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## Hand Picking

### Description

Hand picking is the manual separation of visible impurities or unwanted materials from a mixture using hands. It relies on differences in size,

### Principle

The principle behind hand picking is the physical difference in size, colour, and shape of the components in a mixture, allowing easy identification.

### Example

Removing stones from rice or wheat by picking them out manually.

### Advantages and Limitations

Hand picking is simple and cost-effective for small quantities. However, it is not suitable for large quantities or when particles are very similar.



**Fig. 9.1: Handpicking**

In the image, a boy is using his hand to pick and separate food items on his plate, demonstrating the concept of hand picking as a method of separation.

### Everyday Life Example

Activity: Hand-pick stones from a mixture of grains by spreading out the grains and picking out stones by hand. Stones are distinguishable from grains by their size, shape, and clearly visible particles.



The image shows a group of people working together to clean or sort grains manually, reflecting teamwork and agricultural practices in rural areas.

## Solved Examples

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**Example 1:** How would you separate stones from a mixture of rice grains?

**Solution:** Since stones are larger and different in appearance from rice grains, hand picking can be used. Spread the mixture on a flat surface

## Practice Set

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- **Level 1 (Easy):** What physical differences allow hand picking to separate impurities from grains?
- **Level 2 (Moderate):** Why is hand picking not suitable for separating very fine particles?
- **Level 3 (Challenging):** Suggest a scenario where hand picking would be the most effective method of separation and explain why.

## Answer Key

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- **Level 1:** Differences in size, colour, and shape allow hand picking to separate impurities.
- **Level 2:** Because very fine particles are difficult to distinguish and pick out manually.
- **Level 3:** Hand picking is effective when impurities are large and clearly visible, such as removing stones from grains, because it is simple

# Threshing

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## Description

Threshing is a physical process used to separate grains from stalks by beating or rubbing the harvested crop.

## Principle

The difference in texture and rigidity between grains and stalks allows grains to be separated by beating the stalks.

## Example

Beating wheat stalks to release the grains.

## Advantages and Limitations

Threshing is efficient for large-scale grain processing but is labour and space-intensive.

Prepzy

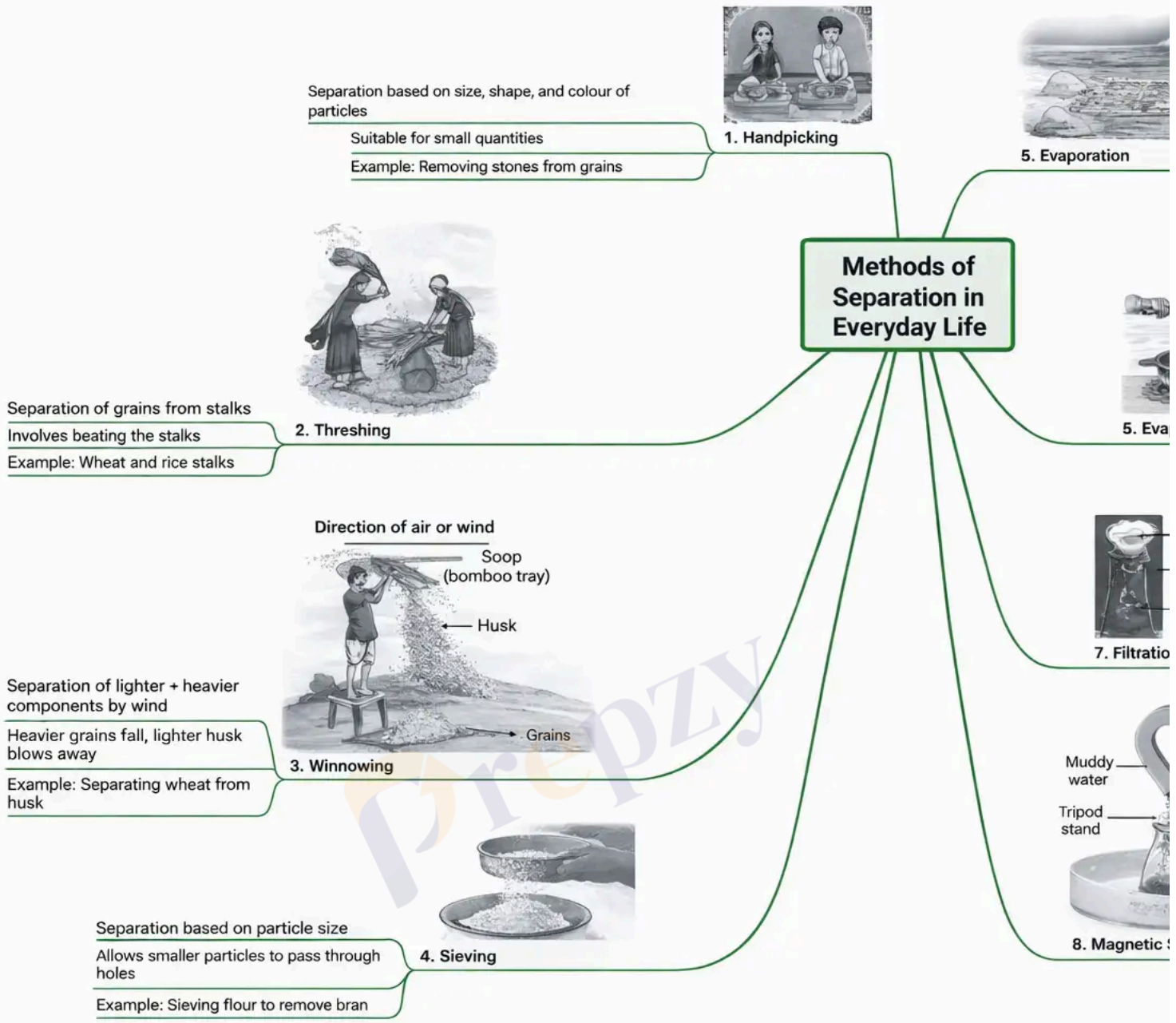


**Fig. 9.2: Threshing**

The image shows two women threshing wheat by beating stalks to separate grains.

