Chapter 1 - Matter in Our Surroundings Exercise 17

Question 1

What are the conditions for 'something'to be called 'matter' ?

Solution 1

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

Question 2

Name two processes which provide the best evidence for the motion of particles in matter.

Solution 2

Diffusion and Brownian motion.

Question 3

Which single term is used to describe the mixing of copper sulphate and water kept in a beaker, on its own ?

Solution 3

Diffusion.

Question 4

When sugar is dissolved in water, there is no increase in the volume.Which characteristic of matter is illustrated by this observation.

Solution 4

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

Question 5

Even two or three crystals of potassium permangnate can impart colour to a very large volume of water. Which charateristic of particles of matter is illustrated by this observation ?

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.

Question 6

When an incense stick (agarbatti)is lighted in one corner of a room, its fragnance spreads in the whole room quickly.Which characteristic of the particles of matter is illustrated by this observation ?

Solution 6

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

Question 7

A piece of chalk can be broken into small particles by hammering but a piece of iron cannot be broken into small particles by hammering. Which characteristic of the particles of matter is illustrated by these observations ?

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.

Chapter 1 - Matter in Our Surroundings Exercise 18

Question 8

What is the scientific name of particles which make up matter ?

Solution 8

Atoms or Molecules.

Question 10

What is th e general name of :

(a) rigid form of matter ?

(b) fluid form of matter ?

Solution 10

(a) Solid.
(b) Liquid and Gas.

Question 11

Out of solids, liquids and gases, which one has:

(a) maximum movement of particles ?

(b) maximum interparticle attractions ?

(c) minimum spaces between particles ?

Solution 11
(a) Gases.
(b) Solids.
(c) Solids.

Question 12
A subtance has a definite volume but no definite shape'. State whether this susbtance is a solid, a liquid ,a gas.

Solution 12
Liquid.

Question 13
Name the physical state of matter which can be easily compressed.

Solution 13
Gas.

Question 14
'A substance has a definite shape as well as definite volume'.Which physical state is represented by statement ?

Solution 14
Solid.

Question 15
A substance has neither a fixed shape nor a fixed volume.State whether it is solid, a liquid or a gas.

Solution 15
Gas.

Question 16

Name two gases which are supplied in compressed form in homes and hospitals.

Solution 16
LPG (Liquefied Petroleum Gas) and Oxygen Gas respectively.

Question 17
Write the full form of the following:

(a) LPG (b) CNG

Solution 17
(a) LPG - Liquefied Petroleum Gas.
(b) CNG - Compressed Natural Gas.

Question 18
Which of the two diffuses faster: a liquid or a gas ?

Solution 18
Gas diffuses faster.

Question 19
Which of the two diffuses slower: bromine vapour into air or copper sulphate into water?

Solution 19
Copper Sulphate into water.

Question 20
State whether the following statement is true or false :

Red-brown bromine vapour diffuse into air in a gas jar but the colourless air molecules do not diffuse bromine vapour.

Solution 20
False.

Question 21
A bottle of perfume was opened in a room. The smell of its vapours spread in the entire room. Name property of gases which is responsible for this behaviour of perfume vapours.

Solution 21

Diffusion.

Question 22
If a fish is being fried in a neighbouring home, we can smell it sitting in our own home. Name the property which brings this smell to us.

Solution 22
Diffusion.

Question 23
Name one property of liquids and gases which tells us that their molecules are moving constantly.

Solution 23
Diffusion.

Question 24
Fill in the following blanks with suitable words:

(a) The best evidence that the particles of matter are constantly moving comes from the studies of..... and .....

(b) The smell of perfume gradually spreads across a room due to ....

(C) Solid, liquid and gas are the three .... of matter.

(d) At room temperature, the forces of attraction between the particles of solid substances are .... than those which exist in the gaseous state.

(e) The arrangement of particles is less ordered in the ..... state. However, there is no order the ... state.

Solution 24
(a) Diffusion; Brownian motion.
(b) Diffusion.
(c) States.
(d) Much more.
(e) Liquid; Gaseous.

Chapter 1 - Matter in Our Surroundings Exercise 19

Question 25

State two characteristics of matter demonstrated by:

(a) diffusion

(b) Brownian motion

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.

Question 26

Name the scientist who studied the movement of pollen grains suspended in water through a microscope. What is the phenomenon known as ?

