9
Chapter

Methods of Separation in Everyday Life

We'll cover the following key points:

- Importance of Separating Components of a Mixture
- Techniques for Separating Mixtures

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 5th we learnt

- Replenishment of nutrients in the soil

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the concept of mixtures and why separating them is important for practical applications.
- Acquire knowledge of various separation techniques based on the physical properties of substances.
- Apply their understanding of separation techniques to real-world situations.
- Recognize the importance of separation methods in daily life, from food preparation to industrial processes, and appreciate how science contributes to solving practical issues.

Guidelines for Teachers

The teacher can begin the chapter by discussing everyday examples where separation techniques are used, prompting students to brainstorm and provide examples. The teacher can highlight the significance of separating substances in mixtures to remove harmful components and to recover useful materials, using real-world examples. Guide students through practical activities to encourage hands-on involvement, observation, and critical thinking. The teacher can also discuss scenarios where more than one separation method might be employed and relate these techniques to daily life.

NCF Curricular Goals and Competencies

This chapter addresses the following curricular goals and skills:

CG-1 (C 1.1): Explores the nature of matter, its components, properties, and behavior.

CG-6 (C 6.2): Investigates the nature and methods of science by examining the evolution of scientific knowledge and engaging in scientific inquiry.

Introduction:

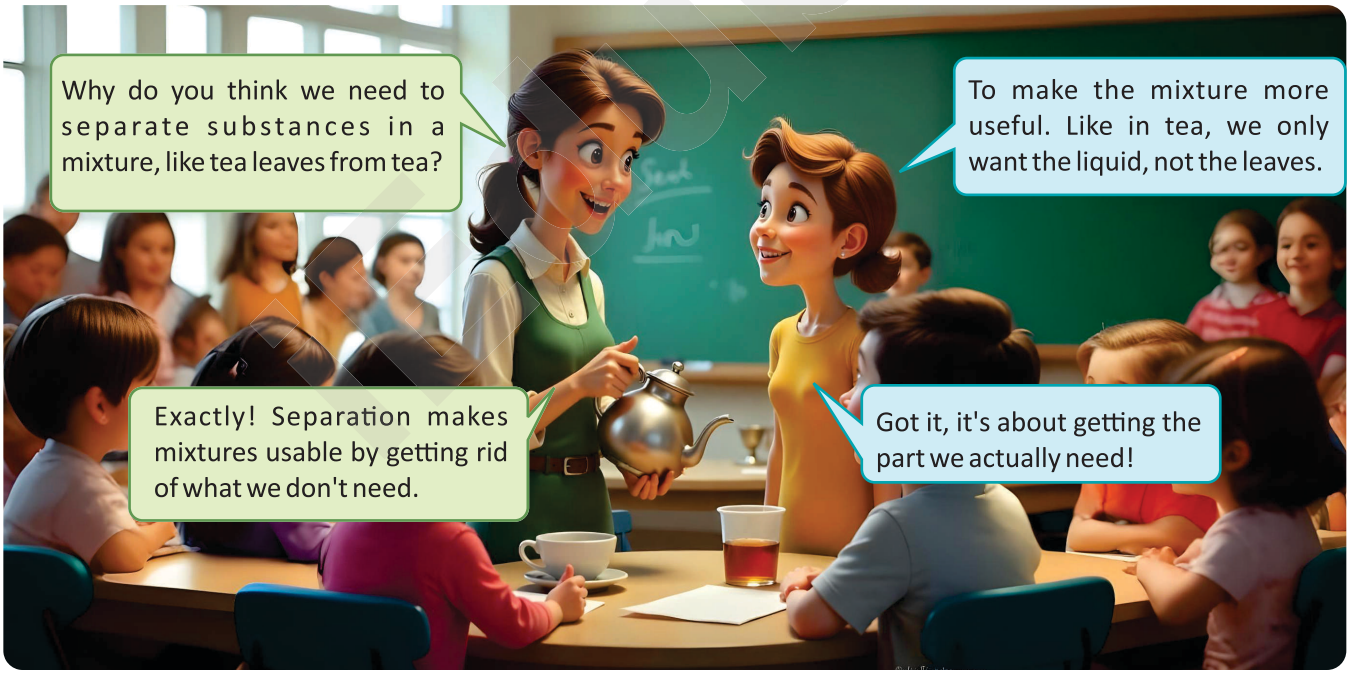
In our daily lives, we often come across mixtures that need to be separated into their individual components. Whether it's separating tea leaves from brewed tea or purifying water for drinking, methods of separation play a crucial role. These techniques are based on the unique properties of each component, such as size, solubility, or density. Understanding these methods helps us in various situations, from cooking and cleaning to industrial applications. By applying the right separation techniques, we can remove unwanted substances or extract valuable materials for practical use.