#### Everyday Life Example

Activity: Observe traditional threshing by beating stalks against a hard surface or using a threshing machine. Grains fall away from the stalk separation.



The image illustrates various separation methods including threshing, showing how grains are separated from stalks.

## Solved Examples

**Example 1:** How does threshing help in grain processing?

**Solution:** Threshing loosens grains from stalks by beating, allowing grains to be collected separately for further processing.

## Practice Set

- **Level 1 (Easy):** What is the main physical action involved in threshing?
- **Level 2 (Moderate):** Why is threshing considered labour-intensive?
- **Level 3 (Challenging):** Compare traditional threshing with mechanical threshing in terms of efficiency and labour.

## Answer Key

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- **Level 1:** Beating or rubbing stalks to separate grains.
- **Level 2:** Because it requires manual effort and space to beat the stalks.
- **Level 3:** Mechanical threshing is faster and requires less manual labour, making it more efficient than traditional methods.

## Winnowing

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### Description

Winnowing uses air or wind to separate lighter particles like husk from heavier particles like grains.

### Principle

Differences in weight allow lighter particles to be blown away by wind, leaving heavier particles behind.

### Example

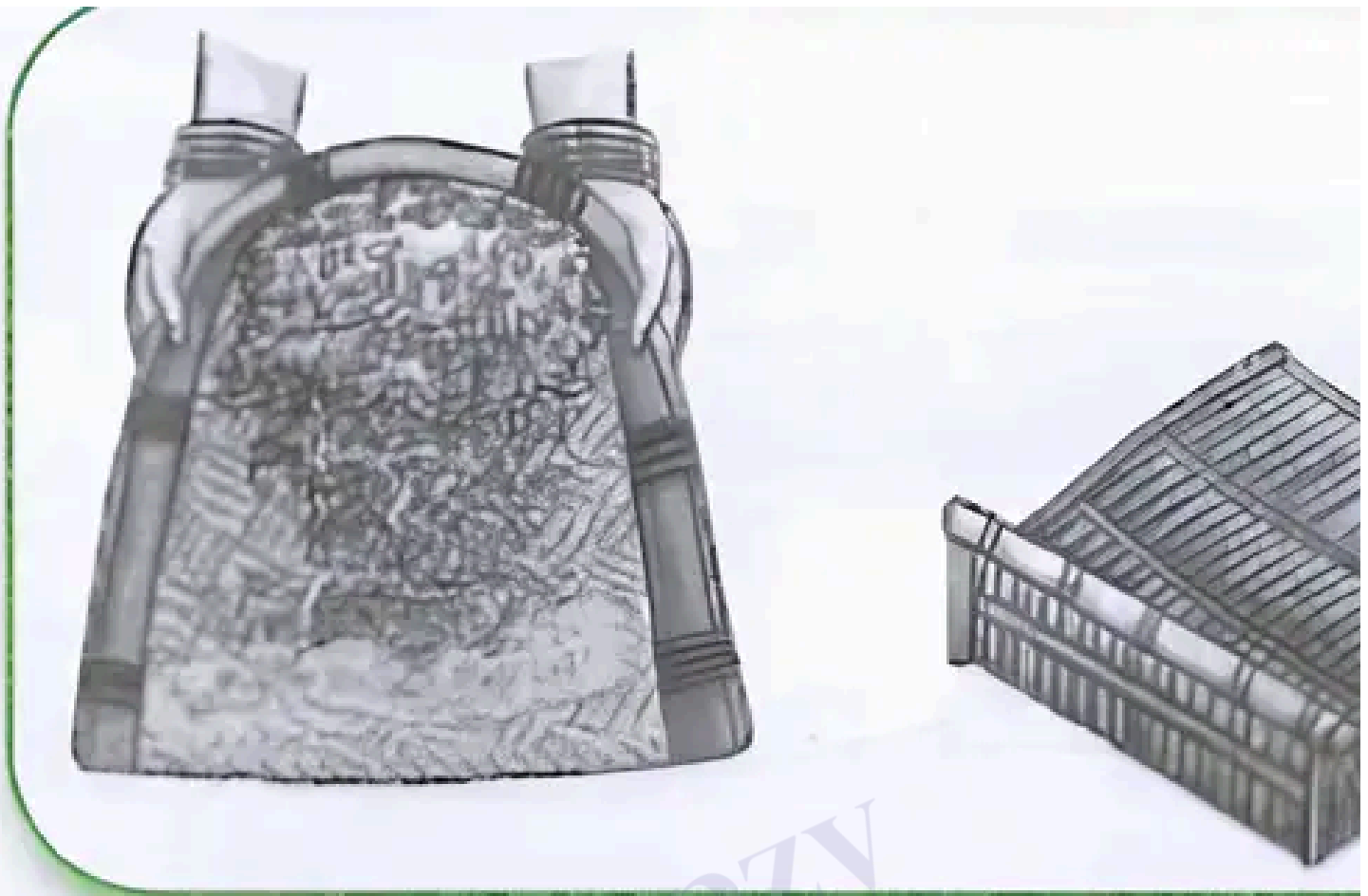
Separating husk from grains using a winnowing basket or bamboo tray.

