Separation Techniques Chemistry Questions with Solutions

Q1. A mixture of iron and copper fillings can be separated by which of the following method?

a.) Magnetic separation
b.) Crystallization
c.) Evaporation
d.) Distillation

Correct Answer – (a.) Magnetic separation

Q2. Which of the following is a method of separation used to separate a mixture that comprises solutes that dissolve in the same solvent?

a.) Evaporation
b.) Filteration
c.) Chromatography
d.) Sublimation

Correct Answer – (c.) Chromatography.

Q3. A mixture of oil and water is separated by ____.

a.) Separating funnel
b.) Evaporation
c.) Decantation
d.) Filteration

Correct Answer – (a.) Separating funnel.

Q4. Which method of separation will be used to separate butter from curd?

a.) Sublimation
b.) Chromatography
c.) Centrifugation
d.) All of the above

Correct Answer – (c.) Centrifugation.

Q5. The process in which the heavier impurities settle at the bottom is ____.

a.) Decantation

b.) Sedimentation
c.) Filteration
d.) Evaporation

Correct Answer – (b.) Sedimentation.

Q6. What are physical methods of separation?

Answer: Methods that use differences in physical properties to separate the components of a mixture, such as handpicking, threshing, winnowing, sieving, evaporation, distillation, filtration, and chromatography, can be used to physically separate the components of a mixture.

Q7. List the methods of separation that can be used to separate the mixtures of solids and liquids.

Answer: The methods of separation used to separate the mixtures of solids and liquids.

- Filtration
- Crystallization
- Centrifugation
- Chromatography
- Evaporation
- Distillation

Q8. Which separation method would be most effective on the following mixtures:
a.) Vinegar (acetic acid (liquid) solution in water).
b.) Tea with loose tea leaves.
c.) Solid copper sulphate in water.

Answer:
a.) Vinegar (acetic acid (liquid) solution in water) – Distillation.
b.) Tea with loose tea leaves – Filtration.
c.) Solid copper sulphate in water – Evaporation.

Q9. What is the difference between distillation and fractional distillation?

Answer: The difference between distillation and fractional distillation are as follows:

Distillation	Fractional Distillation
Distillation is a method of separating liquids with differences in boiling points of more than 25℃.	Fractional distillation is a method of separating liquids with differences in the boiling point of less than 25℃.
A simple apparatus with two simple flasks and a condenser is required for the experiment.	A complex apparatus with a fractioning column is required for the experiment.

Every step of the vaporization-condensation process is recognised as simple distillation.	Multiple simple distillation processes with low losses are carried out in a fractional distillation apparatus.
The distillation method, for example, can be used to separate water from seawater.	The fractional distillation method, for example, can separate an ethanol-water mixture.

Q10. Describe the method to separate a mixture of sand and salt.

Answer: We can separate the mixture of salt and sand by using the method of filtration, evaporation and condensation.
The steps to separate the mixture are as follows:

- Keep the sand and salt mixture in a beaker and add some water to it.
- Leave the beaker aside for a while. The sand will settle at the bottom, and salt will dissolve in the water.
- The water on top can be poured into a different beaker, and the sand can be separated by filtration.
- Heat the beaker containing salt water for a few minutes.
- The vapours can be collected and condensed, giving us salt crystals.

Q11. Which method is used to separate the mixture of camphor and sand?

Answer: Camphor is a sublime substance, whereas sand is not. Therefore, the mixture of camphor and sand can be separated by using the method of sublimation.
The process involves slowly heating the mixture where the sand will remain in the container, but camphor will vaporise. The camphor vapours are then collected and condensed where the solid camphor crystallises.

Q12. Which method can be used to separate a mixture of two solids?

Answer: All mixtures of two solid substances can be separated using:

- Using a suitable solvent
- Through sublimation
- Using a magnet

i.) Using a suitable solvent:
One constituent of a mixture is soluble in a specific liquid solvent, while the other is insoluble. Differences in the solubilities of a mixture's constituents can be used to separate them.
ii.) Through Sublimation:
Sublimation is the process of conversion of a solid state into vapours on heating and vapours into solids on cooling. The solid substance that sublimates is known as sublime. Sublimate is the solid substance formed by cooling the vapours.
Sublimation is a process that separates substances from a mixture that sublimes due to heating.
iii.) Using a magnet:

A magnet can be used to separate a mixture that contains iron as one of its constituents.

Q13. Write a short note on the following:
a.) Centrifugation
b.) Sedimentation and decantation

Answer:
a.) Centrifugation – This method is used to separate out tiny solid particles that normally pass through filter paper, and thus the separation of these insoluble particles is accomplished through centrifugation. The centrifugation process is determined by particle shape and size, medium viscosity, and rotational speed. We can separate butter from cream using this method. We use a centrifuge, which includes a centrifuge tube holder that holds an equal amount of solid-liquid mixture. When the rotor is rotated, the denser insoluble particles separate from the liquid and settle at the bottom of the tube, while the liquid collects at the top due to centrifugal force.

b.) Sedimentation and decantation – Sedimentation is defined as the process by which solids are separated from liquids. All of the solids settle to the bottom of the beaker, leaving a clear layer of liquid on top. Sedimentation is the process by which heavier impurities in a liquid, typically water, settle to the bottom of the container containing the mixture. It takes some time to complete the process.
Example– This method is used by water treatment plants to filter out unwanted particles from dirty water.
Decantation is defined as a separation process that separates two immiscible liquids. Pour out the clear upper layer of liquid to accomplish this. Decantation is the separation of an oil mixture from water.
Example – This method separates two non-mixing liquids, such as oil and water.

