4. Matter around us

Exercise-1 Multiple Choice Questions

1. Question

The physical state of water at 373 K is _____

A. Solid

B. liquid

C. vapour

D. plasma

Answer

373K is equivalent to 100°C in celsius scale which is the boiling point of water so water takes in the latent heat of vaporisation at 373K and converts itself to gas(vapour) state.

2. Question

Among the following _____ is a mixture

A. Common Salt

B. Juice

C. Carbon dioxide

D. Pure Silver

Answer

Common salt, carbon dioxide and Pure silver are pure substances while juice is mixture of water, sugar, fruits and other ingredients. Another way of identifying is that, mixture do not have any formula, here we see that juice does not have any fixed formula while others have.

3. Question

When we mix a drop of ink in water we get a _____

A. Heterogeneous Mixture

B. Homogeneous Mixture

C. Compound

D. Suspension

Answer

Ink does not dissolve into water uniformly and mixture has different composition at different point.

4. Question

The constituents that form a mixture are also called

A. Elements

B. Compounds

C. Alloys

D. Components

Answer

The constituents of the mixture are also known as components of the mixture.

5. Question

_____ has the same properties throughout the sample

A. Pure substance

B. Mixture

C. Colloid

D. Suspension

Answer

Apart from pure substances, others have different ratio of elements as we move across that thing so they have different properties at different position while pure substances have same composition everywhere.

Exercise-1 True or False

1. Question

State whether the following statements are true or false. If false give the correct statement

(a) Liquids expand more than gases on heating.

(b) A compound cannot be broken into simpler substances chemically.

(c) Water has a definite boiling point and freezing point.

(d) Buttermilk is an example of heterogeneous mixture.

e) Aspirin is composed of 60% Carbon, 4.5% Hydrogen and 35.5% Oxygen by mass. Aspirin is a mixture.

Answer

(a) False

Gases expand more than liquid on heating since they have more intermolecular space as compared to liquid so on heating the molecules in gases gets more space to increase in size as compared to molecules in liquid.

(b) False

Compound breaks down into simpler substance during chemical change such as when heat is supplied to calcium carbonate which is compound breaks down into simpler substances which are the constituents of it.

$$CaCO_3 \xrightarrow[(heat)]{} CaO + CO_2$$

(c) False

The boiling point of water depends upon the surrounding pressure since at boiling point, vapour pressure of the gas coming out of the liquid equals the pressure on it because of environment. So as we move up, pressure drops as a result boiling point decreases similar is the case with melting point.

(d) True

Butter and milk are immiscible into one another and a layer of butter can be seen clearly at the top.

(e) False

Aspirin is composed of 60% Carbon, 4.5% Hydrogen and 35.5% Oxygen by mass. Aspirin is a compound.

Aspirin has fixed proportion of carbon, hydrogen and oxygen combined in the ratio of their mass. So it has fixed formula and hence it cannot be mixture as mixture has no formula.

Exercise-1 Match the Following

1. Question

Match the following:

S. No	A	B
i	Element	Settles down on standing
ii	Compound	Impure substance
iii	Colloid	Made up of molecules
iv	Suspension	Pure substance
v	Mixture	Made up of atoms

Answer

i) Element –Pure substance

ii) Compound - Made up of atoms

iii) colloid – made up of molecules

iv) Suspensions - Settles down on standing

v) Mixture - Impure substance

Exercise-1 Fill In the Blanks

1. Question

Evaporation is always accompanied by_____ in temperature

Answer

Evaporation is always accompanied by decrease in temperature.

2. Question

150°C =_____ K

Answer

150°C = 423K

3. Question

A _____mixture has no distinguishable boundary between its components.

Answer

A Homogeneous mixture has no distinguishable boundary between its components.

4. Question

An example of a substance that sublimes is _____

Answer

An example of a substance that sublimes is camphor.

5. Question

Latent heat is the energy used for _____.

Answer

Latent heat is the energy used for changing state of the substance.