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'.

Question 27

When a crystal of potassium permanganate is placed in a beaker, its purple colour spreads throughout the water. What does thids observation tell us about the nature of potassium permanganate and water ?

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.

Question 28

When a gas jar containing air is inverted over a gas jar containing bromine vapour, the red-brown bromine vapour diffuse into air . Explain how bromine vapour diffuse into air.

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.

Question 29

Describe in your own words, what happens to the particles when salt dissolves in water.

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.

Question 30

Explain why , we can easily move our hand in air but to do the same through a plank of wood , we need a karate expert.

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.

Question 31

Give one example of the diffusion of a solid in another solid.

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.

Question 32
Explain why, the diffusion of the solid in another solid is a very slow process.

Solution 32
The diffusion between solids is a very, very slow process because the particles in solids do not move from their fixed positions.

Question 33
Which of the following diffuses fastest and which the slowest ? Solid, Liquid, Gas .Give reasons for your answer.

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.

Question 34
Explain the following:
When an incense stick is lighted in the corner of a room, its fragrance spreads quickly in the entire room.

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.

Question 35
Name the three states of matter. Give one example of each.

Solution 35
Three states of matter are:
(i) The solid state - Ice.
(ii) The liquid state - Water.
(iii) The gas state - Air.

Question 36
State two characteristic properties each of:

(a) a solid (b) a liquid (c) a gas

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.

Question 37
Why do gases have neither a fixed shape nor a fixed volume ?

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.

Question 38
How do solid, liquids and gases differ in shape and volume ?

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.

Question 39
Arrange the following substances in increasing order of force of attraction between their particles(keeping the substance having the minimum force of attraction first): Water, Sugar, Oxygen

Solution 39
Oxygen<Water<Sugar.

Question 40

Give two reason to justify that :
(a) Water is a liquid at room tempreture.
(b) An iron almirah is a solid.

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).

Question 41

(a) When an incense stick (agarbatti) is lighted in one corner of a room, its fragrance quickly spreads in the entire room.Name the process involed in this .
(b) A girl is cooking some food in the kitchen. The smell of food being cooked soon reaches her brother's room. Explain how the smell could have reaches her brother's room.

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.

Question 42

(a)what does the diffusion of gases tell us about their particles ? (b) Give one example of diffusion of gases in a liquid.

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.

Question 43

Give reason of the following observation:
The smell of hot sizzling food reaches us even from a considerable distance but to get the smell from cold food, we have to go close to 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.

Question 44

Explain how, the smell of being cooked in the kitchen reaches us even from a considerable distance.

Solution 44

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

Question 45

Explain why, when a bottle of perfume is opened in a room, we can smell it even from a considerable distance.

Solution 45

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

Question 46

When a crystal of copper sulphate is placed at the bottom of a beaker containing water, the water slowly turns blue. why ?

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.

Question 47

Honey is more viscous then water. Can you suggest why ?

Solution 47

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

Question 48

Explain why:
(a) air is used to inflate tyres.
(b) Steel is used to make railway lines.

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.

Question 49

Explain why, diffusion occurs more quickly in a gas than in a liquid.

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.

Chapter 1 - Matter in Our Surroundings Exercise 20

Question 50

(a) What is meant by 'diffusion' ? Give one example of diffusion in gases.
(b) Why do gases diffuse very fast ?
(c) Name two gases of air which dissolve in water by diffusion. What is the importance of this process in nature ?

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.

Question 51

(a) Compare the properties of solids, liquids and gases in tabular form.
(b) Give two reasons for saying that wood is a solid.

Solution 51

(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.

Question 52

(a) Why does a gas exert pressure ?
(b) Why does a gas fill a vessel completely ?
(c) Why are gases so easily compressible whereas it is almost impossible to compress a solid or a liquid ?

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).

Question 53

(a) Define matter. Give four examples of matter.
(b) What are the characteristics of matter ?

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.

Question 54

(a) What is Brownian motion? Draw a diagram to show the movement of a particle (like a pollen grain) during Brownian motion.
(b) In a beam of sunlight entering a room, we can sometimes see dust particles moving in a haphazard way in the air. Why do these dust particles move?

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.