In History...

By the 8th century, Arab alchemists refined methods such as distillation, which later played a vital role in producing perfumes and medicines. In the Middle Ages, advances in chemistry led to improved separation techniques, helping alchemists isolate metals and develop alloys. In the 17th century, with the development of modern chemistry, scientists such as **Robert Boyle** experimented with more advanced forms of distillation and crystallization, laying the foundation for systematic separation techniques. By the 19th century, innovations such as chromatography and centrifugation emerged.

Importance of Separating Components of a Mixture

In a science classroom. The teacher is explaining separation techniques.



Separating mixtures is essential for removing unwanted components and making substances more useful. For example, we strain tea leaves for a smooth drink or purify water to make it drinkable. This process ensures we get the desired parts, playing a vital role in daily life and industries alike.

1. Removal of Undesirable and Harmful Substances

One of the primary reasons for separating mixtures is to remove harmful or undesirable substances that may affect our health. Many food items, such as cereals, pulses, and spices, may contain impurities like stones, husk, insects, or their eggs. These impurities, if consumed, could cause health issues, and therefore, it is necessary to remove them before using these food items for cooking.

2. Obtaining Useful Components from a Mixture

Another significant reason for separation is to extract the useful components of a mixture. This process allows us to obtain different products from a single mixture, each with its unique applications. For example, crude petroleum oil, which is a mixture of different hydrocarbons, is separated through fractional distillation to produce petrol, diesel, kerosene, and wax, among other products.

- Petrol is used as a fuel for cars.
- Diesel is used in trucks and heavy machinery.
- Kerosene is used as a fuel for lamps or as a heating oil.
- Wax is used to make candles and in many industrial applications.

The separation of crude oil demonstrates how extracting individual components from a complex mixture can provide us with valuable substances that serve different needs in our daily lives.

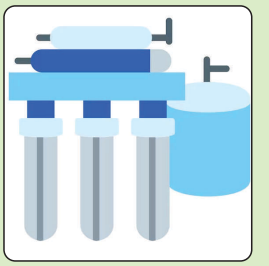
3. Obtaining Pure Substances from a Mixture

In some cases, it is crucial to obtain a substance in its pure form for specific purposes. Pure substances are required for precise applications where even minor impurities can affect the outcome. For example:

- Pure Water is needed in the production of medicines to ensure there are no impurities that might react with the chemicals used.
- Pure water is also used in car batteries, as impurities in water can affect the battery's performance.

In these scenarios, methods such as distillation are used to remove impurities and obtain water in its purest form. The purity of substances is vital to ensure safety, effectiveness, and efficiency in applications like medicine manufacturing, laboratory research, and certain industrial processes.

4. Importance of Separation in Daily Life



The importance of separating substances from mixtures is evident in several aspects of our daily lives:

- **Food Preparation:** We wash and sieve food items before cooking to remove dirt, impurities, and harmful substances.
- **Water Purification:** We use filtration and purification methods to remove harmful microbes and contaminants from drinking water.
- **Industrial Processes:** Industries use separation techniques to purify chemicals, obtain metals from ores, and create different grades of fuel.

Each of these processes involves separating the desired components from the undesirable ones, ensuring that the end product is useful, safe, and meets the required standards.

Let's recall what we know

Apply Concept in Context

Apply

- List five mixtures from your daily routine and describe their components.
- Suppose you have a mixture of salt and sugar. Which method would you use to separate them effectively?

Skills Covered: Observation, Critical and logical thinking, Brainstorming, Applicative thinking

Examine Further

Analyse

- Why do you think it is crucial to purify water before using it in medical applications?
- What are some of the harmful substances that may be found in untreated water? How can they affect health?

Skills Covered: Critical and logical thinking, Brainstorming, Research, Applicative thinking, Research

Self-Assessment Questions

Evaluate

- How would you define the process of separation?
- Why is it important to remove stones and other impurities from flour before using it for cooking?

Bloom's Taxonomy

SCAN TO ACCESS

Take a Task

Watch Remedial

Creative Insight

Create

- Create a flowchart that shows how to separate a mixture of sand and iron filings using different techniques.

Skills Covered: Creativity, Critical and logical thinking, Brainstorming, Applicative thinking, Organisation

Techniques for Separating Mixtures

Mother and child are standing in the kitchen discussing how to clean rice before cooking.