Exercise-1 Very Short Answer Type

1. Question

Why is it possible to row a boat in water but not pass through a wooden fence?

Answer

It is possible to row a boat in water as it has some spaces between its molecules so when we place boat over water, it displaces some amount of water and water displaced provides it necessary buoyant force.

Wooden fence is solid in state and has no space so it is impossible to pass through it.

2. Question

How gaseous pressure arises?

Answer

We know that gases have large amount of intermolecular spaces and they move freely in random direction so when we fill any container with gas then the gas molecules collides with the wall of the container and apply some force on the wall of the container and in this way gases exert pressure on the container.

3. Question

Define Sublimation.

Answer

Sublimation is the process in which solid directly changes to its gaseous state upon heating without passing through its liquid state.

4. Question

Which state of matter has the highest kinetic energy?

Answer

Gaseous/Vapour state has the highest kinetic energy since in this state the intermolecular space is more and molecules have lots of space to move and since kinetic energy is due to the movement/motion of the particles, hence it has highest kinetic energy.

5. Question

A few drops of ‘Dettol’ when added to water the mixture turns turbid. Why?

Answer

Turbid means Cloudiness. Dettol and water are immiscible with one another and form emulsion so when we mix them dettol particles get suspended in water and scatter white light . Therefore it appears turbid.

Exercise-1 Short Answer Type

1. Question

Why are gases easily compressible whereas solids are incompressible?

Answer

Gases are easily compressible since they have lot of spaces between its molecules (intermolecular space) so when we apply pressure during compressing, the molecules gets room to move from its original position while in case of solids, molecules are very close to each other and have almost no intermolecular space to move when we apply pressure on them.

2. Question

Hold a ‘smiley ball’ and squeeze it. Can you compress it? Justify your answer?

Answer

Yes, we can compress it. We know that smiley ball is solid in state yet it can be compressed since it has tiny pores in it, in which air resides so when we squeeze it, air is driven out and in this way we are able to compress it.

3. Question

Which of the following are pure substances? Ice, Milk, Iron, Hydrochloric acid, Mercury, Brick and Water.

Answer

Hydrochloric acid, mercury, Ice, Iron and Water are pure substances since they are made up of one or more than one atom of its kind. Also they have their fixed formula while in case of milk (mixture of butter, milk and other ingredients) and brick (mixture of clay, sand etc), they are made by mixing ingredients whose ratio is not fixed. Also they do not have fixed chemical formula.

4. Question

Oxygen is very essential for us to live. It forms 21% of air by volume. Is it an element or compound?

Answer

An element has fixed symbol and is made up of only one atom of its kind. Since Oxygen has fixed symbol (O_2) and is made up of only one atom of its kind (2 O merge together to form oxygen) it is an example of element.

5. Question

You have just won a medal made of 22-carat gold. Have you just procured a pure substance or impure substance?

Answer

It is an impure substance since the purity of gold is measured in terms of carat. 24 carat is the pure form of gold so 22 carat gold = (22/24) ×100 = is 91.66 % pure only. It is actually alloy of gold, silver and nickel.

Exercise-1 Long Answer Type

1. Question

Write the differences between elements and compounds and give an example for each.