Chapter 1 - Matter in Our Surroundings Exercise 21

Question 66

Look at the diagram on the right side. Jar A contains a red brown gas whereas jar B contains a colorless gas. The two gas jars are separated by a glass plate placed between them.
(a) What will happen when the glass plate between the two jars is pulled away?
(b) What name is given to the phenomenon which takes place?
(c) Name the brown gas which could be in jar A.
(d) Which is the colorless gas most likely to be present in jar B?
(e) Name one colored solid and one colorless liquid which can show the same phenomenon.

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.

Question 67

Bromine and air take about 15 minutes to diffuse completely but bromine diffuses into a vacuum very rapidly. Why is this so?

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.

Question 68

Bromine particles are almost twice as heavy as chlorine particles. Which gas will diffuse faster ;Bromine (vapour) or chlorine ? Explain your answer.

Solution 68

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

Question 69

Why is a liquid (the hydraulic fluid) used to operate the brakes in a car?

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.

Question 70

Explain why, a small volume of water in a kettle can fill a kitchen with steam.

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.

Question 71

Explain why, osmosis can be considered to be a special kind of diffusion. Classify the following into
(i) osmosis, and (ii) diffusion:
(a) swelling up of a raisin on keeping in water.
(b) spreading of virus on sneezing.
(c) earthworm dying on coming in contact with common salt
(d) shrinking of gases kept in thick sugar syrup
(e) preserving of pickles in salt.
(f) spreading of smell of cake being baked in the kitchen.
(g) aquatic animals using oxygen dissolved in water during respiration.

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

Chapter 1 - Matter in Our Surroundings Exercise 22

Question 72

A student placed a gas jar containing air in the upside down position over a gas jar full of red-brown bromine vapours. He observed that the red brown colour spread upwards into the jar containing air. Based on this observation, the student concluded that it is only the bromine vapor which moves up and diffuses into air in the upper jar, the air from the upper jar does not move down by diffusion into the lower jar containing bromine vapors. Do you agree with this conclusion of the student? Give reasons for your answer.

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.

Question 73

An inflated balloon full of air goes down slowly (becomes smaller and smaller slowly) even though the knot at the mouth of the balloon is airtight. And after a week all the air has escaped from the balloon. Explian how the particles got out of the balloon.

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.

Question 74

When extremly small particles X derived from the anther of a flower were suspended in a liquid Y and observed through a microscope, it was found that the particles X were moving througout the liquid Y in avery zig zag way. It is also observed that warmer the liquid Y, faster the particles X moved on its surface.

(a)What could particles X be ?
(b) Whatdo you think liquid Y is ?
(c) What is the zig-zag movement of X known as ?
(d) What is the causing the zig-zag movement of particles X ?
(e) Name the scientist who discovered this phenomenon.
(f) What does this experiment tell us about the nature of liquid Y?

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.

Question 75

When a beam of sunlight enters a room through a window, we can see tiny particles X suspended in a gas (or rather a mixture of gases) Y which are moving rapidly in a very haphazard manner.

(a) What could particles X be?
(b) Name the gas (or mixture of gases) Y.
(c) What is the phenomenon exhibited by particles X known as?
(d) What is causing the movement of particles X ?

(e) What conclusion does the existence of this phenomenon give us about the nature of matter ?

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.

Chapter 1 - Matter in Our Surroundings Exercise 36
Question 1
The boiling point of water is 100 degreeC. Express this in SI units(Kelvin Scale).

Solution 1
373 K.

Question 2
The Kelvin temperature is 270 K. What is the corresponding celsius scale temperature?

Solution 2
270 - 273 = -3^{o}C.

Question 3
Convert the temperature of 573 K to the celsius scale.

Solution 3
573 - 273 = 300^{o}C.

Question 4
Convert the temperature of 373^{o}C to the Kelvin scale.

Solution 4
373 + 273 = 646 K.

Question 5
The boiling point of alcohol is 78^{o}C. What is the temperature of Kelvin scale ?

Solution 5
273 + 78 = 351 K.

Question 6
The Kelvin scale temperature is 0 K . What is the corresponding Celsius scale temperature?

Solution 6
$-273^{o}C$

Question 7
Give the usual name for the following:
Heat required to change the state of a substance without changing the temperature.

Solution 7
Latent heat.

Question 8
What is the (a) common unit of temperature, and (b) SI unit of temperature ?

Solution 8
(a) Degree Celsius - ^{o}C
(b) Kelvin - K.

Question 9
Write the relation between Kelvin scale and Celsius scale of temperature.