Separating mixtures is essential in both everyday life and scientific processes. Mixtures are composed of two or more substances, and separation techniques help us isolate these substances based on their physical properties. Whether it is separating sand from water, filtering coffee, or **refining petroleum**, different methods such as filtration, evaporation, distillation, and sieving are used. Each technique is chosen depending on the properties like size, density, solubility, or boiling point of the components. These separation methods not only simplify tasks in households but are also crucial for industries, laboratories, and environmental conservation. Understanding these techniques helps us make use of substances more efficiently and safely.

KEYWORDS

Refining petroleum: It is the process of transforming crude oil into useful products like gasoline, diesel, kerosene, and other fuels by removing impurities through physical and chemical methods.

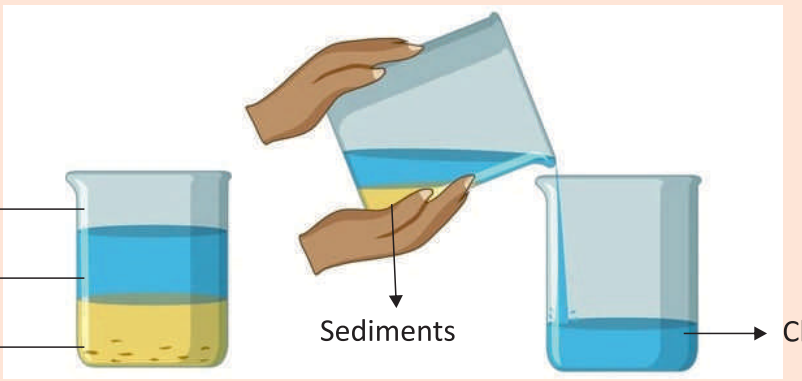
Separation of Insoluble Solids from Liquids

The separation of insoluble solids from liquids is an important process in both everyday life and industrial settings. Insoluble solids are substances that do not dissolve in a liquid, and effective separation techniques are required to isolate them for various purposes. There are multiple methods used to achieve this, such as sedimentation and decantation and filtration, depending on the characteristics of the mixture and the substances involved. Let's explore these techniques in detail:

1. Sedimentation and Decantation

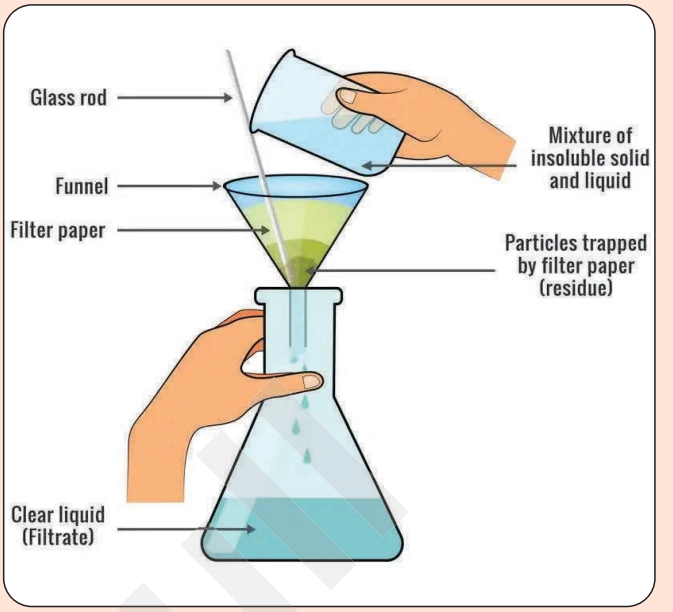
- Sedimentation and decantation are simple yet effective methods used to separate insoluble solids from liquids. This method works particularly well for mixtures where the solid component is heavier than the liquid component and does not dissolve.
  - **Sedimentation:** When a mixture of an insoluble solid and liquid (such as sand and water) is left undisturbed for some time, gravity acts upon the solid particles, causing them to settle at the bottom of the container. This process of solid particles settling at the bottom is called sedimentation. The insoluble solid that collects at the bottom of the container is known as sediment, while the clear liquid that remains above the sediment is called the supernatant liquid. Sedimentation takes advantage of the weight of the solid particles, which are denser than the liquid and naturally fall to the bottom due to gravitational force.
  - **Decantation:** After sedimentation, the next step is to carefully remove the clear liquid above the sediment without disturbing it. This process of pouring the liquid off into another container is called decantation. By doing this, the liquid can be separated from the settled solid, leaving the sediment behind. Decantation is typically used for separating a mixture where the solid component is much heavier and sinks to the bottom, making it easier to extract the supernatant liquid without much effort.

An example of using sedimentation and decantation is separating sand from water. When the mixture is left to sit, the sand (being heavier) settles down, and the water above can be poured off carefully. This method is widely used in various situations, such as separating mud from water, removing stones from grains, or clearing impurities from wastewater.