### Advantages and Limitations

Winnowing is effective for removing light impurities but requires wind or a fan.

### Activity Explanation

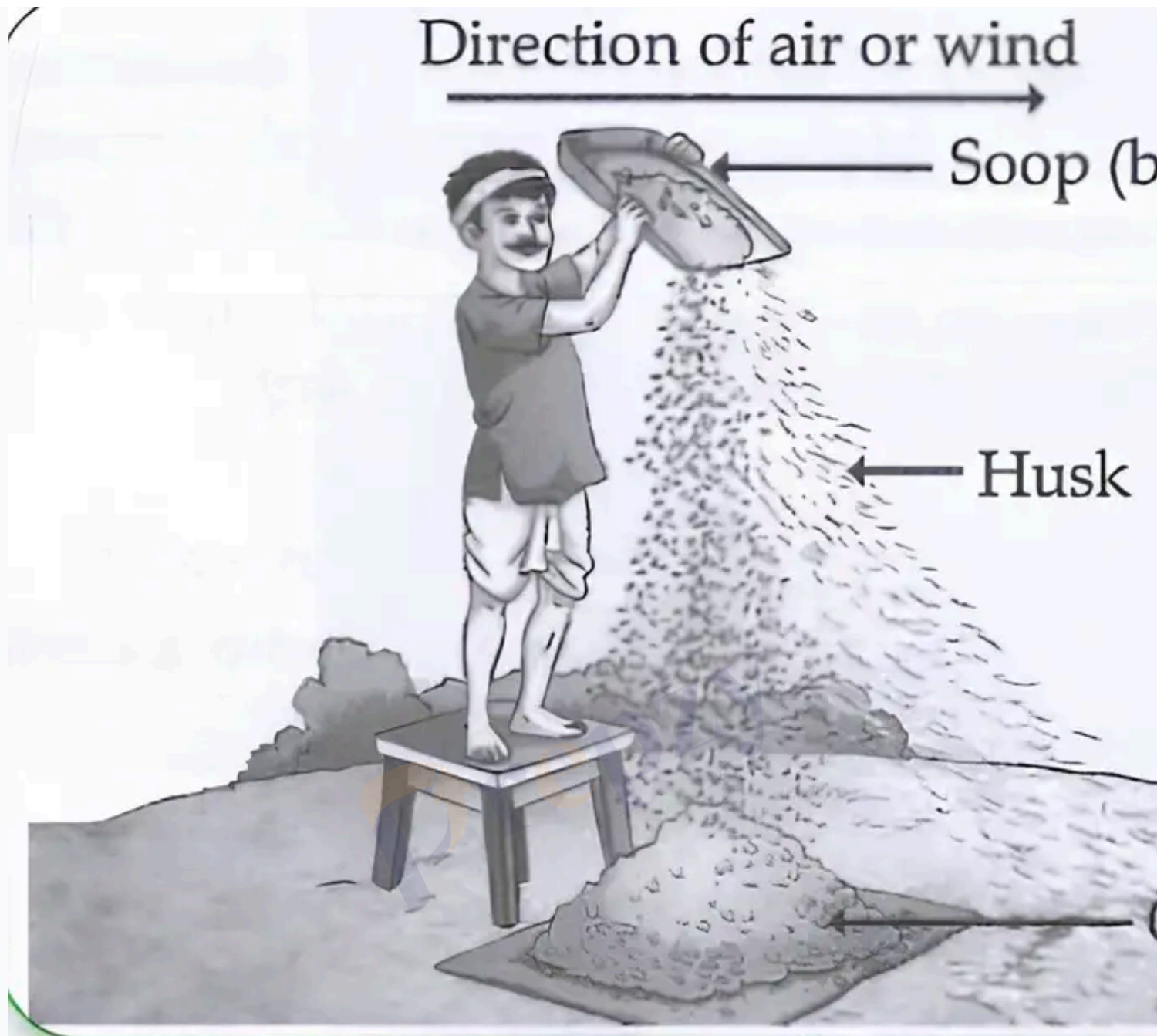
Rubbing roasted peanuts removes their skins, which can be separated by blowing air. Farmers use a bamboo tray to throw grains in the wind; heavier grains fall back.



**Fig. 9.3: Bamboo tra**

The image shows a bamboo tray used for winnowing, made from woven bamboo strips, strong and lightweight.

Direction of air or wind



**Fig. 9.4: Winnowing**

A person is shown winnowing by throwing grains and husk mixture into the air, allowing wind to separate the lighter husk from heavier grains

### Solved Examples

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**Example 1:** How does winnowing separate husk from grains?

**Solution:** When the mixture is thrown into the air, wind blows away the lighter husk while heavier grains fall back, separating the two.

### Practice Set

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- **Level 1 (Easy):** What physical property allows winnowing to separate mixtures?
- **Level 2 (Moderate):** Why is wind necessary for winnowing?

