Distillation Chemistry Questions with Solutions

Q1: Porcelain pieces are put into the distillation flask to avoid _____
a) Overheating
b) Bumping of the solution
c) Uniform boiling
d) None of the mentioned options

Answer: b) Bumping of the solution

Explanation: To prevent the solution from bumping due to uneven heating, porcelain pieces are placed in the distillation flask.

Q2: What are the two processes in distillation?
a) Distilling and condensation reflux
b) Distilling and freezing
c) Freezing and condensation reflux
d) Only condensation reflux

Answer: a) Distilling and condensation reflux

Explanation: Distillation is a two-step process that includes distillation and condensation reflux. The gas-liquid two-phase flow over the countercurrent contact is commonly carried out in a distillation column.

Q3: How aniline and chloroform can be separated?
a) Sublimation
b) Condensation
c) Distillation
d) Evaporation

Answer: c) Distillation

Explanation: The distillation technique can be used to separate aniline and chloroform. The toxic organic molecule aniline has the formula $C_6H_5NH_2$. The organic compound chloroform has the formula $CHCl_3$. It's a colourless, sweet-smelling, thick liquid that's used as a precursor to PTFE and refrigerants on a huge scale.

Q4: Which of the following is not separated through the distillation process?
a) Acetone and water
b) Milk and water
c) Impurities in Sea water

d) Aniline and chloroform.

Answer: c) Impurities in Sea water

Explanation: The distillation technique does not separate milk from water. A distillation procedure can separate all of the other options.

Q5: The process of distillation is used for the liquids having _____
a) Sufficient difference in their solubility
b) Sufficient difference in their melting point
c) Sufficient difference in their boiling point
d) None of the mentioned

Answer: c) Sufficient difference in their boiling point

Explanation: The distillation method is employed for liquids with a significant difference in boiling points. Distillation also allows you to separate the components of air.

Q6: Which salt is obtained as a result of the chemical reaction between hydrochloric acid (HCl) and sodium hydroxide (NaOH)? Which method will you use to separate it from the solution?

Answer:

The chemical reaction between HCl and NaOH gives rise to common salt (NaCl). The following is a representation of the chemical reaction:

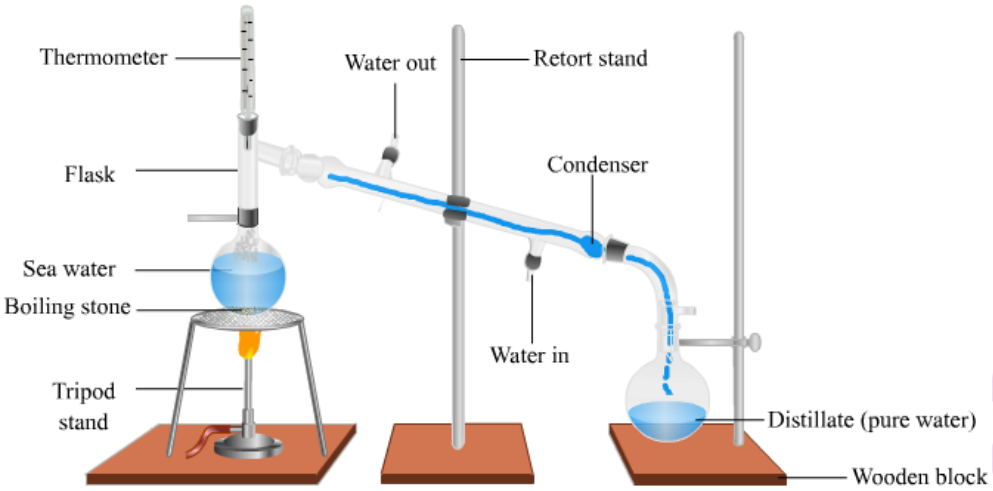
$HCl + NaOH \rightarrow NaCl + H_2O$.

The salt is separated from the solution using the distillation process.

Q7: Draw a labeled diagram showing the process of distillation.

Answer:

The distillation process is depicted in the diagram below.



Q8: Match the following:

Column A	**Column B**
(a) Melting point	1. Separating common salt and water from their mixture.
(b) Boiling point	2. Obtaining diesel from crude oil
(c) Fractional distillation	3. Change of state of a liquid into a gas.
(d) Distillation	4. Change of state from solid to liquid.

Answer:

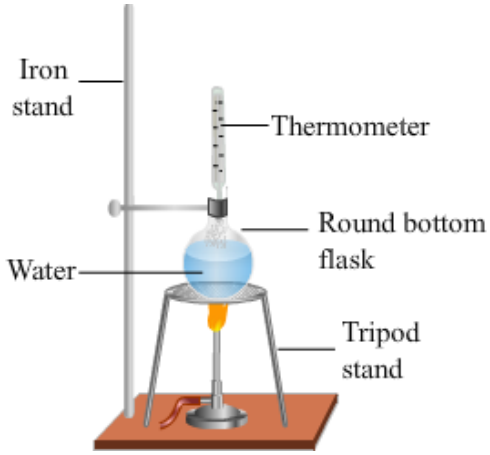
(a) Melting point - 4. Change of state from solid to liquid.
(b) Boiling point - 3. Change of state of a liquid into a gas.
(c) Fractional distillation - 2. Obtaining diesel from crude oil
(d) Distillation - 1. Separating common salt and water from their mixture.