Answer

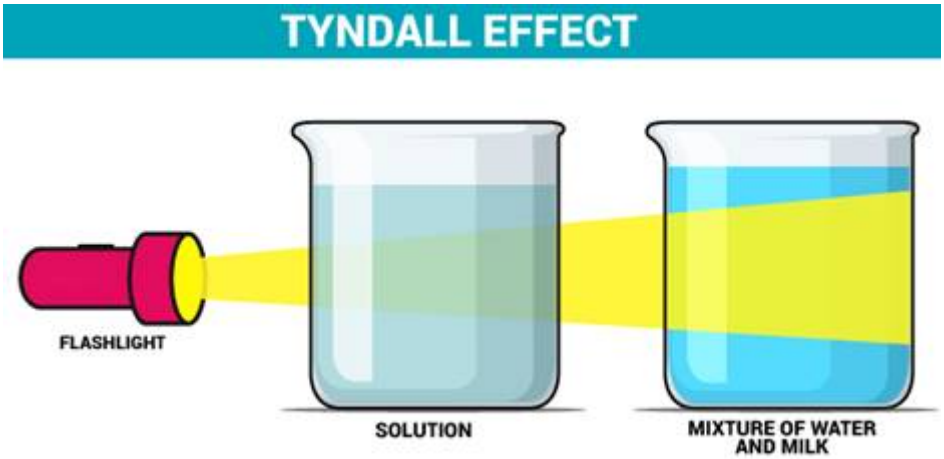
Elements	Compounds
Made up of atoms.	Made up of molecules.
It cannot be disintegrated further into fine particles by any chemical method.	It can be reduced down to simpler substance by using chemical method.
It shows same properties as that of constituent particle.	Its properties are totally different from its constituents.
E.g Oxygen, Hydrogen etc	E.g Water (compound) is made up of oxygen and hydrogen.

2. Question

Explain Tyndall effect and Brownian movement with suitable diagram.

Answer

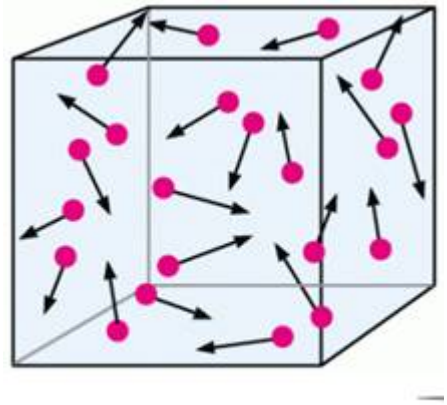
Tyndall effect : It is the effect in which the light is scattered due to colloidal particles in its path as a result path of light becomes visible.



In the figure shown above, the first solution is plain water which does not exhibit Tyndall effect while the second one is a colloidal solution which shows Tyndall effect as the path inside it becomes visible due to scattering of the light by the colloidal particle.

Brownian Motion: Upon dropping some tiny particles in the fluid and observing it with a microscope, we see the zig-zag movement of the particles which occurs due to the collision with the particles of the fluid. This phenomenon is known as

Brownian movement of the particles. Below figure depicts the erratic movement of the particles inside the fluid.



Brownian Movement

3. Question

How are homogenous solutions different from heterogeneous solution? Explain with examples.

Answer

Homogenous Solution	Heterogeneous solution
Visible through microscope but can't be seen from naked eyes.	Can be seen through both naked eyes and microscope.
They have single phase since constituents are uniformly mixed.	More than one different phase since constituents are not uniformly mixed.
They are further categorised into alloys and true solution.	They are further divided into suspensions and colloids.
E.g sugar solution	E.g Muddy water

Exercise-1 Get Together and do

1. Question

Project

Make a model to demonstrate any characteristic property of particles in a solid, liquid and gas.

Answer

Model described below describes one of the important characteristics of the particles in a solid, liquid and gas.

Steps :

a) Take a beaker filled with more than half of water.

b) Put some copper sulphate at the bottom of the beaker.

c) Keep it for some time.

Observation :

After few minutes, we notice that whole solution turned blue.

Reason :

Initially, copper sulphate was placed at the bottom of the beaker. Particles of the copper sulphate start moving randomly in all direction and collide with the water particles since water particles are colourless and copper sulphate is blue in color so the particles of the copper sulphate imparts blue color to the whole solution.

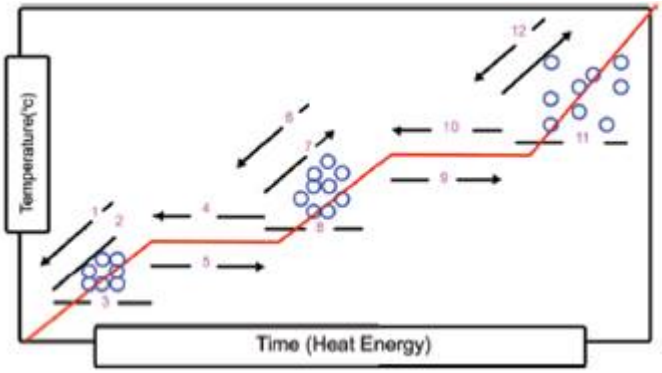
Conclusion:

Particles of solid, liquid and gas are constantly moving.