- **Level 3 (Challenging):** Describe how a farmer uses a bamboo tray to perform winnowing.

## Answer Key

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- **Level 1:** Difference in weight between particles.
- **Level 2:** Wind blows away lighter particles like husk, separating them from heavier grains.
- **Level 3:** The farmer throws the mixture into the air using a bamboo tray; wind carries away the lighter husk while grains fall back onto the tray.

## Sieving

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### Description

Sieving uses a sieve to separate particles based on size by allowing smaller particles to pass through holes while retaining larger ones.

### Principle

Differences in particle size enable separation through a mesh or sieve.

### Example

Sifting flour to remove bran particles.

### Advantages and Limitations

Sieving provides precise size-based separation but is limited to mixtures with particle size differences.



## Fig. 9.5: Sieving

The image shows a person holding a sieve over a plate, shaking it to separate fine flour from bran.

### Everyday Life Example

Activity: Sift flour through a sieve to remove bran. Fine flour passes through, while bran remains in the sieve.

### Solved Examples

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**Example 1:** How does sieving separate flour and bran?

**Solution:** Flour particles are smaller and pass through the sieve holes, while larger bran particles remain on top.

## Practice Set

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- **Level 1 (Easy):** What property of particles does sieving use for separation?
- **Level 2 (Moderate):** Why can sieving not separate particles of the same size?
- **Level 3 (Challenging):** Suggest a household mixture where sieving would be useful and explain.

## Answer Key

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- **Level 1:** Difference in particle size.
- **Level 2:** Because particles of the same size will either all pass through or all be retained.
- **Level 3:** Separating flour from lentils; flour passes through sieve holes while lentils remain.

## Evaporation

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### Description

Evaporation is the process of removing a liquid by heating to obtain the dissolved solid solute.

### Principle

Differences in boiling points allow the liquid to evaporate, leaving the solute behind.

### Example

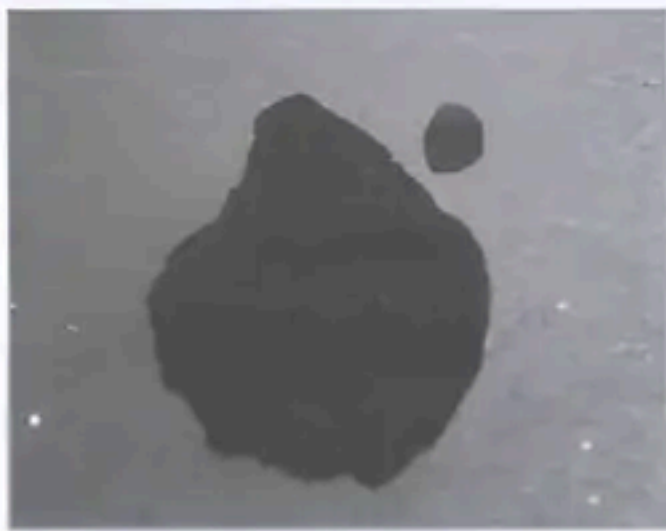
Extracting salt from seawater by evaporating water.

### Advantages and Limitations

Evaporation is simple and effective for obtaining solid solutes but requires heat and time and is unsuitable for heat-sensitive substances.

### Activity Explanation

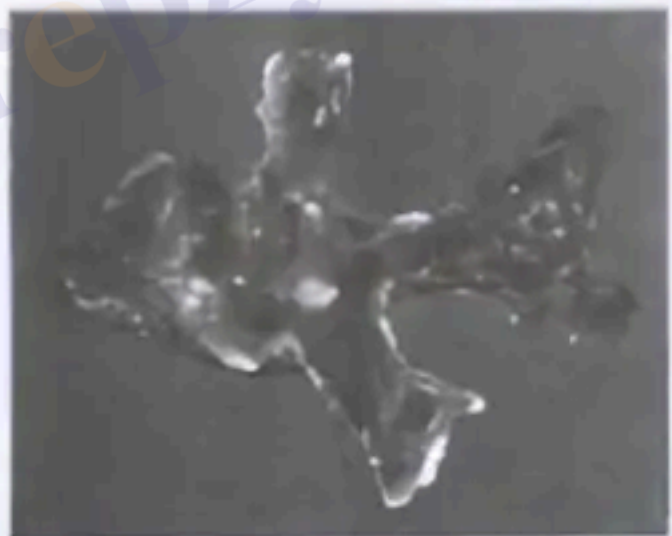
Applying salt solution on dark paper and allowing it to dry shows salt crystals forming as water evaporates. Heating salt solution in a china dish and distillation can be used to recover both salt and water.