Q9: Answer the following questions.

(a) What will you do to find out the boiling point of water?
(b) What changes do you see in the appearance of a candle after you have lit it?
(c) Can a solid and a solvent be separated from their solution by distillation?

Answer:

(a) To determine the boiling point of water, we will use the following apparatus:



Experiment: We'll put water in a flask with a round bottom and a single holed rubber stopper. We'll put a thermometer in the hole and start heating the flask by placing it on iron gauze on a tripod stand.

Observation: The increase in temperature in the thermometer will be observed. When the mercury within the thermometer reaches 100°C., water begins to boil, and the temperature falls.

Conclusion: The boiling point of water is defined as the temperature at which the temperature stops rising and the water begins to boil. As a result of the experiment, the boiling point of water is 100°C.

(b) When we light the candle, the following changes occur

(i) **State change**: The candle's wax melts and then vaporises to generate wax vapours.

(ii) **Combustion**: Heat and flame are produced when wax vapors burn.

(c) Yes, distillation can separate components of a solution made up of a dissolved nonvolatile solid (solute) and a liquid (solvent).

Q10: What is the difference between distillation and fractional distillation?

Answer:

The following table summarises the differences between distillation and fractional distillation:

Distillation	Fractional Distillation
Distillation is a method of separating liquids having boiling points that differ by at least 50 degrees.	The procedure of fractional distillation is used to separate liquids with similar boiling points.

Simple distillation is used in every vaporization-condensation stage.	In a fractional distillation method, multiple basic distillation procedures with minor losses are carried out in one apparatus.
The experimental setup is simple. A basic apparatus with two flasks and a condenser is required.	The setup for the experiment is complicated. A complicated apparatus with a fractioning column is required.
Used in the purification of seawater.	Used in crude oil refining.

Q11: Mention the various uses of Distillation.

Answer:

Some of the uses of Distillation are as follows:

- It can be used in a laboratory to do experiments. The results aren't immediately utilised, although they can help with chemical and medicinal research.
- Distillation may remove numerous pollutants from water, making it beneficial for purification. Desalination plants use the seawater distillation process to obtain pure water. When making infant food, parents use distilled water.
- Distilling ferment material (a mixture of fruit and animal components) creates ethyl alcohol, which is used to make alcoholic beverages.
- When crude oil is distilled, various compounds such as gasoline, wax, fuel oil, lubricating oil, and other petrochemical products separate at different boiling points.
- Distillation produces the perfumes we use today. We extract essential oil and aroma from many plants and herbs using this method. Simple distillation is not used because plants begin to disintegrate at higher temperatures. As a result, steam distillation is beneficial.
- Food flavour is created by steam distillation. Citrus oils, for example.
- Acetone and methyl alcohol are separated via fractional distillation.
- Oxygen, nitrogen, carbon dioxide, argon, and other gases are found in the air. Cryogenic distillation can be used to remove these gases.
- The sugarcane industry uses vacuum distillation to concentrate sugarcane juice.

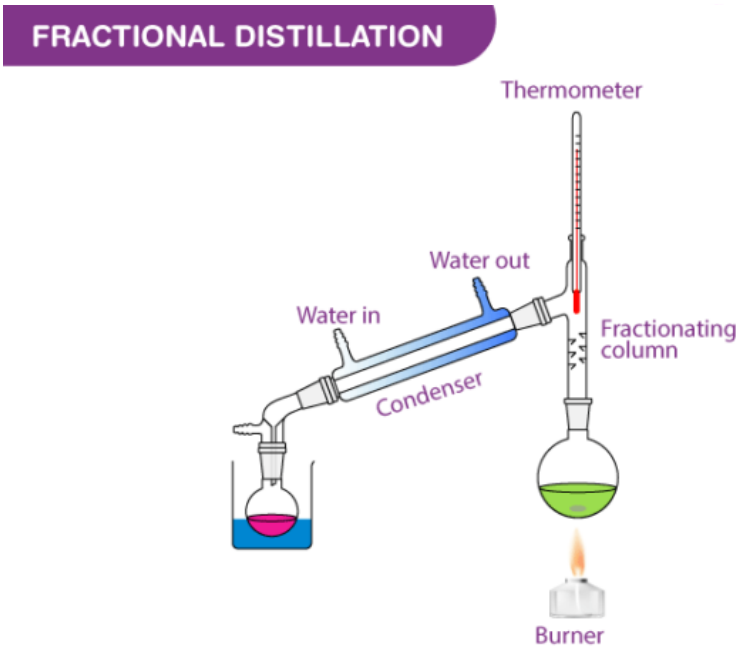
Q12: Fractional distillation can be used to separate miscible liquids having a boiling point difference of

less than 25 K. What part of the fractional distillation equipment makes it efficient and superior to a normal distillation process? Use a diagram to explain.