Q14. How can you separate two immiscible liquids?

Answer: Two immiscible liquids can be separated by the separating funnel method. The mechanism involves taking advantage of the particles' unequal density in the mixture. Using this technique, oil and water can be easily separated. The two liquids are placed in the funnel and allowed to settle out and form two layers for a short period of time. The funnel's tap is opened, allowing the bottom liquid to flow. The two liquids are now distinct.

Q15. Describe the method of fractional distillation.

Answer: Fractional distillation is a type of distillation that involves the separation of miscible liquids. This process involves repeated distillations and condensations, and the mixture is usually separated into component parts.
A chemical mixture's components are separated into different parts (called fractions) based on their different boiling points.

Vapours from a boiling solution are passed through a tall column known as a fractionating column. The column is packed with plastic or glass beads, which provide more surface area for condensation and evaporation. The temperature of the column decreases gradually along its length. Higher boiling point

components condense on the column and return to the solution; lower boiling point (more volatile) components pass through the column and are collected near the top.

Practice Questions on Separation Techniques

Q1. Which of the following separation techniques is affected by differences in boiling point?

a.) Evaporation
b.) Sublimation
c.) Distillation
d.) Crystallization

Correct Answer – (c.) Distillation.

Q2. Which technique is used to separate drugs from blood?

a.) Sublimation
b.) Chromatography
c.) Centrifugation
d.) Evaporation

Correct Answer – (b.) Chromatography.

Q3. Explain the method of crystallization.

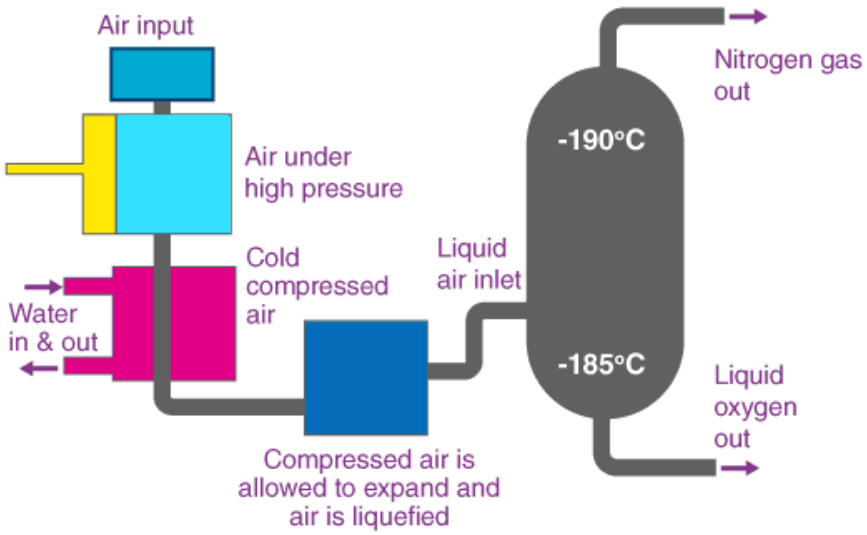
Answer: Crystallization is a process for removing impurities from solids. The process of crystallization is as follows:

- In an open container, the solution is heated.
- The solvent molecules begin to evaporate, leaving the solutes behind.
- As the solution cools, solute crystals accumulate on the solution's surface.
- Crystals are collected and dried as needed for the product.
- The undissolved solids in the liquid can be separated by filtration.
- The size of crystals formed during this process is determined by the rate of cooling.
- If the solution is rapidly cooled, many tiny crystals form.
- Slow cooling rates result in the formation of large crystals.

Q4. How can different gas be separated from the atmosphere?

Answer: Air is a homogeneous mixture of gases. It comprises different proportions of gases such as nitrogen, oxygen, carbon dioxide, and argon. The technique of fractional distillation is used to separate various components from the air/atmosphere.
Fractional distillation is a method of separating liquid mixtures into fractions by using the difference in boiling points of the components.

Process:
The air is compressed under high pressure and cooled by lowering the temperature. This liquefies the air.
After that, the liquid air is passed through the fractional distillation column. The liquid air is allowed to warm up here. The bottom of the fractionating column is warmer than the top. Each gas begins to separate at different temperatures depending on its boiling point.
Nitrogen has a boiling point of -196 °C, and oxygen has a boiling point of -183 °C. The nitrogen gas begins to escape through the outlet and is collected. The liquid oxygen will then be collected in a fractionating column.



Separation Techniques-Obtaining gases from Air

Q5.What is chromatography?

Answer: Chromatography is a technique for separating the various components of a liquid mixture. It is a technique used to separate solutes that are dissolved in the same solvent.
The mixture is dissolved in a fluid known as the mobile phase, which transports it through a structure that contains another material known as the stationary phase.
Chromatography is a broad separation technique that involves many methods or different separation principles.
Applications:

- It is used to separate coloured substances from solutions.
- It is used in forensic science to detect and identify trace amounts of substances in bladder and stomach contents.
- It is used to separate small amounts of chemical reaction products.
- It is employed in the separation of pigments from natural colours.