(a) Before drying



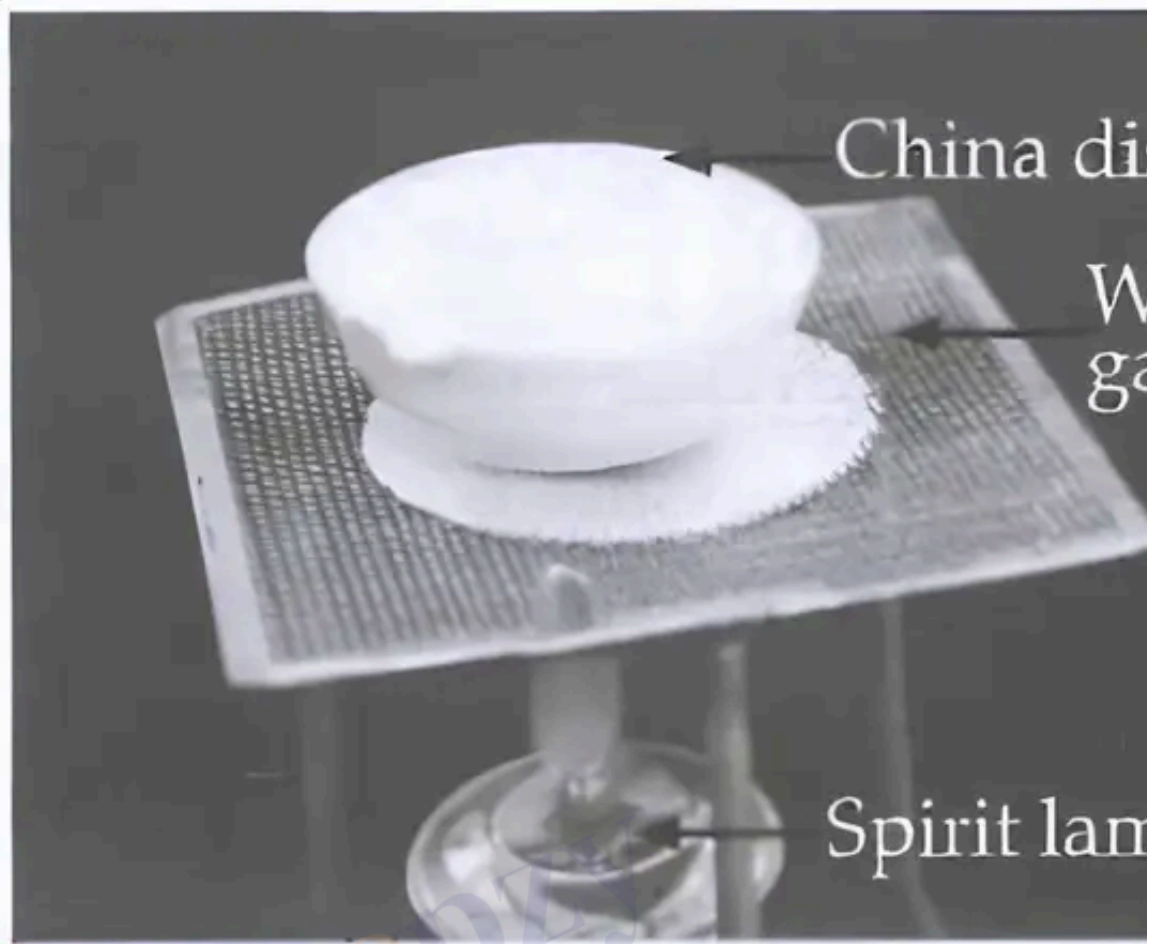
(b) After



(c) Art created

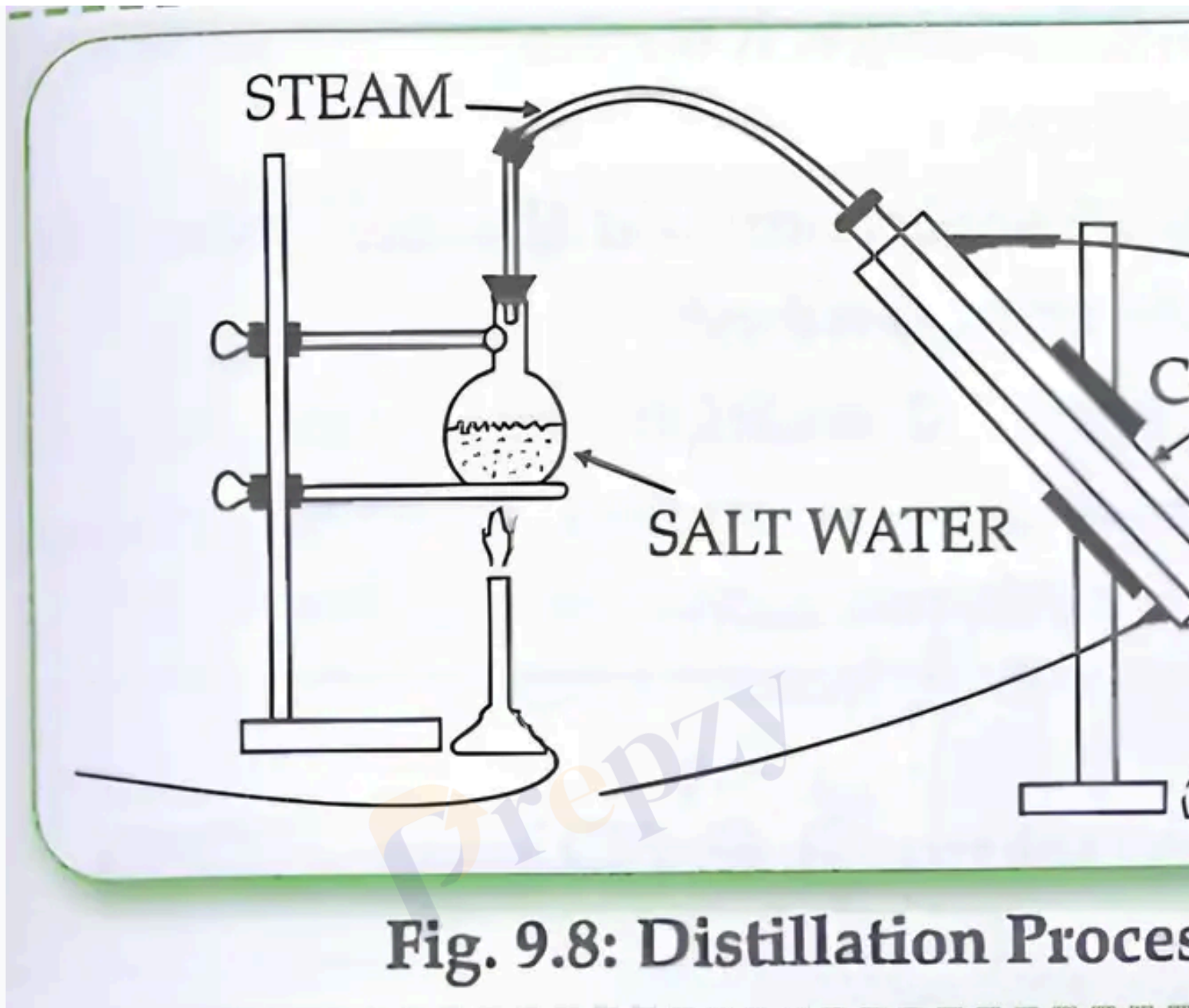
**Fig. 9.6: A few drops of salt solution spread on thick black paper**