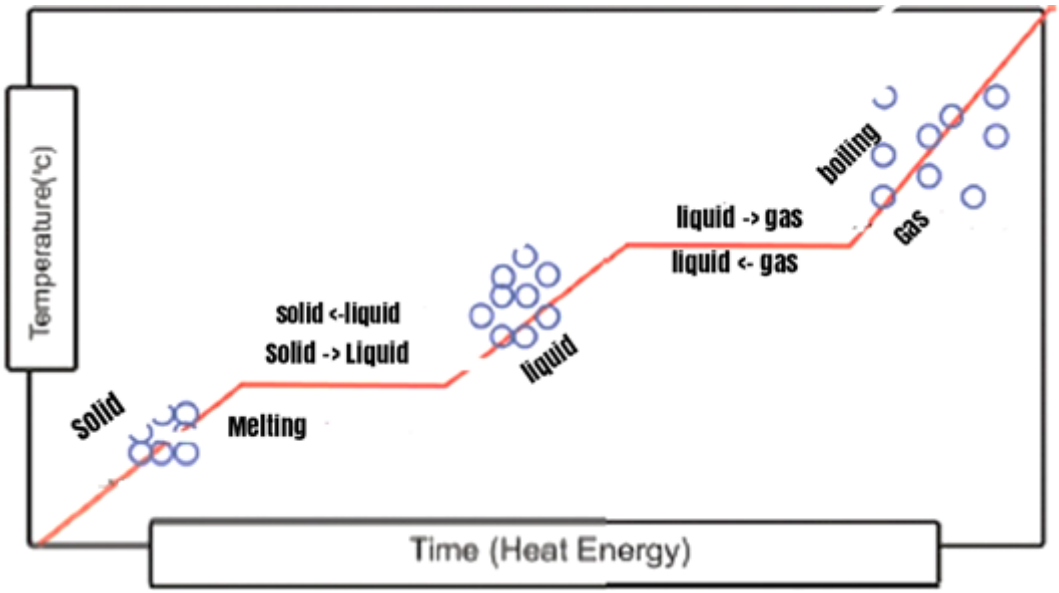
Exercise-1 Hots

1. Question

Fill in the numbered blanks to make the heating curve meaningful.



Answer



1. Question

'Shake well before use'. This is the instruction on a bottle of medicine. What kind of a mixture is contained in the bottle? Give reason.

Answer

Bottle of the medicine such as cough syrup is colloidal mixture that comes under category of emulsion in which liquids immiscible with one another are taken together.

It is advised to shake the contents of the bottle as particles inside the bottle settle down after sometime so in order to mix well the particle thoroughly so that its composition becomes same throughout.

2. Question

What produces more severe burns, boiling water or steam? Why?

Answer

Steam produces more severe burns as compared to boiling water.

Reason: We know that water boils at 100°C and for converting to steam at 100°C it takes the latent heat of vaporization so steam has more heat than boiling water which is the latent heat which causes more severe burns than boiling water.

Exercise-2 Multiple Choice Questions

1. Question

The difference in _____ is the principle used in fractional distillation

A. solubility

B. melting point

C. boiling point

D. adsorption

Answer

.

2. Question

The separation of denser particles from lighter particles done by rotation at high speed is called _____

A. Filtration

B. sedimentation

C. decantation

D. centrifugation

Answer

.

3. Question

_____ is essential to perform separation by solvent extraction method.

A. Separating funnel

B. centrifuge machine

C. filter paper

D. sieve

Answer

.

