 + 4 + 32)u = 60 g/ mole

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Solution 43

1 mole of SO_2 = Mass of S + 2 x Mass of O = 64 grams

64 g of SO_2 = 1 mole

So, 1 g of SO_2 = 1/64 mole

Now since equal moles of all the substances contain equal number of molecules so, 1/64 mole of O_2 will also contain x molecules like SO_2.

32 g of oxygen = 1 mole

So, 1 g of oxygen = 1/32 mole

Now, 1/64 mole of oxygen contains = x molecules

So, 1/32 mole of oxygen will contain = x x 64/32 = 2x molecules

Solution 44

Mass of one molecule of substance = 4.65×10^{-23} u

So, mass of 1 mole of substance = Mass of 6.022×10^{23} molecules of the substance

$= 4.65 \times 10^{-23} \times 6.022 \times 10^{23}$ u = 28 u

The substance is Nitrogen with molecular mass 28 u.

Solution 45

Molar mass of SO_2 = (32 + 2x16) g = 64g

Molar mass of oxygen (O_2) = 32g

Given mass of SO_2 = 10g = Given mass of oxygen (O_2)

1 mole of substance = 6.023×10^{23} particles of the substance

(a). No. of moles of SO_2 = 10g/64g = 0.15

Total no. of molecules of $SO_2 = 0.15 \times 6.022 \times 10^{23} = 0.90 \times 10^{23}$ molecules of SO_2

(b). No. of moles of O_2 = 10g/32g = 0.31

Total no. of molecules of $O_2 = 0.31 \times 6.022 \times 10^{23} = 1.88 \times 10^{23}$ molecules of O_2

Thus, 10g of O_2 contains more no. of molecules.

Solution 46

Given mass of nitrogen = 56g

Molar mass of nitrogen = 14g

No. of moles of nitrogen = 56g/14g = 4 moles

Equal number of moles of all the susbtances contain equal number of molecules.

So, 4 moles of nitrogen and 4 moles of oxygen contains same no. of molecules.

Hence, mass of 4 mole of oxygen = 4 x 16g = 64 g

Solution 47

Given mass of water = 1.8g

Molar mass of water = 18g

No. of moles of water = 1.8g/18g = 0.1 moles

Equal number of moles of all the susbtances contain equal number of molecules.

So, 0.1 moles of water and 0.1 moles of nitrogen contains same no. of molecules.

Hence, mass of 0.1 mole of nitrogen = 0.1 x 28 g = 2.8 g

Solution 48

32 g of S = 1 mole

So, 1 g of S = 1/32 mole

Now since equal moles of all the substances contain equal number of atoms so, 1/32 mole of oxygen will also contain x atoms like S.

16 g of oxygen = 1 mole

So, 1 g of oxygen = 1/16 mole

Now, 1/32 mole of oxygen contains = x atoms

So, 1/16 mole of oxygen will contain = x x 32/16 = 2x atoms

Solution 49

Given mass of carbon = 6g

Molar mass of carbon = 12g

No. of moles of carbon = 6g/12g = 0.5 moles

Equal number of moles of all the susbtances contain equal number of molecules.

So, 0.5 moles of carbon and 0.5 moles of magnesium contains same no. of molecules.

Hence, mass of 0.5 mole of magnesium = 0.5 x 24g = 12g

Solution 50

(i). Mass of 1 g of element X = 2×10^{-23} g

Mass of 1 mole of element X = $2 \times 10^{-23} \times 6.022 \times 10^{23}$ = 12.044 g

Molar mass of the element X = mass of 1 mole of element = 12 u

(ii). Element X is CARBON.

Structure of The Atom

Solution 01

Neutron is not present in ordinary hydrogen atom.

Solution 02

J. J. Thomson

Solution 03

Maximum of 2 e^- can be accommodated in K shell of an atom.

Solution 04

Maximum of 8 e^- can be accommodated in L shell of an atom.

Solution 05

Maximum of 18 e^- can be accommodated in M shell of an atom.

Solution 06

Maximum of 32 e^- can be accommodated in N shell of an atom.

Solution 07

(a). Maximum of 2 e^- can be accommodated in innermost shell of an atom.

(b). Maximum of 8 e^- can be accommodated in outermost shell of an atom.

Solution 08

Three subatomic particles present in atom are electrons, protons and neutrons.

Solution 09

Electron is negatively charged particle present in atoms of all the elements.