2. Filtration

Filtration is a more precise method used to separate insoluble solids from liquids, particularly when dealing with finer solid particles that may not settle quickly or completely. This method involves passing the mixture through a porous medium, typically filter paper, which allows the liquid to pass while retaining the solid particles.



- **The Filtration Process:** During filtration, the mixture is poured onto a piece of filter paper, which acts as a barrier that only allows the liquid (or much smaller particles) to pass through its tiny pores, while the larger, insoluble solid particles are trapped on its surface. The insoluble solid that remains on the filter paper is known as the residue, while the clear liquid that passes through is called the filtrate. The filter paper thus acts as a sieve, allowing separation based on the particle size of the solid and liquid components.
- **Materials Used for Filtration:** Besides filter paper, other materials can also be used to filter mixtures. These include glass wool, charcoal sand, and strainers. Each of these materials has pores of varying sizes that serve the same function of separating the solid from the liquid. The choice of filter depends on the nature of the mixture and the precision required for the separation.
- **Examples of Filtration in Everyday Life:**
  - **Tea Preparation:** Filtration is frequently used in our homes to separate tea leaves from brewed tea using a strainer. After boiling the tea leaves in hot water, the strainer helps retain the leaves while letting the liquid tea pass through.
  - **Fresh Juice:** Filtration is also used when making fresh juice. The pulp can be removed from the juice by pouring it through a fine sieve or strainer.
  - **Muddy Water:** Another common use of filtration is to clean muddy water. When muddy water is passed through a filter, the dirt particles are retained, and the clear water is collected.
  - **Coffee:** Filter coffee preparation is another example of filtration, where hot water is passed through ground coffee, and the resulting brew is collected while the coffee grounds are retained by the filter.

Comparison of Sedimentation, Decantation, and Filtration

Aspect	Sedimentation	Decantation	Filtration
Definition	Process where heavier insoluble solids settle at the bottom of a liquid when left undisturbed.	Process of carefully pouring out the clear liquid after sedimentation without disturbing the sediment.	Process of separating insoluble solids from liquids using a filter medium.
Principle	Uses gravity to allow denser solid particles to settle.	Uses the difference in density between solid and liquid components to pour off the liquid.	Uses a porous barrier (filter) to separate solids from liquids based on particle size.
Use of Equipment	Does not require special equipment—typically involves containers.	Does not require special equipment—simply pouring the clear liquid into another container.	Requires a filter medium such as filter paper, glass wool, or a strainer.
Separation Precision	Less precise—solid particles may remain suspended in the supernatant liquid.	Less precise—there may still be some solid particles left in the liquid.	More precise—solid particles are effectively retained by the filter.
Suitable for	Mixtures where the solid particles are heavier and larger than the liquid.	Mixtures that have undergone sedimentation with clear liquid needing to be separated.	Mixtures with fine or coarse particles needing complete separation.
Example	Sand settling at the bottom of a water container.	Pouring water off from sand after sedimentation.	Separating tea leaves from tea using a strainer.

Separation of Solid from Other Solids

In our daily lives, there are many instances where we need to separate different solids from one another. The separation of one solid from another solid can be based on differences in properties like size, shape, density, or **magnetic behavior**. Various techniques can be used depending on the nature of the mixture and the desired outcome. Here, we will explore different methods of separating solids from other solids, including handpicking, threshing, winnowing, sieving, and magnetic separation.

KEYWORDS

Magnetic Behavior: This Behavior is used to separate magnetic materials (like iron) from a mixture using a magnet. The magnet attracts the magnetic substances, leaving the non-magnetic ones behind.

1. Handpicking

Handpicking is one of the simplest and oldest methods of separating one solid from another. This technique involves physically picking out undesirable or different substances from the mixture by hand. It is most suitable for small quantities of mixtures and when the components are easily distinguishable based on physical characteristics like color, shape, or size.

Examples of Handpicking:

- **Fruits:** Separating different types of fruits by hand from a basket containing mixed fruits.
- **Grains:** Removing stones or broken grains from dal or rice before cooking.
- **Vegetable Separation:** Sometimes, handpicking is used to separate desirable substances as well. For instance, sorting vegetables from a basket of mixed fruits and vegetables.

2. Threshing

Threshing is a method used to separate grains from stalks after harvesting. The stalks of grains are bundled together, and the grains need to be removed for consumption or further processing. Threshing can be done in different ways based on the resources available and the quantity of grain to be separated.

