Chapter 9: Methods of Separation in Everyday Life

Exercises — Let Us Enhance Our Learning

Q1 What purpose does handpicking serve in the process of separation?

(i) Filtration
(ii) Sorting
(iii) Evaporation
(iv) Decantation

SOLUTION

Handpicking is done on the basis of differences in size, colour, and shape of particles.

It is used to pick out substances by hand — for example, removing small stones and husk from wheat or rice.

This is essentially sorting — selecting and removing specific particles from a mixture by hand.

Filtration involves passing a liquid through a filter; evaporation converts a liquid to vapour; decantation involves tilting a vessel to remove liquid after sedimentation.

None of those match the purpose of handpicking.

Answer: (ii) Sorting

Q2 Which of the following substances are commonly separated using the churning method?

(i) Oil from water
(ii) Sand from water
(iii) Cream from milk
(iv) Oxygen from air

SOLUTION

Churning is used when a lighter component needs to be separated from a liquid mixture by spinning or agitation.

The chapter describes churning curd using a mathni (churner) to separate butter — butter (lighter) floats to the top, buttermilk is left behind.

The same principle applies to separating cream from milk.

Oil from water is separated by decantation (oil forms a separate layer). Sand from water uses sedimentation and decantation/filtration. Oxygen from air requires

industrial methods.

Cream from milk is the standard example of churning given in the chapter.

Answer: (iii) Cream from milk

Q3 Which factor is usually essential for filtration?

(i) Apparatus size

(ii) Presence of air

(iii) Pore size

(iv) Temperature of the mixture

SOLUTION

Filtration separates insoluble solid particles from a liquid by passing the mixture through a filter.

The chapter states that the choice of filter depends on the size of particles of the materials to be removed.

A filter paper has very fine pores; cloth has small pores between woven threads. Larger pores let larger particles through; smaller pores trap finer particles.

Apparatus size, air, and temperature are not the determining factor — pore size determines what passes through and what is retained.

Answer: (iii) Pore size

Q4 State with reason(s) whether the following statements are True [T] or False [F]. Also, correct the False statement(s).

(i) Salt can be separated from salt solution by keeping it under the Sun.

(ii) Handpicking should be used only when the quantity of one component is less.

(iii) A mixture of puffed rice and rice grains can be separated by threshing.

(iv) A mixture of mustard oil and lemon water can be separated by decantation.

(v) Sieving is used to separate a mixture of rice flour and water.

SOLUTION

(i) TRUE — Seawater (a salt solution) kept in shallow pits exposed to sunlight allows water to evaporate, leaving salt behind. The Sun provides the heat needed for evaporation.

(ii) TRUE — The chapter states handpicking is a convenient method when the particles to be removed are present in small quantities and can easily be picked by hand. If the quantity is large, other methods like winnowing or sieving are more

practical.

(iii) FALSE — Threshing is the process of beating stalks to separate grains from them. It is not used to separate puffed rice from rice grains. A mixture of puffed rice and rice grains can be separated by winnowing, because puffed rice is lighter and gets blown away while heavier rice grains fall down.

(iv) TRUE — Mustard oil and lemon water do not mix; oil is lighter and forms a separate layer on top. After leaving undisturbed, the liquid layer (lemon water) can be gently poured off by tilting the vessel — this is decantation.

(v) FALSE — Sieving is used to separate solid–solid mixtures based on different particle sizes. Rice flour and water form a solid–liquid mixture; sieving cannot separate dissolved or suspended particles in water. Filtration would be the appropriate method here.

Answer: (i) T (ii) T (iii) F — puffed rice and rice grains can be separated by winnowing, not threshing. (iv) T (v) F — rice flour and water should be separated by filtration, not sieving.

Q5 Match the mixtures in Column I with their method of separation in Column II.

Column I:

(i) Gram flour mixed with black gram

(ii) Chalk powder mixed with water

(iii) Corn mixed with potatoes

(iv) Iron powder mixed with sawdust

(v) Oil mixed with water

Column II:

(a) Handpicking

(b) Magnetic separation

(c) Decantation

(d) Sieving

(e) Filtration

SOLUTION

(i) Gram flour mixed with black gram → (d) Sieving

Gram flour (fine particles) and black gram (larger particles) differ in size. Sieving allows flour to pass through while black gram stays on the sieve.

(ii) Chalk powder mixed with water → (e) Filtration

Chalk powder is insoluble in water. Passing the mixture through a filter paper collects the chalk as residue and lets clear water through as filtrate.

(iii) Corn mixed with potatoes → (a) Handpicking
Corn and potatoes are solid components that differ in size, colour, and shape. They can be picked apart by hand.

(iv) Iron powder mixed with sawdust → (b) Magnetic separation
Iron is a magnetic substance and gets attracted to a magnet. Moving a magnet through the mixture pulls out the iron powder, leaving sawdust behind.

(v) Oil mixed with water → (c) Decantation
Oil and water do not mix. Oil being lighter forms a separate layer on top. After leaving undisturbed, the water can be poured off by tilting the vessel.