Solution 10

J. J. Thomson discovered electron.

Solution 11

(a). e^-

(b). p^+

(c). n

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Solution 12

(a). False

(b). True

(c). False

Solution 13

Nucleus is the central part of an atom in which protons and neutrons are held together.

Solution 14

K, L, M, N were the letters used by Bohr to represent electron shells in an atom.

Solution 15

Protons and neutrons actually determine the mass of atom.

Solution 16

Proton is the positively charged particle present in atoms of all the elements.

Solution 17

Electronic configuration of hydrogen : 1

Solution 18

Proton is 1840 times heavier than electron.

Solution 19

Hydrogen gas produces anode rays consisting of protons in the discharge tube experiment.

Solution 20

Nucleus was discovered by Rutherford in the alpha particle scattering experiment.

Solution 21

Positive charge on the nucleus is due to presence of protons.

Solution 22

(a). 8 electrons are present in outermost shell of Neon.

(b). 7 electrons are present in outermost shell of Chlorine.

Solution 23

(a). L shell can accommodate maximum of 8 e-.

(b). N shell can accommodate maximum of 32 e-.

Solution 24

(a). K shell can accommodate maximum of 2 e-.

(b). M shell can accommodate maximum of 18 e-.

Solution 25

(i). Chadwick discovered ‘neutron’.

(ii). Thomson discovered ‘electron’.

(iii). Goldstein discovered ‘proton’.

Solution 26

(a). Proton has relative charge of +1.

(b). Electron has relative charge of -1.

(c). Neutron has relative charge of 0.

Solution 27

(a) Atomic number

(b) Mass number

(c) 11

(d) 23

(e) 20

(f) Nucleus

(g) Electrons
(h) Protons
(i) 8
(j) 18
(k) Neutron
(l) Negative; Positive; No

Solution 28

Electron is a negatively charged particle found in the atoms of all elements.
The relative mass of an electron is 1/1840 u.
A charge of -1 is carried by an electron.

Solution 29

Absolute mass of electron is 9×10^{-28} Kg.

Absolute charge on electron is 1.6×10^{-19} C.

Solution 30

The deflection of fast moving alpha- particles through small and large angles in Rutherford's scattering experiment is the evidence for the presence of nucleus in an atom.

Solution 31

Important information furnished about nucleus in Rutherford's alpha- particle scattering experiment is:
(i). Nucleus of an atom is positively charged.
(ii). Nucleus of an atom is very hard and dense.
(iii). Nucleus of an atom is very small as compared to the size of an atom as a whole.

Solution 32

Most of the alpha- particles passed straight through the gold foil without any deflection in Rutherford's alpha- particle scattering experiment, this shows that most of the space in an atom is empty.

Solution 33

There are equal no. of positive and negative particles in an atom, so it is neutral as a whole.

Solution 34

(a). Proton is present in same fixed no. in the atoms of any particular element.
(b). Atomic no. is characteristic for any particular element.

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Solution 35

Protons are positively charged particle found in the atoms of all the elements.
Relative mass of proton is 1u.
Relative charge of proton is +1 C.

Solution 36

Absolute mass of proton - 1.6×10^{-27} Kg
Absolute charge of proton - 1.6×10^{-19} C

Solution 37

Difference between proton and neutron-
(1). Proton is positively charged while electron is negatively charged.
(2). Proton is much heavier than electron.

Solution 38

Two observations which shows that atom is not indivisible are-
(1). In J. J. Thomson's experiment, the stream of cathode rays in the gas discharge tube shows the presence of negatively charged subatomic particles called electrons.
(2). In Goldstein's experiment, the faint red glow in the gas discharge tube shows the presence

of positively charged subatomic particles called protons.

Solution 39

(i). Formation of cathode rays tells about the presence of negatively charged electrons in all the atoms.

(ii). Formation of anode rays tells about the presence of positively charged protons in all the atoms.

Solution 40

The arrangement of electrons in various shells of an atom of the element is known as electronic configuration of the element.

Electronic configuration of oxygen (atomic no. = 8) is (2,6)

Solution 41

Electronic configuration of element with atomic no. 12- (2,8,2)

So, K-2 ; L-8 ; M-2

Solution 42

(a). Nucleus is a small positively charged part at the center of an atom. Nucleus is positively charged.

(b). Rutherford discovered nucleus of an atom.

Solution 43

Alpha – particles were used by Rutherford in his experiment on the discovery of nucleus.