4. Question

Filtration method is effective in separating _____ mixture

A. Solid-solid

B. solid-liquid

C. liquid-liquid

D. liquid-gas

Answer

.

5. Question

For a simple distillation process, we need to have

A. an evaporating dish.

B. a separating funnel.

C. a filter with filter paper.

D. a Liebig condenser.

Answer

.

Exercise-2 True or False

1. Question

Butter from curd can be separated by centrifugation.

Answer

False

Butter from milk can be separated by centrifugation.

2. Question

Oil and water are immiscible in each other.

Answer

True

3. Question

Sublimation is the property of a substance to directly change from liquid to solid state.

Answer

True

4. Question

Liquid-liquid colloids are called gels.

Answer

False

Liquid – liquid colloids are called emulsions.

5. Question

Fractional distillation is used when the boiling point of the components have large difference

Answer

True

Exercise-2 Match the Following

1. Question

Match the following:

	A	B	C
i	Sand and camphor	Ink	Distillation
ii	Acetone and water	Miscible liquids	Chromatography
iii	Pigments	Immiscible liquids	Separating funnel
iv	Salt and water	Mixture of two solids	Fractional distillation
v	Water and kerosene	Soluble	Sublimation

Answer

A	B	C
Sand and camphor	Mixture of two solids	Sublimation
Acetone and water	Miscible liquids	Fractional distillation
Pigments	Ink	Chromatography
Salt and water	Soluble	Distillation
Water and kerosene	Immiscible liquids	Separating funnel

Exercise-2 Fill In the Blanks

1. Question

Alcohol can be separated from water by _____

Answer

Alcohol can be separated from water by Fractional Distillation.

2. Question

Sand is removed from naphthalene by _____ method.

Answer

Sand is removed from naphthalene by a Sublimation method.

3. Question

In petroleum refining, the method of separation used is _____

Answer

In petroleum refining, the method of separation used is Fractional distillation.

4. Question

Chromatography is based on the principle of _____

Answer

Chromatography is based on the principle of different solubility of the solute in the same solvent.

5. Question

The solubility of solid in water _____ with an increase in temperature

Answer

The solubility of solid in water increases with an increase in temperature.

Exercise-2 Very Short Answer Type

1. Question

Name the method you would adopt to separate a mixture of ammonium chloride and common salt.

Answer

Using the process of sublimation we can separate mixture of ammonium chloride and common salt since ammonium chloride sublimes on heating and changes to its vapour form while common salt does not.

2. Question

Define a solute and a solvent.

Answer

Solute: Substance (solid, liquid and gas) which is dissolved in another substance is known as solute.

Solvent: The substance on which solute is dissolved is solvent.

E.g in the salt solution, salt is solute and water is solvent and together they make solution.

3. Question

Name the sublimate that you will be getting when you heat a mixture of

i. Iodine and sand

ii. Sodium chloride and ammonium chloride.

Answer

i) Iodine since it sublimes and changes to its vapour state on heating which then can be cooled to again get back the iodine.

ii) Ammonium chloride since it t sublimes and changes to its vapour state on heating which then can be cooled to again get back the Ammonium chloride.

4. Question

What is meant by desalination of sea water?

Answer

Desalination of sea water implies taking out salt and other vital minerals from sea water.

Exercise-2 Short Answer Type

1. Question

What is an adsorbate and adsorbent?

Answer

Adsorbate: Substance which get adsorbed (atoms or ions of the substance get attached to other surface by adhesive force) on the adsorbent.

Adsorbent: Substance on whose surface substance gets adsorbed. Its concentration is high.

2. Question

What is meant by Rf value?

Answer

Rf is known as Retardation factor. It is helpful in chromatography.

Rf = Distance moved by the solute/Distance moved by the solvent.

Here distances are measured from the common origin.

3. Question

Differentiate between filtrate and distillate.

Answer

Filtrate	Distillate
The solution obtained after passing the mixture through filter paper during the process of filtration. It can pass through filter paper.	It is obtained by heating the liquid and then cooling back the vapours.
E.g) When we separate chalk and water we get water as filtrate.	E.g) When we separate salt and water then we get water as distillate.