Solution 9
Temp. on Kelvin scale = Temp. on Celsius scale + 273

Question 10
What should be added to a Celsius scale reading so as to obtain the corresponding Kelvin scale reading so as to obtain the corresponding Kelvin scale reading ?

Solution 10
273.

Question 11

What is meant by saying that the latent heat of fusion of ice is 3.34×10^5 J/kg ?

Solution 11

It means that 3.34×10^5 J of heat has to be supplied to change 1 Kg of ice (at its melting point, 0^oC) into water at the same temperature of 0^oC.

Question 12

What is meant by saying that the latent heat of fusion of vaporisation of water is 22.5×10^5 J/kg?

Solution 12

It means that 22.5×10^5 J of heat is required to change 1 Kg of water (at its boiling point, 100^oC) into steam at the same temperature of 100^oC.

Question 13

Name the temperature at which (a) liquid changes into a gas (b) a solid changes into a liquid.

Solution 13

(a) Boiling point.
(b) Melting point.

Question 14

Name one common substance which can be easily changed from one state to another by heating or cooling.

Solution 14

Water.

Question 15

What is the name of the process in which:
(a) a solid turns directly into a gas ? (b) a gas turns directly into solid ?

Solution 15

(a) Sublimation.
(b) Sublimation.

Question 16

Name one property which is shown by ammonium chloride but not by sodium chloride.

Solution 16
Sublimation.

Question 17
What is the nameof the process due to which dry ice changes into carbon dioxide gas?

Solution 17
Sublimation.

Question 18
What is the common name of the solid carbon dioxide ?

Solution 18
Dry ice.

Question 19
Why is solid carbon dioxide known as 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.

Question 20
State one condition necessary to liquefy gases(other than applying high pressure).

Solution 20
Lowering temperature (or cooling)

Question 21
State whether the following statement is true of false:
Solid carbon dioxide is stored under low pressure.

Solution 21
False.

Question 22
What is the chemical name of dry ice ?

Solution 22

Carbon dioxide (solid).

Question 23

Fill in the following blanks with sutaible words:
(a) Gases can be liquefied by applying _____ and lowering _____.
(b) When steam condenses to form water, heat is _____.
(c) Temp on Kelvin scale = Temp on Celsius scale + _____.
(d) Scientists say that there are actually five states of matter: solid, liquid, gas, ____ and _____.
(e) The state of matter called _____ makes a fluorescent tube (or neon sign bulb) to glow.

Solution 23

(a) Pressure; temperature.
(b) Released.
(c) 273.
(d) Plasma; Bose-Einstein Condensate (BEC).
(e) Plasma

Question 24

What do you understand by the term 'latent heat' ? What are the two types of latent heat ?

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.

Question 25

Why is heat energy needed to melt a solid ? What is this heat energy called ?

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.

Question 26

Under what conditions heat can be given to a substance without raising its tempreture ?

Solution 26

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

Chapter 1 - Matter in Our Surroundings Exercise 37

Question 27

Why does the temperature remain constant during the melting of ice even though heat is supply continuosly ?

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.

Question 28

Why does the temperature remain constant during the boiling of water even though heat is supply continuosly?

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.

Question 29

Explain why, ice at 0^oC is more effective in cooling than water in the same temperature.

Solution 29

This is due to the fact that for melting, each kilogram of ice takes its latent heat of 3.34×10^5 joules from the substance and

hence cools the substance more effectively. On the other hand, water at 0^o cannot take any such latent heat from the substance.

Question 30

Would you cool a bucket of water more quickly by placing it on ice or by placing ice in it? Give reasons for your answer.

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.

Question 31

Why does steam cause more severe burns than boiling 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 22.5×10^5 Joules per kilogram more heat than boiling water.

Question 32

Which contains more heat, 1 kg of ice at 0^oC or 1 kg of water at 0^oC? Give reason for your answer.

Solution 32

The latent heat of fusion of ice is 3.34×10^5 J/Kg. It means that 3.34×10^5 joules of heat is required to change 1 Kg of ice at its melting point of 0^oC into water at the same temperature (of 0^oC). This means that 1 Kg of ice at 0^oC has 3.34×10^5 joules of less heat than 1 kg of water at the same temperature of 0^oC.

Question 33

Which contains more heat, 1 kg of water at 100^oCor 1 kg of steam at 100^oC? Give reason for your answer.