Methods of Threshing

- **Manual Beating:** Beating the stalks with sticks on the ground is one of the traditional ways to separate grains from stalks.
- **Animal Power:** Animals like bullocks are allowed to trample over the stalks to separate the grains from the stalks.
- **Machines:** In large agricultural fields, machines are commonly used for threshing. These machines provide efficiency and reduce labor in large-scale farming.

Example of Threshing:

- **Harvested Wheat or Paddy:** After harvesting wheat or paddy, the grains are still attached to their stalks, and threshing helps separate them. Threshing is a crucial step to make grains ready for further processing and consumption.

3. Winnowing

Winnowing is a method used to separate lighter components from heavier components by using wind or blowing air. This method is commonly used by farmers to separate the husk from grains after threshing. Winnowing makes use of differences in density; lighter materials are carried away by the wind, while heavier substances fall near the winnowing area.

Winnowing Process:

- The mixture of grains and husk is dropped from a height while wind or air blows across it.
- The husk particles, being lighter, are carried away by the wind.
- The heavier grains fall near the winnowing area and can be collected separately.

Example of Winnowing:

- **Separating Husk from Grains:** Farmers use winnowing to separate husk from harvested grains. The husk, which is lighter, is carried away by the wind, while the grains, being heavier, fall to the ground. The separated husk is useful as fodder for animals.

4. Sieving

Sieving is a method used to separate solid components of a mixture based on their particle sizes. The mixture is passed through a sieve—a device with holes or pores—allowing smaller particles to pass through while retaining larger particles. Sieving is a widely used technique in both construction and household settings.

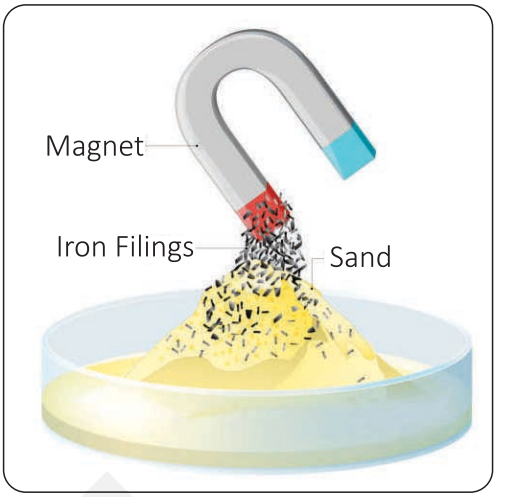
Sieving Process:

- A sieve is used to filter the mixture.
- Fine particles pass through the pores of the sieve.
- Larger particles are left behind on the sieve.

Examples of Sieving:

- **Construction Sites:** In construction, sieves with larger pores are used to separate stones and pebbles from sand, which helps to ensure that the sand used for construction is clean and uniform.
- **Household Use:** In homes, sieves with smaller pores are used to filter wheat flour, removing larger impurities from the flour before baking or cooking.

5. Magnetic Separation



Magnetic Separation is a technique used when one of the components of the mixture is a magnetic substance. In this process, a magnet is used to attract the magnetic component, thereby separating it from the other substances.

Magnetic Separation Process:

- A magnet is rolled or placed over the mixture.
- The magnetic component gets attracted to the magnet and is pulled out of the mixture, leaving the non-magnetic substances behind.

Examples of Magnetic Separation:

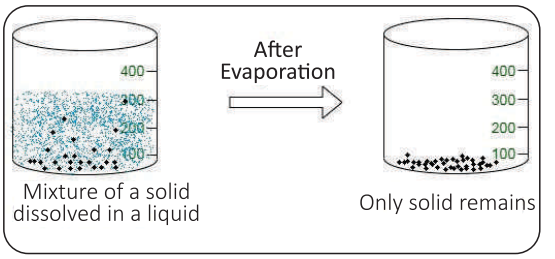
- Iron and Sulphur Mixture: In a mixture of iron filings and sulphur, iron can be separated by using a magnet. The magnet attracts the iron filings, making it easy to remove them, while the sulphur remains.

Separation of Soluble Solids from Liquids

The separation of soluble solids from liquids involves isolating a dissolved substance from its liquid solution. This is often necessary in various industries, as well as in daily life, for obtaining useful products or purifying substances. Depending on the physical properties of the substances involved, several techniques can be used, such as evaporation, churning, and condensation. Below, we explore these methods in detail:

1. Evaporation

Evaporation is a commonly used method to separate a soluble solid from a liquid by converting the liquid into its vapour state. This process is based on heating the mixture until the liquid evaporates, leaving the solid substance behind. The key principle of evaporation is that the liquid component of the mixture has a much lower boiling point than the solid, allowing it to vaporize while the solid remains.