Answer:

Fractional Distillation of Miscible Liquids

- A fractionating column improves the efficiency of fractional distillation over simple distillation by increasing the possibility of liquid condensation.
- A fractionating column with glass beads or glass helices provides a vast surface area for the vapours to collide and lose energy, allowing them to be quickly condensed and distilled.
- Fractional distillation efficiency could be improved by increasing the length of the fractionating column.



Q13: Which tubes in Fig. 2.1 (a) and (b) will be more effective as a condenser in the distillation apparatus?

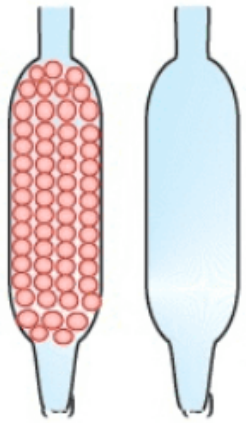


Fig. 2.1

Answer:

As a condenser in the distillation equipment, tube (a) will be more effective. The presence of marbles enhances the surface area of the vapours' contact area. This gives the vapours more time to condense, making the first column more effective than the second column without marbles.

Q14: Give an example of each mixture having the following features. Suggest a suitable method to separate the components of these mixtures
a) A volatile and a non-volatile component.
b) Two volatile components with appreciable differences in their boiling point.
c) Two immiscible liquids.
d) Two or more coloured constituents soluble in some solvents.

Answer:

(a) Example: Mixture of acetone and water.
A mixture of volatile and non-volatile components can be separated by simple distillation.

(b) Example: Mixture of kerosene and petrol.
Simple distillation can be used to separate two volatile components with significant boiling point differences.

(c) Example: Mixture of mustard oil and water.
Separating funnel is used to separate a mixture of immiscible liquids.

(d) Example: A mixture of different pigments from an extract of flower petals.
Two different compounds present in the same solution can be separated using the chromatography method.

Q15: Briefly describe Vacuum Distillation.

Answer:

- Vacuum distillation is ideal for separating mixtures of liquids with extremely high boiling points.
- Heating these chemicals at high temperatures is an ineffective technique for boiling them. As a result, the pressure in the environment is reduced.
- Because the pressure is reduced, the component can boil at lower temperatures. The component is transformed into a vapour when its vapour pressure equals the ambient pressure.
- The fumes are then condensed, and the distillate is collected. High-purity samples of chemicals that degrade at high temperatures are also obtained using the vacuum distillation method.

Practise Questions on Distillation

Q1: What are the basic methods of distillation?
a) Fractional distillation and simple distillation
b) Steam distillation and destructive distillation
c) Steam distillation, simple distillation, and gas distillation
d) Fractional distillation, destructive distillation, and simple distillation

Answer: d) Fractional distillation, destructive distillation, and simple distillation

Explanation: Simple distillation, fractional distillation (where distinct volatile fractions are collected during the process), and destructive distillation (where a material is heated to disintegrate into components for collection) are all examples of distillation.

Q2: Define the following terms.
(a) Melting point
(b) Boiling point
(c) Distillation.

Answer:

(a) Melting point: The temperature at which a substance's state changes from solid to liquid is known as its melting point. Ice, for example, has a melting point of 0°C.

(b) Boiling point: The temperature at which a substance's state changes from liquid to gas is known as the boiling point. Water, for example, has a boiling point of 100°C.

(c) Distillation: Distillation is the process of heating a liquid to its boiling point and then cooling the vapours to retrieve the liquid.

Q3: Give scientific reasons.
(a) A condenser has two taps.
(b) At dawn, in winter, we see dewdrops on the leaves of trees

Answer:

(a) For better circulation of cold water around the inner tube, a condenser includes two taps, one inlet, and one outlet.

(b) In the winter, the surface temperature is very low at the morning. Atmospheric water vapours condense to create little droplets on the surface when the temperature decreases. As a result, we see dewdrops on tree leaves.

Q4: Salt is dissolved in seawater. You're probably aware that you can distill pure water from seawater. This approach, however, is not used to obtain drinking water from seawater. What do you believe the reason is?

Answer:

Seawater contains salt, and distillation can obtain pure water. However, the energy required to heat significant amounts of seawater is extremely expensive for this procedure to be extensively used. Furthermore, they are highly expensive if the condensers are large enough to distill huge amounts of seawater. As a result, distillation is no longer used to extract drinking water from seawater.

Q5: Two water samples, labeled 'A' and 'B,' are given to you. Sample "A" boils at 100°C, while sample "B" boils at 102°C. Which water sample will not freeze at 0°C? Comment.

Answer:

Pure water has a boiling point of 100°C at 1 atm pressure and a melting point of 0°C at 1 atm pressure. When water contains contaminants, the boiling point rises, and the melting point falls. When salt is added, the boiling point rises by 2°C, and the melting point falls.

Sample B, as a result, will not freeze at 0°C.