Solution 33

1 Kg of steam at 100^{o}C 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.

Question 34

Explain why, steam at 100^{o}C is better for heating purposes than boiling water at 100^{o}C.

Solution 34

It is because of the fact that steam at 100^{o}C contains more heat, in the form of latent heat, than boiling water at 100^{o}C. Hence, steam would give out 22.5 x 10^5 joules per kilogram more heat than boiling water.

Question 35

Which produce more severe burns: boiling water or steam? Why?

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 10^5 joules per kilogram more heat than boiling water.

Question 36

Why does the temperature of a substance remain constant during the change of state?

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.

Question 37

What is the physical state of water :

(a) at 0^{o}C? (b) at 25^{o}C ? (c) at 100^{o}C ? (d) at 250^{o}C ?

Solution 37

(a) Either solid (as ice) or liquid as 0^oC 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 100^oC is the boiling point of water as well as the condensation temperature of steam.
(d) Gas.

Question 38
Explain why, there is no rise in temperature of a substance when it undergoes a change of state though heat is supplied continuously.

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.

Question 39
Define 'melting point' of a substance ? What is the melting point of ice ?

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 0^oC.

Question 40
Define 'boiling point' of a substance? What is the boiling point of water?

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 100^oC.

Question 41
Define the following terms:

(a) Melting (b) Boiling

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.

Question 42
Define the following terms:

(a) condensation (b) freezing

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.

Question 43
Explain why, naphthalene balls kept in stored clothes in our homes disappear over a period of time.

Solution 43
This happens because naphthalene balls undergo sublimation. The naphthalene balls keep on forming naphthalene vapours slowly which disappear into the air.

Question 44
Explain briefly, how gases can be liquefed?

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.

Question 45
How is ammonia gas liquefied ?

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.

Question 46
How does applying pressure (or compression) help in a liquefaction of a 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.

Question 47
How does the perspiration or sweating help keep our body cool on a hot day ?

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.

Question 48
Why does all the water on the earth not get evaporated during hot summer days?

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.

Question 49
If the back of your hand is moistened with alcohol, you will find that it rapidly becomes dry? Why is it that while it is drying, your hand feels cool?

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.

Question 50
Why does the desert cooler cool better on a hot, dry day ?

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.

Question 51
How does the water kept in an earthen pot (matka) become cold during summer?

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.

Question 52
What type of clothes should we wear in summer? why?

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.

Question 53
Why are we able to sip hot tea or milk faster from a saucer rather than from a cup?

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.

Question 54
Why does our palm feel cold when we put some acetone (or perfume) on it ?

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.

Question 55
How will you demonstrate that water vapour is present in air ?

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,

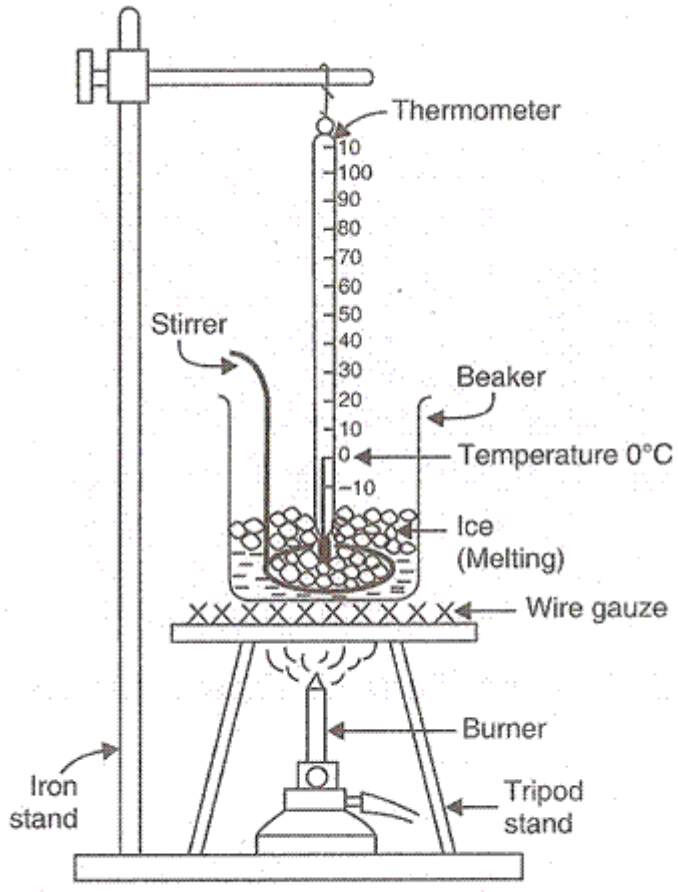
outside surface of steel tumbler, they condense to form tiny drops of liquid.