Answer: (i)→(d), (ii)→(e), (iii)→(a), (iv)→(b), (v)→(c)

Q6 In what situations would you use decantation instead of filtration to separate solids from liquids?

SOLUTION

Decantation is used when the solid is heavier than the liquid and settles at the bottom on its own (sedimentation), and we do not need a completely clear liquid.
It is preferred when:
— The solid particles are heavy and settle quickly without a filter (e.g., tea leaves settling in tea, mud settling in water).
— A filter or filter paper is not available.
— A small number of particles still remaining in the liquid is acceptable.
The chapter notes that decantation does not completely separate all solid particles, so filtration is better when a fully clear liquid is needed.
Examples from the chapter: removing tea leaves from tea by letting them settle and pouring, and washing rice and pulses.

Answer: Use decantation when the solid is heavy and settles quickly, and when complete removal of all particles is not required (e.g., washing rice, settling tea leaves). Use filtration when a fully clear liquid is needed.

Q7 Can you relate the presence of nasal hair to any separation process?

SOLUTION

Yes, nasal hair acts like a filter.

When we breathe in air, the nasal hair traps dust particles, pollen, and other solid impurities, preventing them from entering the lungs.

The air (like a filtrate) passes through, while solid particles (like residue) are held back by the hair — exactly like filtration through a filter paper or cloth.

This is a natural filtration process inside our body.

Answer: Nasal hair acts as a natural filter — it traps dust and solid particles from the air we breathe in, just as a filter paper traps solid particles from a liquid.

Q8 During the COVID-19 pandemic, all of us wore masks. Generally, what material are they made of? What is the role of these masks?

SOLUTION

Masks are generally made of multiple layers of cloth (cotton, non-woven fabric, or special filter material such as polypropylene).

Some masks, like N95 masks, use fine-fibre filter layers with very small pores.

The role of masks is filtration — they filter out fine droplets and particles (including virus-carrying droplets) from the air we breathe in and out.

The small pores in the mask material trap the droplets or particles (residue) while allowing air (filtrate) to pass through.

This is similar to filtration through a cloth or filter paper, as described in the chapter.

Answer: Masks are made of layered cloth or fine-filter material. They work by filtration — the mask's fine pores trap virus-carrying droplets and particles while allowing air to pass through.

Q9 A mixture containing potatoes, salt and sawdust has been given to you. Outline a stepwise procedure for separating each component from this mixture.

SOLUTION

Step 1 — Handpicking: Pick out the potatoes by hand, since they are large solid pieces that can be easily identified and removed from the mixture.

Step 2 — Add water: Add water to the remaining mixture of salt and sawdust. Salt

dissolves in water to form a salt solution; sawdust does not dissolve and remains floating or suspended.

Step 3 — Filtration: Filter the mixture through a filter paper or cloth. Sawdust is collected as residue on the filter paper. The salt solution passes through as filtrate.

Step 4 — Evaporation: Heat the salt solution in a china dish. Water evaporates, leaving behind dry salt.

Result: Potatoes (by handpicking), sawdust (by filtration), and salt (by evaporation) are each separated.

Answer: Step 1: Handpick the potatoes. Step 2: Add water — salt dissolves, sawdust does not. Step 3: Filter to separate sawdust (residue) from salt solution (filtrate). Step 4: Evaporate the salt solution to recover salt.

Q10 Read the following story titled 'Intelligent Leela' and tick the most appropriate options. Provide a suitable title of your choice for the paragraph.

Leela was working in the farm with her father when she realised that they left their drinking water at home. Before her father felt thirsty/hungry, she went to the nearby pond to fetch some water/grains. After obtaining some water in the container, she noticed that the water was muddy and fit/unfit for drinking. To purify the water, she kept it for some time and then she filtered/churned the muddy water using a piece of paper/muslin cloth. Leela, then, cooled/boiled the water for about 10 minutes in a covered pan. After cooling/boiling, she filtered/churned it again and made it fit/unfit for drinking. She served this water to her father while having food, who blessed her and appreciated her efforts.

SOLUTION

Correct options (ticked):

— 'thirsty' (her father was in the farm and needed water, not food)

— 'water' (she went to fetch water from the pond, not grains)

— 'unfit' (muddy water is unfit for drinking)

— 'filtered' (she used a piece of muslin cloth to filter the muddy water)

— 'muslin cloth' (cloth with fine pores acts as a filter; filter paper is not available in a field)

— 'boiled' (boiling kills germs; cooling does not purify water)

— 'cooling' (after boiling, she let it cool before drinking)

— 'filtered' (she filtered it again after boiling to remove any remaining particles)

— 'fit' (after filtering and boiling, the water became fit for drinking)

Methods of separation used: Sedimentation and decantation (let muddy water settle), Filtration (muslin cloth), and heating/boiling (not a separation method but a purification step).

Suitable title: 'Leela's Smart Solution' or 'How Leela Purified Water'

Answer: Correct options: thirsty, water, unfit, filtered, muslin cloth, boiled, cooling, filtered, fit. Suitable title: 'Leela's Smart Solution'. Methods used: sedimentation, filtration (muslin cloth), and boiling.