Chapter – 3

Separation of Substances

2marks:

1. Why do we need to separate different components of a mixture? Give two examples.

Answer:

When two or more substances are mixed together, they form a mixture. Components of a mixture should be separated because some components may not be useful or may spoil the useful component of the mixture.

Examples:

Tea leaves are separated from the liquid with a strainer while preparing tea.

Removal of stone pieces from wheat, rice or pulses by hand.

2. What is winnowing? Where is it used?

Answer:

The method of separating the components from a mixture is known as winnowing. In this method, heavier and lighter components of a mixture are separated by wind or by blowing air. This method is used

by farmers to separate lighter husk particles from heavier seeds of grain.

3. How will you separate husk or dirt particles from a given sample of pulses before cooking?

Answer:

Husk and dirt particles are separated from pulses by winnowing.

4. What is sieving? Where is it used?

Answer:

Sieving is a method in which fine particles are sieved through holes in the sieve while the bigger impurities remain on the sieve. Sieving is used in a flour mill to separate impurities like husk and stones from wheat before grinding it. It is also used at construction sites to separate pebbles and stones from sand.

5. How will you separate sand and water from their mixture?

Answer:

Sand and water are separated from their mixture by the following steps:

a) The mixture is allowed to stand without any disturbances.

b) Now, sand settles down.

c) Slowly pour the water into another container to obtain sand in the bottom.

6. Is it possible to separate sugar mixed with wheat flour? If yes, how will you do it?

Answer:

Yes, it is possible to separate sugar mixed with wheat flour by the following method:

a) Mix sugar and wheat flour in water.

b) Stir the solution to allow the sugar to dissolve.

c) Now, filter the mixture.

d) Filtrate contains the sugar solution, and the residue will be wheat flour.

7. How would you obtain clear water from a sample of muddy water?

Answer:

The following process should be carried out to obtain clear water from muddy water:

i) Allow muddy water to stand.

ii) Mud gets settled down in the water.

ii) Slowly pour water into another container.

8.What happens during the process of evaporation?

Answer:

Evaporation is the conversion of a liquid into vapor. In the context of separation, it's commonly used to separate a dissolved solid (e.g., salt) from a liquid by heating the mixture and allowing the liquid to evaporate, leaving the solid behind.

5marks:

1.Explain the method of winnowing in detail. Provide examples of situations where winnowing is a practical and effective method of separation.

Answer:

Winnowing is a separation technique used to separate lighter particles, like husk, from heavier particles, such as grains, by utilizing wind or blowing air. In agriculture, it is commonly employed after threshing to separate chaff from grains. The process involves tossing the mixture into the air; the lighter husk is carried away by the wind, leaving behind the heavier seeds.

2. Elaborate on the process of sieving. How does particle size influence the effectiveness of sieving, and provide an example of an industry where sieving is extensively used.

Answer:

Sieving is a separation method based on particle size. A mesh or sieve with specific-sized holes is used to separate components of a mixture. The effectiveness of sieving depends on the size of particles; smaller particles pass through while larger ones are retained. In the food industry, sieving is crucial for obtaining fine flour by removing impurities like husk from grains.

3.Differentiate between sedimentation and decantation. Illustrate each process with a real-life example and discuss their applications in separation techniques.

Answer:

Sedimentation is the process of settling heavier particles to the bottom when a mixture is allowed to stand. An example is muddy water settling overnight. Decantation involves pouring off the clear liquid from the top after sedimentation. In water treatment, sedimentation and decantation are employed to separate impurities from water.

4.Discuss the concept of filtration, its principle, and applications. Provide an example where filtration is crucial for obtaining a pure component from a mixture.

Answer:

Filtration is a method that uses a medium with fine pores to separate solid particles from a liquid. The principle is based on the inability of larger particles to pass through the filter. In the chemical industry, filtration is essential for separating precipitates from a liquid solution. For instance, obtaining a clear liquid by filtering tea leaves from prepared tea.