Stages of salt solution drying on black paper show crystal formation after evaporation.



**Fig. 9.7: Heating of china dish containing**

Setup for heating salt solution to evaporate water and collect salt.



**Fig. 9.8: Distillation Process**

Distillation apparatus separates pure water from salt water by evaporation and condensation.

## Solved Examples

**Example 1:** How can salt be obtained from salt water?

**Solution:** Heat the salt water to evaporate water, leaving salt crystals behind.

**Example 2:** How can both salt and water be recovered from salt water?

**Solution:** Use distillation to evaporate water, condense the vapour to collect pure water, and retain salt in the boiling flask.

## Practice Set

- **Level 1 (Easy):** What happens to salt when salt water is evaporated?
- **Level 2 (Moderate):** Why is evaporation not suitable for heat-sensitive substances?

- **Level 3 (Challenging):** Explain how distillation separates salt and water from salt water.

## Answer Key

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- **Level 1:** Salt remains as solid crystals after water evaporates.
- **Level 2:** Heat-sensitive substances may decompose or change properties when heated.
- **Level 3:** Salt water is heated; water evaporates and is condensed back to liquid in a separate container, leaving salt behind.

## Sedimentation and Decantation

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### Description

Sedimentation allows solids to settle at the bottom of a liquid, and decantation involves pouring off the clear liquid.

### Principle

Differences in density cause solids to settle at the bottom.

### Example

Separating tea leaves from brewed tea by letting leaves settle and pouring off clear tea.

### Advantages and Limitations

Simple for separating large solids from liquids but not effective for very fine particles.

### Everyday Life Example

Allow tea leaves to settle and decant the clear tea.

## Solved Examples

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**Example 1:** How can tea leaves be separated from brewed tea?

**Solution:** Allow tea leaves to settle at the bottom and carefully pour off the clear tea.

## Practice Set

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- **Level 1 (Easy):** What causes solids to settle during sedimentation?
- **Level 2 (Moderate):** Why is decantation not effective for very fine particles?
- **Level 3 (Challenging):** Describe a situation where sedimentation and decantation can be used together.

## Answer Key

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- **Level 1:** Difference in density causes solids to settle.
- **Level 2:** Fine particles remain suspended and do not settle easily.
- **Level 3:** Settling muddy water to allow mud to settle, then pouring off clear water.

## Filtration

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### Description

Filtration uses a filter to separate solid particles from liquids by trapping solids and allowing liquid to pass through.

### Principle

Differences in particle size allow separation using filter paper or porous material.

### Example

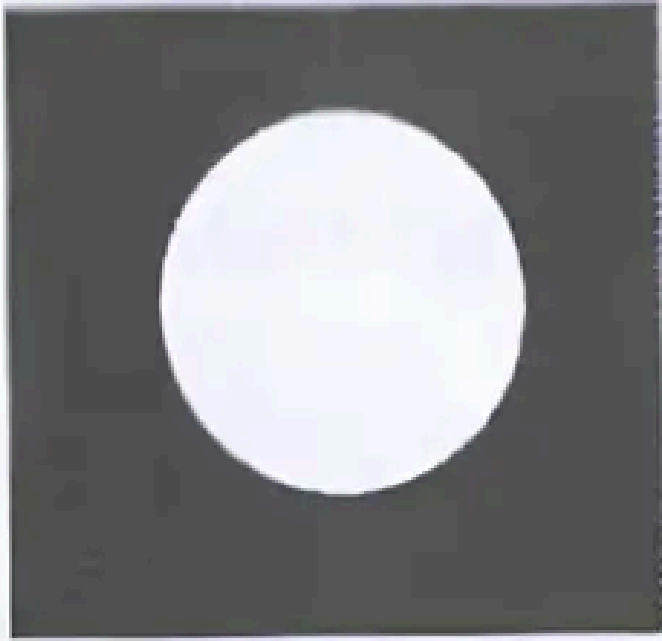
Filtering muddy water using filter paper to obtain clear water.