Question 56

(a) Define the term 'latent heat of fusion' of a solid. How much is the latent heat of fusion of ice?
(b) Draw a labelled diagram of the experimental set-up to study the latent heat of fusion of ice.

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 3.34×10^5 J/Kg.
(b)



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

Question 57

(a) Define the term 'latent heat of vapourisation' of a liquid. What is the value of the latent heat of the vaporisation of water?
(b) Draw a labelled diagram of the experimental set-up to study the latent heat of vaporisation of water.

Solution 57

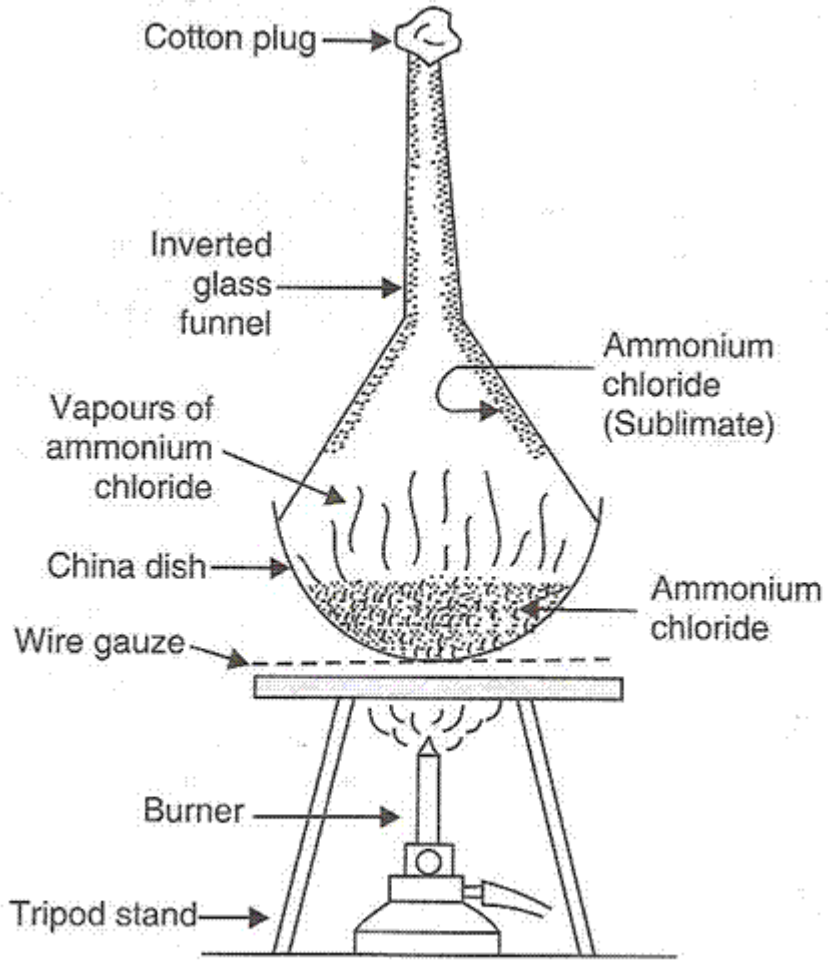
(a) The latent heat of vaporization of a liquid is the quantity of heat in joules required to convert 1 Kg of the liquid (at its boiling point) to vapour or gas without any change in temperature. The latent heat of vaporization of water is 22.5×10^5 J/Kg.
(b)

Question 58

(a) What is sublimation? Name two substances (other than ammonium chloride) which undergo sublimation.
(b) Draw a labelled diagram of the experimental set-up to demonstrate the subimation of ammonium chloride.

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.

Question 59

(a) What are the two ways in which the physical states of matter can be changed ?

