

Separation Of Mixture – Experiment, Viva Voce

Experiment

Aim

To separate the components of a mixture of sand, common salt and ammonium chloride (or camphor) by sublimation.

Theory

1. Natural substances are not chemically pure. Different methods of separation are used to get individual components from a mixture. But, before separating any components from a mixture one must have sound knowledge of its physical and chemical properties so that separation can be done with ease.
2. Sand, common salt and ammonium chloride form a heterogeneous mixture which can be separated easily through simple physical methods of separation.
3. In the mixture given ammonium chloride is a sublimating substance. On heating the mixture, sublimating substance directly changes into gaseous state, its fumes are collected and cooled to get solid sublimate.
4. To separate mixture of salt and sand following processes are used:
 - Dissolve the mixture in water → as one substance is soluble and the other (sand) is insoluble.
 - Sedimentation' sand settles down at the bottom of the solution.
 - **Filtration:** salt + sand + water solution is filtered to separate sand particles completely from it.
 - **Evaporation:** The water from salt solution is evaporated by heating to get salt.

Materials Required

1. A China dish, tripod stand, a wire gauze, a Bunsen burner, glass funnels, cotton, a glass rod, a beaker, filter paper, a clamp stand.

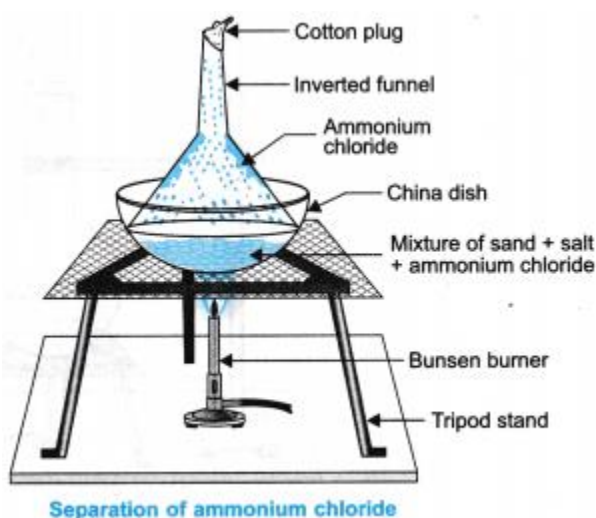
Chemicals Required

1. Sand, common salt, ammonium chloride (or camphor powder), and distilled water.

Procedure

1. **Sublimation**
Separation of ammonium chloride from the given mixture.
 - Take a tripod stand, place a wire gauze over it.

- Keep the china dish with the given mixture on the wire gauze.
- Place the glass funnel in an inverted position on the mixture and plug the stem hole of the funnel with cotton.
- Heat the mixture with Bunsen burner or spirit lamp, for few minutes (till you see white fumes released from the mixture).
- Turn off the burner and allow the fumes to collect on the inner side of the funnel.
- Remove the funnel to collect the deposited ammonium chloride on the funnel.
- Place the funnel again on the mixture, heat it and collect all the white fumes that comes out of the mixture. This procedure will continue till all the white fumes are collected and on further heating no more white fumes are released. The left out mixture has only salt and sand.

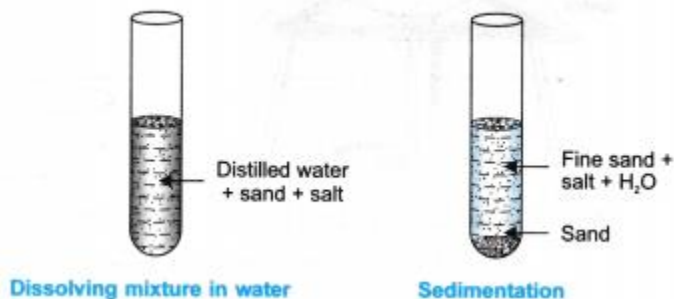


2. Sedimentation and Decantation/Filtration

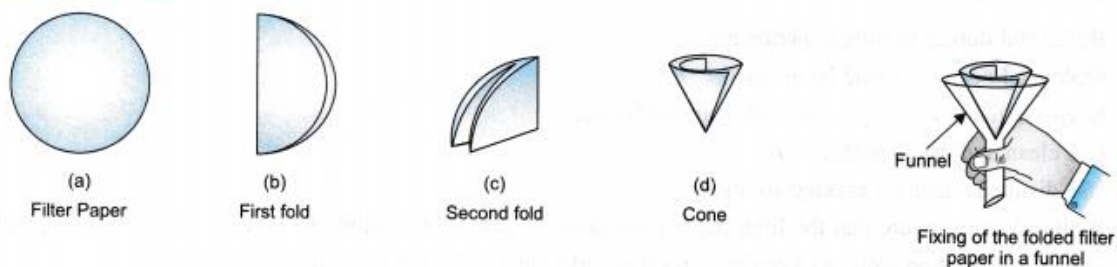
Separation of sand from the mixture

- The mixture left in the last step of sublimation is transferred into a beaker.
- Add 5-10 mL of distilled water into the mixture (water should be sufficient to dissolve the salt into it) and stir it with glass rod.
- Make a cone of filter paper as shown in the diagram. Fix this cone in the glass funnel. Place the funnel over tripod stand or clamp it on the stand. Place a clean beaker under the stem of the funnel.
- Allow the mixture to stand so that sand particles settle down in the beaker.
- Now transfer the solution into the funnel with filter paper slowly for filtration.
- The residue collected on the filter paper is sand and the filtrate is salt solution.
- Collect the sand from the beaker and filter paper, dry it to get the sand completely separated from the mixture.