5.Provide a detailed explanation of the process of evaporation. How is evaporation utilized in the separation of substances, and what factors influence the rate of evaporation?

Answer:

Evaporation is the conversion of a liquid into vapor. In separation, it is employed by heating a mixture to evaporate the liquid component, leaving behind the dissolved solid. Factors influencing evaporation include temperature, surface area, and air circulation. For example, obtaining salt from a saltwater solution involves evaporating the water, leaving the solid salt behind.

6.Analyze the role of handpicking in the separation of substances. Provide examples where handpicking is a practical and effective method, discussing its limitations and suitable applications.

Answer:

Handpicking involves manually separating larger-sized impurities from a mixture. It is practical for materials with easily distinguishable components, like removing stones and dirt from grains such as wheat or rice. However, it is limited to scenarios with manageable quantities and larger-sized impurities.

7. Describe the process of threshing and its applications in agriculture. Provide examples of crops where threshing is commonly employed and discuss the significance of this method in separating valuable components.

Answer:

Threshing is a method used in agriculture to separate grain seeds from stalks. After harvesting crops like wheat or paddy, the dried stalks are beaten to free the grain seeds. Threshing is crucial in separating valuable grain seeds from the bulk of the crop residue, facilitating further processing and utilization.

8.Explain the methods of sedimentation, decantation, and filtration using a practical example of a mixture. Discuss the sequence of these processes and their significance in obtaining pure components from the mixture.

Answer:

Consider a muddy water mixture. Sedimentation involves letting it stand, allowing heavier particles to settle at the bottom. Decantation is pouring off the clear water from the top. Filtration follows to separate remaining particles. This sequence is essential for obtaining clear water, demonstrating the effective use of these methods in purification.

9.Discuss the process of obtaining salt from seawater using the method of evaporation. Explain the steps involved and the significance of this method in obtaining a valuable product.

Answer:

Obtaining salt from seawater involves letting seawater stand in shallow pits. As sunlight evaporates the water, solid salts are left behind. Further purification yields common salt. This method is significant for obtaining a valuable product from abundant seawater resources and has historical importance in salt production.

10.Evaluate the importance of employing multiple methods of separation. Provide an example where more than one method is necessary for effective separation, discussing the rationale behind using a combination of techniques.

Answer:

Multiple methods of separation are essential when one method alone is insufficient. For example, separating a mixture of sand and salt may involve initial sedimentation and decantation to remove large impurities, followed by filtration to separate finer particles, and finally, evaporation to obtain pure salt. This combination ensures comprehensive separation, addressing the specific properties of each component in the mixture.

8. Fill in the blanks:

(a) The method of separating the seeds of paddy from its stalks is called _____.

(b) When milk, cooled after boiling, is poured onto a piece of cloth, the cream (malai) is left behind on it. This process of separating cream from milk is an example of _____.

(c) Salt is obtained from seawater by the process of _____.

(d) Impurities settled at the bottom when muddy water was kept overnight in a bucket. The clear water was then poured off from the top. The process of separation used in this example is called _____.

(e)A saturated solution is one in which no more of the substance can be _____.

(f) The process of separating insoluble solid particles from a liquid by allowing it to settle or using filter paper is called _____.

(g) Distillation is a process used for the separation of _____ based on differences in their boiling points.

(h) Chromatography is a technique used for the separation of _____ based on their ability to move at different rates through a medium.

(i) Magnetic separation is a method used for separating _____ from a mixture using a magnet.

Answer:

(a)The method of separating the seeds of paddy from its stalks is called **threshing**.

(b) When milk cooled after boiling is poured onto a piece of cloth, the cream (malai) is left behind on it. This process of separating cream from milk is an example of **filtration**.

(c) Salt is obtained from seawater by the process of **evaporation**.

(d) Impurities settled at the bottom when muddy water was kept overnight in a bucket. The clear water was then poured off from the top. The process of separation used in this example is called **decantation**.