### Advantages and Limitations

Precise separation based on size but filter paper can clog with large amounts of solid.

### Activity Explanation

Folding filter paper into a cone and placing it in a funnel allows muddy water to be poured through. Mud particles are trapped, and clear wa



A filter paper



On



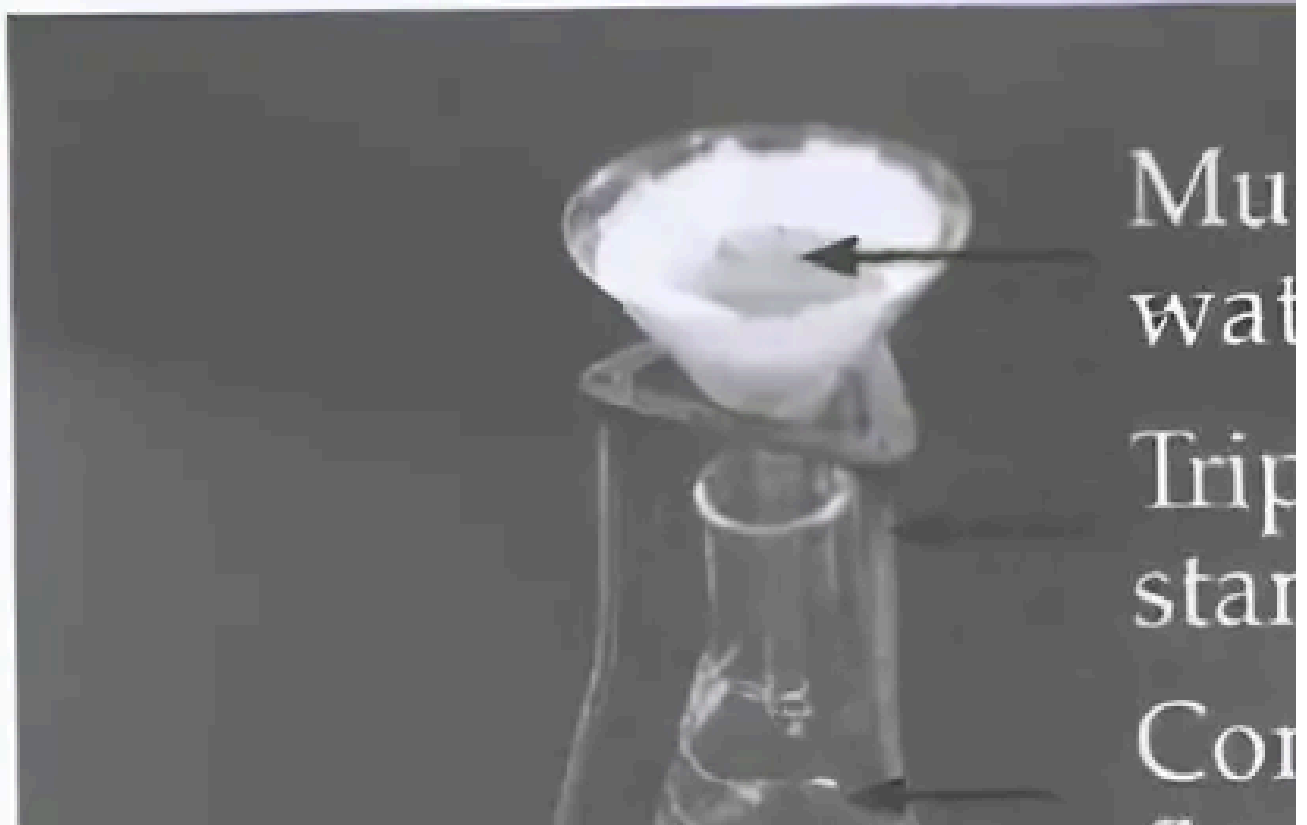
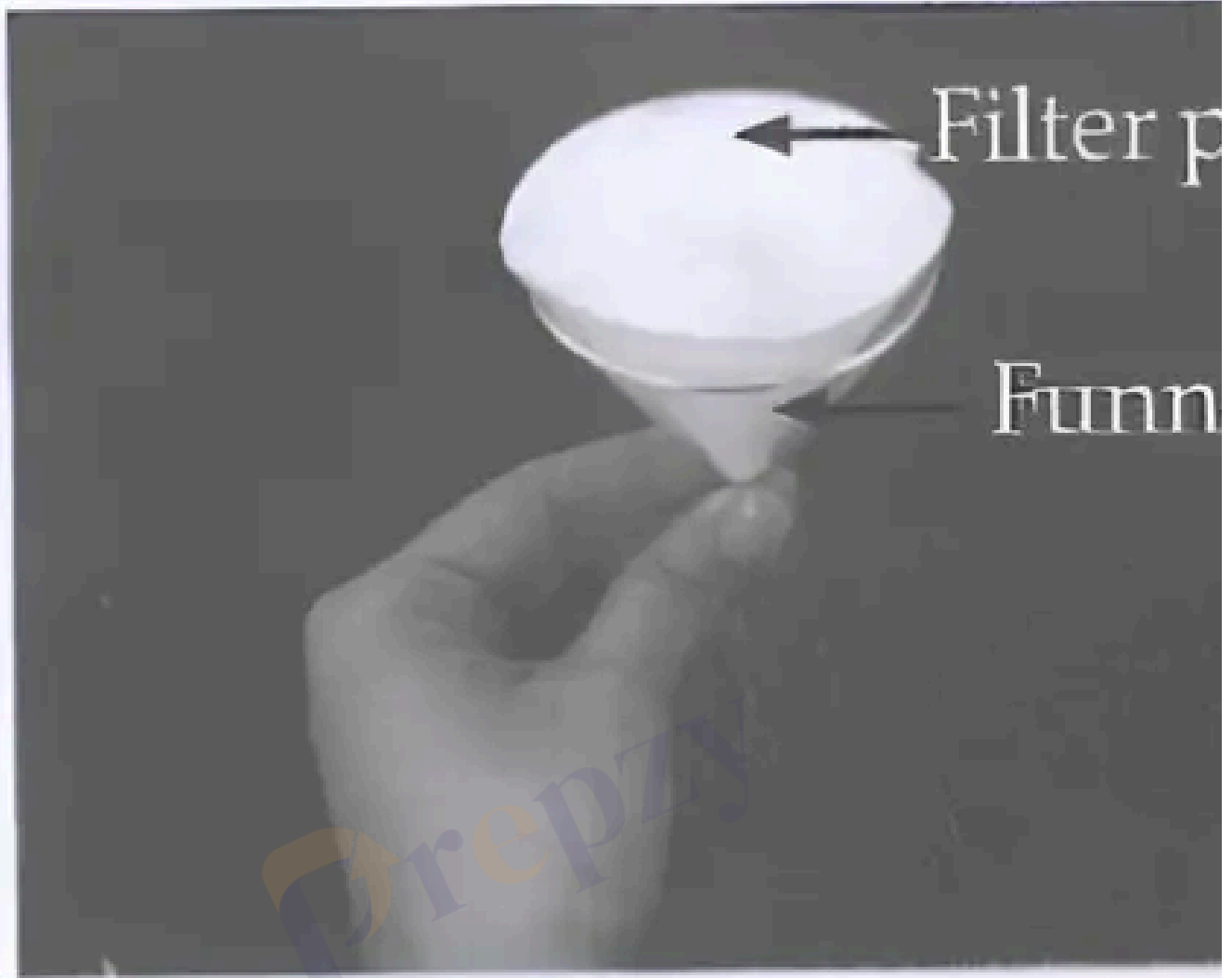
Two-folds