Evaporation Process:

- The mixture containing a soluble solid and a liquid is heated.
- As the temperature rises, the liquid evaporates, leaving the solid behind.
- The vapour of the liquid is usually not collected, as it simply dissipates into the surroundings.

This method is particularly effective when a solid is fully dissolved in the liquid, and the goal is to retrieve the solid substance.

Example of Evaporation:

Salt Extraction from Seawater: One of the most well-known applications of evaporation is the extraction of salt from seawater. In this process, seawater is collected in shallow beds and exposed to the sun's heat. As the temperature rises, the water gradually evaporates, leaving salt crystals behind. This salt is further purified before it becomes suitable for human consumption. This process, also known as salt harvesting, is widely used in **coastal regions** to produce table salt.

Salt Harvesting Process:

- **Collection of Seawater:** Seawater is collected in large, shallow beds.
- **Exposure to Sun:** The beds are left open to the sun's heat, allowing the water to gradually evaporate.
- **Formation of Salt Crystals:** As the water evaporates, salt crystals form, which are then collected and refined.

2. Churning

Churning is a separation process typically used in dairy to extract butter from curd. The principle behind churning is based on differences in density. The curd contains both fat and buttermilk, and when churned, the lighter butter floats to the top, while the heavier buttermilk remains at the bottom.

Churning Process:

- The curd is placed in a large container and churned using a churner (also known as a mathni).
- During churning, the fat globules in the curd stick together to form butter, which being lighter, floats at the top.
- The remaining liquid, called buttermilk, is separated from the butter.
- This process is commonly used in traditional dairy production and household settings to produce butter from curd.

Example of Churning:

- Butter Extraction: Butter is extracted from curd by placing it in a container and using a churner. During this process, the lighter butter floats to the top, and the heavier buttermilk is left behind. Butter, being rich in fat, is collected for use, while the buttermilk can be consumed separately as a refreshing drink.

KEYWORDS

Coastal regions are areas where land meets the sea or ocean. These regions often have beaches, cliffs, and a variety of plants and animals that live near the water.

3. Condensation

Condensation is a process where water vapour or gas is converted back into its liquid form. This process is essentially the opposite of evaporation and is used to recover the evaporated liquid by cooling the vapour. Condensation plays a key role in various separation processes where capturing the evaporated component is necessary.

Condensation Process:

- When a liquid is heated and begins to evaporate, the vapour rises.
- If the vapour is allowed to come into contact with a cool surface, it loses its heat energy and converts back into a liquid form.
- This liquid can then be collected, which is often useful in cases where both the solid and liquid components are needed.

Example of Condensation:

- **Boiling Milk:** When milk is boiled and covered with a plate, the steam that rises gets trapped under the plate. The water vapour then condenses into water droplets on the underside of the plate. This happens because the surface of the plate is cooler compared to the temperature of the steam, leading to condensation.

Condensation is often used in combination with evaporation to collect both the solid and the evaporated liquid, making it a crucial part of processes like **distillation**.

Did you know

Chromatography

Chromatography is a fascinating technique used to separate mixtures into their individual components. The term "chromatography" is derived from the Greek words chroma (color) and graphein (to write), reflecting its origins in studying colored substances. First developed in 1901 by Russian scientist **Mikhail Tsvet**, it was initially used to separate plant pigments. Over time, chromatography has evolved into various forms, including paper chromatography, gas chromatography, and liquid chromatography. This versatile method finds applications across diverse fields. In forensic science, it is crucial for analyzing crime scene evidence such as ink, drugs, and explosives. The food industry relies on it to detect contaminants and ensure product quality, while healthcare professionals use it to identify and purify drugs.

KEYWORDS

Distillation : It is a process of separating components in a mixture based on differences in their boiling points. It involves heating the mixture to create vapor and then condensing it to collect the desired component.

Let's recall what we know

Apply Concept in Context

Apply

- Make a list of different substances in your home that are mixtures. Describe which separation methods you could use to separate their components.
- Imagine you have a mixture of sand, pebbles, and iron filings. Outline the steps to separate these materials using appropriate methods.

Skills Covered: Creativity, Applicative thinking, Brainstorming, Critical and logical thinking, Observation

Examine Further

Analyse

- Our body also uses the process of evaporation. Name an organ that uses evaporation and explain how it helps in regulating body temperature.
- Using clean water is crucial for health. Why is boiling water an effective way to purify it? Give a detailed reason.

Skills Covered: Critical and logical thinking, Research, Brainstorming, Applicative thinking, Problem-solving

Self-Assessment Questions

Evaluate

- What are three common ways to separate a liquid from a mixture?
- Name the method used by farmers to remove dust and dirt from freshly harvested grains.
- Define the process of sedimentation and explain how it is used to separate mixtures.