(e)A saturated solution is one in which no more of the substance can be **dissolved.**

(f) The process of separating insoluble solid particles from a liquid by allowing it to settle or using filter paper is called **Filtration.**

(g) Distillation is a process used for the separation of Liquids or **components of a liquid mixture** based on differences in their boiling points.

(h) Chromatography is a technique used for the separation of **Components or substances** based on their ability to move at different rates through a medium.

(i) Magnetic separation is a method used for separating **Magnetic materials or substances** from a mixture using a magnet**.**

9. True or false:

(a) A mixture of milk and water can be separated by filtration.

(b) A mixture of powdered salt and sugar can be separated by the process of winnowing

(c) Separation of sugar from tea can be done with filtration.

(d) Grain and husk can be separated with the process of decantation.

Answer:

a) False

b) False

c) False

d) False

10. Lemonade is prepared by mixing lemon juice and sugar in water. You wish to add ice to cool it. Should you add ice to the lemonade before or after dissolving sugar? In which case would it be possible to dissolve more sugar?

Answer:

Ice should be added to lemonade after dissolving sugar. It is possible to add more sugar before adding ice.

Multiple Choice:

1. What is the purpose of sieving in the separation of substances?

A) To convert a liquid into vapor

B) To separate lighter and heavier components

C) To dissolve substances in a liquid

D) To convert vapor into a liquid

Answer: B) To separate lighter and heavier components

2. Which method is commonly used by farmers to separate husk particles from grain seeds?

A) Filtration

B) Handpicking

C) Threshing

D) Sedimentation

Answer: C) Threshing

3. What is the primary purpose of decantation?

A) To separate solid particles using a strainer

B) To dissolve substances in a liquid

C) To separate components based on size

D) To separate heavier and lighter components after settling

Answer: D) To separate heavier and lighter components after settling

4. Which method is used to separate components of a mixture based on the size of particles?

A) Filtration

B) Sedimentation

C) Sieving

D) Decantation

Answer: C) Sieving

5. In the process of winnowing, what is used to separate components of a mixture?

A) Water

B) Wind or blowing air

C) Heat

D) Magnetism

Answer: B) Wind or blowing air

6. What does the term "saturated solution" mean?

A) A solution with no dissolved substances

B) A solution that cannot dissolve more of the substance in it

C) A solution with visible impurities

D) A solution that changes colour

Answer: B) A solution that cannot dissolve more of the substance in it

7. Which method is NOT suitable for separating smaller impurities like dirt and stones from grains?

A) Handpicking

B) Sieving

C) Threshing

D) Winnowing

Answer: A) Handpicking

8. What does sedimentation involve in the separation of substances?

A) Conversion of a liquid into vapor

B) Settling of heavier particles to the bottom

C) Dissolving substances in a liquid

D) Separation based on size

Answer: B) Settling of heavier particles to the bottom

9. What is the process used to separate solid particles from a liquid by using a medium with fine pores?

A) Decantation

B) Winnowing

C) Filtration

D) Evaporation

Answer: C) Filtration

10. What method is employed to separate tea leaves from prepared tea?

A) Handpicking

B) Filtration

C) Sieving

D) Sedimentation

Answer: B) Filtration

Summary:

In the exploration of separation methods for substances mixed in various forms, this chapter delves into practical processes used in daily life and scientific contexts. Methods like handpicking, winnowing, sieving, sedimentation, decantation, and filtration are elucidated, each suited for specific scenarios. The chapter emphasizes the importance of separating components to extract usable substances and introduces the concept of a saturated solution.

Practical activities illustrate these methods, from handpicking stones from grains to demonstrating filtration and evaporation. It concludes with an understanding of how multiple methods may be employed sequentially for effective separation. The chapter also touches on the solubility of substances in water, exploring how saturation limits can be influenced by factors like temperature. Overall, it provides a comprehensive overview of methods crucial for separating substances based on size, weight, or solubility.