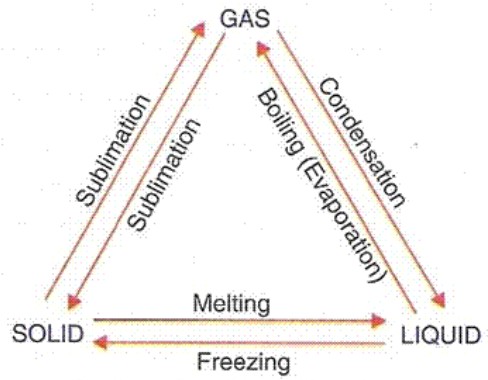
(b) Draw the 'states of matter triangle' to show the interconversion of states of matter.

(c) How can the evporation of a liquid be made faster ?

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.

(c) The rate of evaporation of a liquid can be made faster by (i) Increasing the temperature (ii) Increasing the surface area of the liquid (iii) Lowering humidity and (iv) increasing wind speed.

Question 60

(a) What is evaporation? State the various factors which affect evaporation.
(b) Why does evaporation cool a liquid?

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.

Chapter 1 - Matter in Our Surroundings Exercise 39

Question 81

There are four substances W,X,Y, and Z. tha substanc W is a dark violet solid having diatomic molecues. A solution of W in alcohol is used as a common antiseptic C.The substance X is a white solid which is usally recovered from sea water on a large

scale.The substance Y is a white solid which is insoluble in water and used in form in small balls for the safe storage of wollen clothes. The substance Z is a yet another white solid which is used in making commonly used dry cells.

(a) Name (i) W (ii) X (iii) Y (iv) Z.

(b) Out of W,X,Y and Z, which substance/ substances can undergo sublimation ?

(c) Which substance is organic in nature?

(d) What is the name of substance C?

(e) Which substance belongs to the halogen family?

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.

Question 82

The substance X normally exists in a physical state which can flow easily but does not fill its vessel completely. It also turns anhydrous copper sulphate blue. When substance X is cooled excessively, it changes into a substance Y which has a fixed shape as well as a fixed volume. If however, the substance X is heated strongly, it chamges into a substance Z which has neither a fixed shape nor a fixed volume.

(a) Name the substances (i) X (ii) Y and (iii) Z.
(b) What is the process of conversion of X into Y known as ?
(c) At which temperature X gets converted into Y ?
(d) What is the process of conversion of X into Z known as ?
(e) At which temperature X gets converted into Z ?

Solution 82

(a) (i) Water (ii) Ice (iii) Steam.
(b) Freezing.
(c) 0^oC.
(d) Boiling (or vaporisation).
(e) 100^oC

Question 83

The scientists now say that there are actully five states of matter A,B, C, D and E. The state A has a fixed volume but no fixed shape. The state B can be compressed very easily by applying pressure and state C has a fixed shape as well as a fixed volume. The state D is a mixture of free electrons and ions whereas state E is named after an Indian scientist and a famous physicist.

(a) Name the physical states (i) A (ii)B (iii) C (iv) D and (v) E.

(b) Name one substance belonging to state C which can directly change into vapours on heating. What is this process known as ?

(c) Name one substance which normally belongs to state B but whose solid from changes directly into gaseous state.

(d) Name the most comman substance belonging to state A.

(e) Which state of matter makes the sun and other stars to glow?

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).

Question 84

When water is cooled to a temperature x, its get converted into ice at temperature x by a process called P. And when ice at temperature x is warmed, it gets reconverted into water at same temperature x in a process called Q.

(a) What is the value of the temperature x in Kelvin ?
(b) What is the process P known as ?
(c) What is the name of energy released during process P ?
(d) What is the process Q known as ?
(e) What is the name of energy absorbed during process Q ?

Solution 84

(a) 273 K.
(b) Freezing.
(c) Latent heat of freezing.
(d) Melting.
(e) Latent heat of fusion.

Chapter 1 - Matter in Our Surroundings Exercise 40

Question 85

When water is heated to a temperature x, it gets converted into steam at temperature x by a process called R. And when steam at temperature x is cooled, it gets reconverted into water at same temperature x by a process called S.
(a) How much is the value of x in Kelvin ?
(b) What is the process R called ?
(c) What is the name of the energy absorbed during the process R ?
(d) What is process S known as ?
(e) What is the name of energy released during the process S known as ?

Solution 85

(a) 373 K.
(b) Boiling (or vaporisation).
(c) Latent heat of vaporisation.
(d) Condensation.
(e) Latent heat of condensation.