Creative Insight

Create

Make a mixture of sand, sugar, and small metal pins. Create a diagram to illustrate the steps involved in separating each component.

- Describe the method of decantation and perform a simple experiment at home to show it in action.
- Write your observations and note the effectiveness of the separation.

Skills Covered: Creativity, Critical and logical thinking, Brainstorming, Applicative thinking, Observation

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

SUMMARY

Importance of Separating Components of a Mixture

- **Removal of Undesirable and Harmful Substances**

The separation of mixtures is crucial to remove unwanted or harmful substances. Many food items such as cereals, pulses, and spices may contain impurities like stones, husk, or insects that need to be removed to ensure safety.

- **Obtaining Useful Components from a Mixture**

Separation allows us to extract useful products from mixtures. For example, crude petroleum oil is separated through fractional distillation to produce:

- Petrol (used in cars)
- Diesel (used in trucks and machinery)
- Kerosene (used as a heating fuel)
- Wax (used for candles and industrial applications)

3. Obtaining Pure Substances from a Mixture

Pure substances are required for precise applications where impurities can affect the outcome. Examples include:

- Pure water used in medicine manufacturing.
- Distilled water for car batteries.

4. Importance of Separation in Daily Life

- Food Preparation: Sieving or washing removes impurities from food.
- Water Purification: Filtration removes harmful contaminants.

Techniques for Separating Mixtures

Separation of Insoluble Solids from Liquids

Sedimentation and Decantation: Heavy particles settle due to gravity, and the clear liquid is poured off. Example: Sand separated from water.

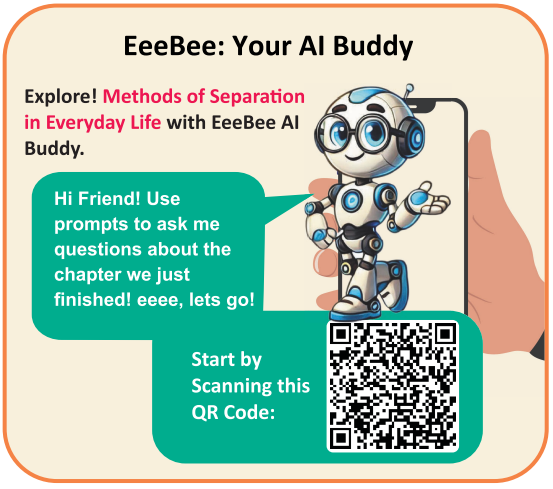
Filtration: A filter separates solids from liquids. Examples: Straining tea leaves or filtering muddy water.

Separation of Solids from Other Solids

- **Handpicking**
- **Threshing**
- **Winnowing**
- **Sieving**
- **Magnetic Separation**

Separation of Soluble Solids from Liquids

- **Evaporation:** Liquid turns to vapor, leaving the solid behind. Example: Extracting salt from seawater.
- **Churning:** Separates butter from curd by density differences. Example: Butter production.
- **Condensation:** Vapor cools and turns back into liquid. Example: Condensed water from boiling milk.



EXERCISE

That turn curiosity into confidence—let's begin!

Gap Analyzer™
Take a Test

A. Choose the correct answer.

1. Which of the following methods is used to separate tea leaves from tea?
   (a) Decantation ☐ (b) Filtration ☐
   (c) Winnowing ☐ (d) Sedimentation ☐
2. What is the main purpose of handpicking as a separation technique?
   (a) Removing harmful gases ☐ (b) Separating large visible impurities ☐
   (c) Mixing substances together ☐ (d) Boiling the mixture ☐
3. Which method of separation involves using a magnet?
   (a) Evaporation ☐ (b) Magnetic Separation ☐
   (c) Churning ☐ (d) Threshing ☐
4. What happens during sedimentation?
   (a) The lighter particles float on the surface ☐ (b) The liquid evaporates ☐
   (c) Heavier solid particles settle at the bottom ☐ (d) The mixture is churned ☐
5. Which separation technique is most suitable for extracting salt from seawater?
   (a) Filtration ☐ (b) Distillation ☐
   (c) Evaporation ☐ (d) Winnowing ☐

B. Fill in the blanks.

1. _____ is a method used to separate heavier particles from lighter ones using wind.
2. In _____, the mixture is passed through a porous barrier to separate solid from liquid.
3. During sedimentation, the ____ settles at the bottom while the clear liquid remains on top.
4. In traditional dairy production, _____ is used to separate butter from buttermilk.
5. _____ is a method used to separate components based on magnetic properties.