Alpha – particles have +2 units of charge.

Solution 44

(a). There are 13 e- in each atom of the element.

(b). Electronic configuration of given element- (2,8,3)

K-2 ; L-8 ; M-3

Solution 45

Atomic No. – 18

Electronic configuration – (2,8,8)

The special thing about the outermost shell is that it is completely filled with the electrons.

Solution 46

The neutron is a neutral particle found in the nucleus of an atom. Its relative mass is 1 u. It has no charge.

Solution 47

Electron has relative mass of 1/1840 u, proton has 1u and neutron also has 1u.

Electron has relative charge of -1u, proton has +1u and neutron has 0 relative charge.

Solution 48

Protons are positively charged particle found in the atoms of all the elements whereas neutron is a neutral particle found in the nucleus of an atom.

Solution 49

Electron has relative mass of 1/1840 u and proton has relative mass of 1u.

Electron has relative charge of -1u while proton has +1u of relative charge.

Solution 50

Proton has relative mass of 1u and neutron also has relative mass of 1u.

Proton has relative charge of +1u and neutron has no relative charge.

Solution 51

Electron has relative charge of -1 u whereas neutron has no relative charge.

Also, electron has relative mass of 1/1840 u and neutron has relative mass of 1 u.

Solution 52

Protons and neutrons are collectively present in the nucleus at the center while electrons revolve rapidly round the nucleus in fixed circular orbits called energy levels.

Solution 53

ATOMIC NO.	MASS NO.	PROTONS	NEUTRONS	ELECTRONS	SYMBOL
10	22	10	12	10	Ne

Solution 54

NO. OF PROTONS	NO. OF NEUTRONS	MASS NO.	ATOMIC NO.	NO.OF ELECTRONS	SYMBOL
11	12	23	11	11	Na

Solution 55

(a). The stream of particles coming out from cathode (negative electrode) are called cathode rays. Cathode rays are negatively charged.

(b). When electricity at high voltage is passed through a gas at very low pressure taken in discharge tube, stream of minute particles are given out by the cathode. These stream of particles are called cathode rays.

(c). The conclusion is that all the atoms contain negatively charged particles called electrons.

Solution 56

(a). According to Thomson model of atom- An atom consists of a sphere of positive charge with negatively charged electrons embedded in it. The positive and negative charges in an atom are equal in magnitude.

Neutron was not present in the Thomson model of atom.

(b). When mass no. is 18 and no. of electrons is 7 then

(i). No. of protons = 7

(ii). No. of neutrons = 18 – 7 = 11

(iii). Atomic no. = 7

Solution 57

(a).Rutherford's model of atom-

1. An atom consists of positively charged, dense and very small nucleus containing all the protons and neutrons. Almost all the mass of atom is concentrated in the nucleus.
2. The nucleus is surrounded by negatively charged electrons. The electrons are revolving at very high speed round the nucleus in fixed circular orbits.
3. The electrostatic attraction between the positively charged nucleus and negatively charged electrons keep the atom held together.
4. An atom is electrically neutral.
5. Most of the space in an atom is empty.

The major drawback of Rutherford model of atom is that it does not explain the stability of the atom.

(b).Given: Mass no. = 23

No. of electrons = 11

Then, no. of protons = 11

No. of neutrons = 23 – 11 = 12

Atomic no. = 11

Solution 58

(a). Bohr's model of atom-

1. An atom is made up of three particles, namely electrons, protons and neutrons.
2. The protons and neutrons are located in the small nucleus at the center of atom.
3. Electrons revolve round the nucleus in fixed circular orbits.
4. Maximum no. of electrons for any given shell is fixed. Any shell cannot exceed that maximum value.
5. Each given shell is associated with fixed amount of energy.
6. There is no change in energy of electrons as long as they keep revolving in the same energy level, and the atom remains stable.