4. Question

Name the apparatus that you will use to separate the components of mixtures containing two,

i. miscible liquids, ii. immiscible liquids.

Answer

i) For separating miscible liquids we use fractional distillation method in which we use fractionating column (long vertical glass tube) and distillation flask.

ii) For separating immiscible liquids we use separating funnel (funnel with stop cock at its top)

5. Question

How will you separate a mixture containing saw dust, naphthalene and iron filings?

Answer

Mixture containing saw dust, napthalene and iron filling can be separated as follows :

a) We bring magnet near the mixture as a result iron filling get attracted to it and we are left with saw dust and napthalene.

b) Now we adopt the process of sublimation and heat the given mixture gently then napthalene sublimes which then can be collected by cooling and

sand dust is left behind.

Exercise-2 Long Answer Type

1 A. Question

How is a mixture of common salt, oil and water separated? You can use a combination of different methods.

Answer

Common salt has polar nature (actually ionic) and water is a polar solvent whereas oil is non-polar so salt gets dissolved only with water. (Like dissolves like)

a) We know that oil and water are immiscible liquids and salt is dissolved only in water so we make use of separating funnel. Water along with dissolved salt is present in the lower layer while oil forms the upper layer. On opening the stop-cock, water runs out while oil remains which can then be removed.

b) Now, water boils at 100°C while common salt doesn't so they can easily be separated with boiling or vaporisation technique.

1 B. Question

Group activity (group of four): Use your research skills (including the Internet) to find out what is forensic science and obtain information about the use of chromatography in forensic science.

Answer

Forensic science is the way of utilising science in catching the criminals in our society.

Application of chromatography in forensic science:

a) The blood samples that are recovered from the crime scene.

b) chromatography is used to analyze the explosive material.

c) It is helpful to analyze whether content written is using the same ink or different ink.

d) It is used to catch the suspect of stealing the money by mixing the money with the dye and then analyzing it using chromatography.

1 C. Question

Field Trip: Visit a milk dairy and note down the at least two separating techniques used there.

Answer

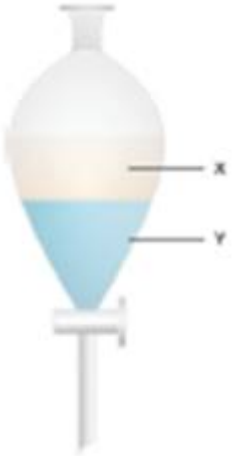
Two separating techniques used there are

a) Centrifugation : To obtain cream from raw milk. A rotating machine knowns as centrifuge is used.

b) **Evaporation :** After getting raw milk from farmers, it is evaporated so as to get its condensed form which is then mixed with small amount of sugar and packed in can.

Exercise-2 Hots

1. Question



Two immiscible liquids are taken in the above funnel for separation. Which is denser, X or Y? Suggest any one example for X and one for Y. A third liquid Z which is soluble only in Y is added to the mixture and contents in the funnel are shaken well. How many layers will you observe now? How will you separate the three liquids? Boiling point of X is 98° C, that of Y is 43° C and that of Z is 75° C.

Answer

Y is denser. One example for X is kerosene and one example for Y is water. Third liquid Z is alcohol (ethanol) which is soluble in water. We will observe two layers.

Now we will employ the process of fractional distillation since every liquid has different boiling point.

Upon taking them in fractionating column, first the liquid with least boiling point will evaporate and will be collected as pure compound and then the next one and in this we can separate all three liquids.

2. Question

The most appropriate labelling of X and Y in a filtration set up are

	X	Y
a.	precipitate	solvent
b.	solvent	solute
c.	residue	filtrate
d.	filtrate	residue

Answer

C

In the process of filtration we separate solids from the liquids in which they are insoluble. So the components that is unable to pass funnel is residue while one that has successfully passed is filtrate.