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**Fig. 9.9: Folding a filter paper to fo**

Steps to fold filter paper into a cone shape for filtration.



Filtration setup with filter paper in funnel above conical flask collecting clear water.

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## Solved Examples

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**Example 1:** How does filtration separate muddy water?

**Solution:** Filter paper traps solid mud particles while allowing clear water to pass through and collect below.

# Fig. 9.10: Filtration

## Practice Set

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- **Level 1 (Easy):** What is the role of filter paper in filtration?
- **Level 2 (Moderate):** Why does filter paper get clogged during filtration?
- **Level 3 (Challenging):** Design a simple water filter using household materials and explain how it works.

## Answer Key

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- **Level 1:** To trap solid particles and allow liquid to pass.
- **Level 2:** Large amounts of solid particles block the pores of the filter paper.
- **Level 3:** Layers of cotton, charcoal, sand, and gravel filter out particles and impurities from water.

## Churning

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### Description

Churning is stirring or agitating a liquid like curd to separate its components, such as butterfat from buttermilk.

### Principle

Mechanical agitation causes fat molecules to clump together, separating from the liquid.

### Example

Making butter by churning curd.

### Advantages and Limitations

Churning separates components effectively but requires effort or mechanical devices.

Electric blenders or mixer grinders can be used to churn curd and prepare buttermilk.

## Solved Examples

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**Example 1:** How is butter separated from curd?

**Solution:** By churning curd, fat molecules clump together forming butter, separating from buttermilk.

## Practice Set

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- **Level 1 (Easy):** What is the purpose of churning curd?
- **Level 2 (Moderate):** Name an electric appliance used for churning.
- **Level 3 (Challenging):** Explain the changes that occur during churning of curd.

## Answer Key

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- **Level 1:** To separate butterfat from buttermilk.
- **Level 2:** Electric blender or mixer grinder.
- **Level 3:** Mechanical agitation causes fat molecules to clump, forming butter, while liquid buttermilk separates.

## Magnetic Separation

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### Description

Magnetic separation uses a magnet to attract magnetic materials away from non-magnetic materials.

### Principle

Magnetic properties of substances allow separation using magnets.

### Example

Separating iron nails from sawdust using a magnet.

### Advantages and Limitations

Quick and efficient for magnetic materials but only applicable to magnetic substances.

### Everyday Life Example

Using a magnet to separate iron nails from sawdust by moving the magnet through the mixture.

## Solved Examples

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**Example 1:** How can iron nails be separated from sawdust?

**Solution:** Use a magnet to attract and remove iron nails from the sawdust.

## Practice Set

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- **Level 1 (Easy):** What property allows magnetic separation?
- **Level 2 (Moderate):** Why can magnetic separation not be used for non-magnetic materials?
- **Level 3 (Challenging):** Describe a situation where magnetic separation is useful.

## Answer Key

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- **Level 1:** Magnetic properties of substances.
- **Level 2:** Because non-magnetic materials are not attracted by magnets.
- **Level 3:** Separating iron nails from sawdust in a carpenter's workshop.

## Quick Reference Table

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## Common Mistakes and Misconceptions

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## Glossary

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