(b).Given: Atomic no. = 11
Mass no. = 23
Then, electronic configuration – (2,8,1)
Nuclear composition is – 11 protons and 12 neutrons

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Solution 59

(a). (i). Atomic no. is the number of protons in one atom of an element.
(ii). Mass no. is the total number of protons and neutrons present in one atom of the element.
Example- The total no. of protons in a carbon atom is 6, so its atomic no. is 6.
Also, one atom of Na contains 11 protons and 12 neutrons, so its mass no. is 23.
(b). Mass No. = Atomic no. + No. of neutrons
(c). No. of neutrons = Mass No. – Atomic no.
= 24 – 12 = 12

Solution 71

(i). Mass no. = 31
(ii). Atomic no. = 15
(iii). E.C. = (2,8,5)

Solution 72

(a). E.C. – (2,8,7)
(b). Atomic No. = 17
(c). Non-metal
(d). Anion; X-
(e). X must be Chlorine

Solution 73

(a). Atomic no. = 3
(b). Mass no. = 3 + 4 = 7
(c). E.C. – (2, 1)
(d). Metal
(e). Cation will be formed; because outermost single electron can be easily donated.
(f). E+
(g). Lithium

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Solution 74

(a). Mass number
(b). Atomic number
(c). No. of protons = 4
(d). No. of neutrons = 9 – 4 = 5
(e). No. of electrons = 4
(f). Electrons in outermost orbit = 2
(g). X2+

Solution 75

(a). Atomic no. = 18
(b). Element Z is non-metal
(c). As the outermost shell of element Z is completely filled so, it will not form any ion.
(d). Outermost electronic shell is completely filled with electrons.
(e). Name of element 'Z' = Argon
Symbol is Ar
(f). Z belongs to the group 'Noble gases'.

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Solution 01

E.C of Nitrogen = 2, 5

So, no. of valence electrons in Nitrogen atom = 5

Solution 02

Noble gases

Solution 03

Helium has less than 8 electrons in the valence shell of an atom. Its atomic no. is 2

Solution 04

Radioactive isotopes are used in the treatment of cancer.

One such isotope is Cobalt-60.

Solution 05

Uranium-235 isotope is used as a fuel in the reactors of nuclear power plants for generating electricity.

Solution 06

Cobalt-60 radioisotope is used in the treatment of cancer.

Solution 07

Iodine-131 radioisotope is used to determine the activity of thyroid gland.

Solution 08

Radioactive isotopes are used in industry to detect the leakage in underground oil pipelines, gas pipelines and water pipes.

Solution 09

The given statement is false.

Solution 10

Atoms containing same number of protons and electrons but different number of neutrons are called ISOTOPES.

Solution 11

Isotopes

Solution 12

The given pair are isotopes.

Solution 13

Radioactive isotopes have unstable nuclei and emit various types of radiations.

Solution 14

Number of protons	Number of neutrons	Mass number	Atomic number	Number of electrons	Valence
11	**12**	23	11	11	1

Solution 15

(a). M

(b). 3

(c). neutrons

(d). isotopes

Solution 16

(a). Atomic no. = 5

(b). Mass no. = 6 + 5 = 11

(c). No. of electrons = 5

(d). No. of valence electrons, per atom = 3

Solution 17

Atomic No. = 17

E.C. = (2, 8, 7)

Valency = 8 – no. of valence electrons = 8 – 7 = 1

Solution 18

Atomic No. of X = 16

E.C. of X = (2, 8, 6)

Valency of X = 8 – no. of valence electrons = 8 – 6 = 2

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Solution 19

Valency shown by A (atomic no. 2) – 0

Valency shown by B (atomic no. 4) – 2

Valency shown by C (atomic no. 8) – 2

Valency shown by D (atomic no. 10) – 0

Valency shown by E (atomic no. 13) – 3

Solution 20

Uranium-235 : This isotope is used as a fuel in the reactors of nuclear power plants for generating electricity.

Cobalt-60 : This is used in the treatment of cancer.

Solution 21

$^3H_1$ and $^3He_2$ are not considered as isotopes because they do not have same atomic number.

Solution 22

The difference in the masses of isotopes of an element is due to different number of neutrons in their nuclei.

Solution 23

Because all the isotopes of an element have identical atomic configuration containing same number of valence electrons, therefore, all the isotopes of an element show identical chemical properties.

For example- Cl-35 and Cl-37, show identical chemical properties as they have same no. of 7 valence electrons.

Solution 24

Due to slight difference in the masses of the isotopes of an element, the physical properties of the isotopes are slightly different.

Solution 25

The fractional atomic masses of elements are due to the existence of their isotopes having different masses.

Solution 26

Deuterium, Protium and Tritium are isotopes.

Argon and Calcium are isobars.

Solution 27

(i). Due to identical electronic configuration containing the same no. of valence electrons, these isotopes have almost identical chemical properties.

(ii). All of them have 1 electron and 1 proton, so, they are electrically neutral.