C. Write True or False.

1. Winnowing is used to separate sand from water. _____
2. Handpicking is suitable when the mixture contains small quantities and easily distinguishable impurities. _____
3. Filtration involves heating the mixture to separate the components. _____
4. Sedimentation takes advantage of gravity to separate heavy solid particles from a liquid. _____

D. Define the following terms.

1. Sedimentation
2. Filtration
3. Decantation
4. Handpicking
5. Evaporation

E. Match the columns.

Column A	Column B
1. Handpicking	(a) Extracting salt from seawater
2. Magnetic Separation	(b) Butter from curd
3. Evaporation	(c) Visible impurities
4. Churning	(d) Using a magnet
5. Winnowing	(e) Separating husk from grains

F. Give reasons for the following statements.

1. Sedimentation is used to separate sand from water.
2. Filtration is suitable for separating finer solid particles from a liquid.
3. Magnetic separation works well when one component of the mixture is magnetic.
4. Handpicking is an efficient method for small mixtures with distinguishable particles.
5. Evaporation is used to separate salt from seawater.

G. Answer in brief.

1. What is the purpose of using sedimentation and decantation?
2. How does handpicking help in the separation process?
3. Why is evaporation commonly used in salt production?
4. Describe how filtration works to separate solids from liquids.
5. What role does churning play in dairy production?

H. Answer in detail.

1. Explain the importance of separation techniques in daily life and their applications.
2. Describe the differences between sedimentation, decantation, and filtration.
3. How does magnetic separation work? Provide examples of its use.
4. Discuss the various methods used to separate mixtures of solids from each other.
5. Compare and contrast evaporation and filtration as separation techniques.

NEP Corner

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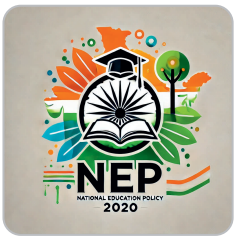
Learn For Life, Not Exams!

Assessments are now competency-based, focusing on your actual understanding, problem-solving skills, and critical thinking.



Skill-based Activity

DIY Experiment: Separating Sand from Water

STEM

Conduct an experiment to separate sand from water using sedimentation and decantation:

- Take a glass of water and add a small amount of sand to it.
- Leave the mixture undisturbed for 10 minutes and observe.

Carefully pour the clear water into another container without disturbing the sediment.

Questions:

- Why does the sand settle at the bottom of the glass?
- What is the purpose of decantation in this experiment?

Skills Covered: Analytical thinking, Observation, Applicative thinking

Poster Making: Techniques of Separation in Everyday Life

Art

Design a poster showcasing different techniques of separation such as filtration, winnowing, evaporation, and handpicking. Include visuals of each technique in daily use.

Skills Covered: Creativity, Awareness-building, Logical thinking

Planning a Wastewater Filtration System

Group Activity

Imagine your community wants to filter greywater for irrigation. Work in groups to design a wastewater filtration system that removes impurities.

Questions:

- What materials would you use to filter the greywater?
- How would you ensure the filtered water is safe for use in gardening?
- Suggest ways to involve the community in maintaining the filtration system.

Skills Covered : Teamwork, Problem-solving, Collaboration, Innovation

Investigating Methods of Separation in Industry

Case to Investigate

Research how separation techniques are used in industries, such as the refining of crude oil or processing of dairy products.

Questions:

- How does fractional distillation help in refining crude oil?
- Why is separation important in food processing industries?
- Discuss how filtration plays a role in water purification plants.

Skills Covered: Research, Analytical thinking, Ethical reasoning

The Role of Separation in Environmental Conservation

Aligning with SDGs

Research modern technologies used for sustainable separation methods, such as desalination and greywater recycling.

Questions:

- How does desalination help provide drinking water in water-scarce areas?
- What are the benefits of recycling greywater for household use?
- Suggest three innovative ways to make separation processes more energy efficient.

Aligned with SDGs:

SDG 6: Clean Water and Sanitation: Ensure availability of clean water through efficient separation processes., SDG 12 - Responsible Consumption and Production: Promote the efficient use of natural resources using separation techniques., SDG 13 - Climate Action: Implement sustainable technologies to adapt to climate change impacts on resource management.

Skills Covered: Innovation, Problem-solving, Applicative thinking

Innovative Separation Techniques

Integrated Learning

Write a short report on how separation techniques contribute to environmental conservation through waste management and resource recovery.

Questions:

- How does the process of filtration differ from sedimentation?
- Why are efficient separation techniques essential for managing household and industrial waste?
- Discuss the impact of improper separation of recyclable materials on the environment.

Skills Covered: Integrated thinking, Logical reasoning, Research