Solution 28

$$\begin{aligned}\text{Atomic mass} &= \Sigma \text{Mass no.} \times \% \text{ of that isotope} \\ &= 20 \times \frac{90}{100} + 22 \times \frac{10}{100} \\ &= 20.2\,u\end{aligned}$$

Solution 29

Isobars are the atoms of different elements having different atomic numbers but the same mass number (or same atomic mass).

Solution 30

H – 1 proton, 1 electron and no neutron.

D – 1 proton, 1 electron and 1 neutron.

T – 1 proton, 1 electron and 2 neutrons.

Solution 31

Atomic No. = 7

E.C = 2, 5

Valency of given element = 3

Given element is NITROGEN.

Solution 32

(a). The number of electrons present in the valence shell are called valence electrons.

Valence electrons are situated in the outermost shell.

(b). There are 3 valence electrons present in the element with atomic no. 13.

Valence shell of this atom is M.

Solution 33

(a). Isotopes are the atoms of the same element having the same atomic number but different mass numbers.
For example - $^{35}Cl_{17}$ and $^{37}Cl_{17}$ are isotopes of chlorine.

(b). Similarity - A pair of isotopes have same atomic number.
Difference - A pair of isotopes have different mass numbers.

(c). In $^{35}Cl_{17}$ - 17 protons, 17 electrons and 18 neutrons.

In $^{37}Cl_{17}$ - 17 protons, 17 electrons and 20 neutrons.

Solution 34

(a).The isotopes which are unstable due to presence of extra neutrons in their nuclei and emit various types of radiations, are called radioactive isotopes or radioisotopes.

For example: Carbon – 14 , Arsenic – 74

(b). Uses of isotopes-

(i). They are used in the treatment of cancer.

(ii). Radioactive isotopes are used as 'tracers' in medicine to detect the presence of tumors and blood clots in human body.

(c). Average atomic mass = 35.5 u
Let % amount of $^{35}Z_{17}$ be y, then amount of $^{37}Z_{17}$ is (100 - y).

Then-

$$35 \times \frac{y}{100} + 37 \times \frac{(100 - y)}{100} = 35.5$$

So, $35y + 3700 - 37y = 3550$

Hence, $y = 75$

Thus, amount of $^{35}Z_{17}$ is 75% and amount of $^{37}Z_{17}$ is 25%.

Solution 35

(a). The capacity of an atom of an element to form chemical bonds is known as its valency.

Valency of an atom with atomic no. 14 is 4.

(b). The valency of an element is either equal to the number of valence electrons in its atom or equal to the number of electrons required to complete eight electrons in the valence shell.

Valency of metal = No. of valence electron in its atom

Valency of a non-metal = 8 – No. of valence electron in its atom

For example- Valency of sodium (metal) is 1 and that of chlorine (non-metal) is also 1.

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Solution 52

(a). E.C of Na^+ = 2, 8

So, no. of valence electrons in sodium ion, Na^+ = 8

(b). E.C of O2- = 2,8

So, no. of valence electrons in oxide ion, O^{-2} = 8

Solution 53

Atom A - $^{209}A_{82}$
Atom B - $^{209}B_{83}$

(i). A has 82 protons.
(ii). B has 83 protons.
(iii). No, A and B are not isotopes.

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Solution 54

(i). $^{58}A_{26}$ and $^{58}B_{28}$ - these are not isotopes because they have different atomic numbers.
(ii). $^{79}X_{35}$ and $^{80}Y_{35}$ - these are isotopes as they have same atomic number.

Solution 55

(i). Subscripts represent atomic number whereas superscripts represent atomic mass.

(ii). Number of neutrons is responsible for the change in the superscripts.

(iii). Isotopes is the usual name for the given atoms of the element.

(iv). Nuclear composition of $^{18}O_8$ is:-

No. of protons = 8

No. of neutrons = 18 - 8 = 10

Solution 56

A and B are the example of isobars. This is because they have same number of nucleons.

Solution 57

Mass no. of A and B is 40.

The two species are isobars.

A represents Argon (Atomic no. = 18) while B represents Calcium (Atomic no. = 20).

Solution 58

$^{58}A_{26}$ and $^{58}B_{28}$ are isobars because they have same number of nucleons.

Solution 59

A and D are isotopes as they have the same number of protons.

Solution 60

(i). Mass number of X = 8 + 8 = 16

(ii). Mass number of Y = 8 + 9 = 17

(iii). X and Y are isotopes.

(iv). X and Y represent Oxygen.