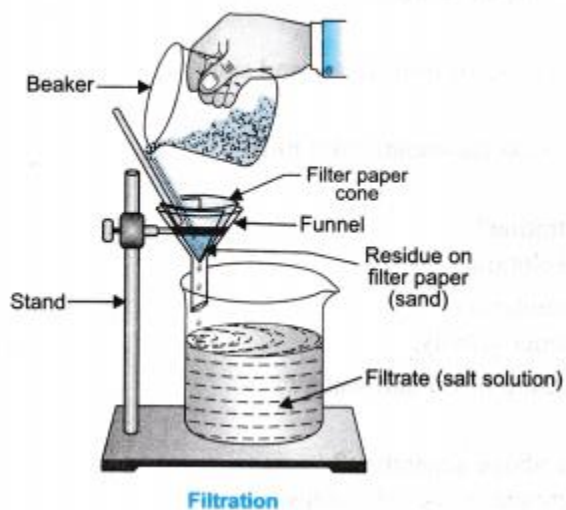
• Dissolving the Mixture, Sedimentation and Decantation



• Filter Paper Cone



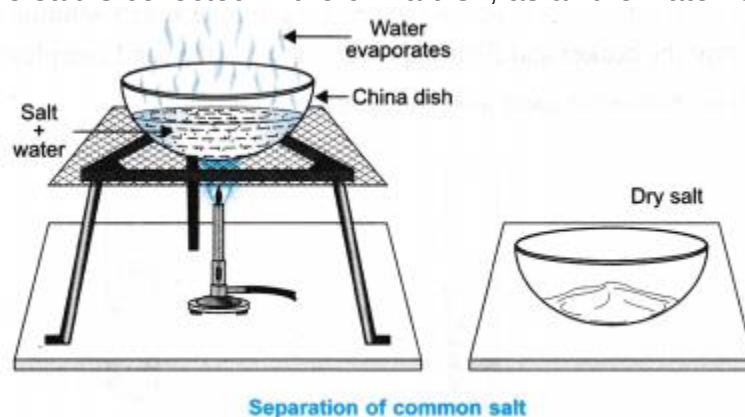
• Filtration of Sand & Salt Solution



3. Evaporation Separation of common salt.

- The filtrate obtained in the beaker in previous step consists of common salt solution. Transfer it to the china dish.
- Place the china dish on tripod stand with Bunsen burner and heat it in low flame (controlled heating) till all water gets evaporated.

- The salt is collected in the china dish, as all the water is evaporated.



Precautions

1. Be careful during heating experiments.
2. Prolonged heating should be avoided.
3. Keep the flame low if you are using Bunsen burner.
4. Use clean and dry apparatus.
5. Use distilled water for making solution.
6. While filtering ensure that the filter paper cone does not tear up and allow the mixture to pass slowly through it.
7. During sublimation, you can keep an extra plugged funnel to collect the dense white fumes.

VIVA VOCE

Question 1:

How will you separate a mixture of sand and camphor?

Answer:

By sublimation.

Question 2:

How can you separate the mixture of iron filings and sand?

Answer:

By magnet.

Question 3:

Name the technique used to separate cream from milk.

Answer:

Centrifugation.

Question 4:

What is the principle for filtration?

Answer:

The size of particles in the solution.

Question 5:

What is the principle for decantation?

Answer:

Settling down of particles under gravity.

Question 6:

How will you separate a mixture of oil and water?

Answer:

By using separating funnel.

Question 7:

What is the principle for the above separation?

Answer:

Immiscible liquids and difference in their densities.

PRACTICAL BASED QUESTIONS

Question 1:

Name two sublimating substances.

Answer:

Camphor, ammonium chloride.

Question 2:

How will you separate a mixture that has soluble substance A and insoluble substance B?

Answer:

It can be separated by dissolving in distilled water, followed by filtration and then evaporation.

Question 3:

What is the principle of centrifugation?

Answer:

Difference in the densities of substances in a mixture.

NCERT LAB MANUAL QUESTIONS

Question 1:

If in the first step the mixture had been dissolved in water what would have been the

difficulty in separation?

Answer:

The mixture given for separation is sand, common salt and ammonium chloride. The later two (i.e., common salt and ammonium chloride) dissolve in water. If the mixture had been dissolved in water then the separation of the constituents would be a difficult task.

Question 2:

Instead of common salt if one component in the given mixture is sulphur, how would you carry out separation process then?

Answer:

The steps would be:

1. Sublimation to remove ammonium chloride which will sublime and can be collected.
2. Dissolve sulphur in carbon disulphide and filter, the filtrate would be dissolved sulphur and the sand can be separated.
3. By heating the filtrate at controlled temperature, sulphur can be collected.

Question 3:

Can the two components of a mixture that are soluble in water be separated by any technique? Justify your answer.

Answer:

The separation can be based on the principle of difference in their boiling point where distillation process can be used.

MULTIPLE CHOICE QUESTIONS (MCQs)

Questions based on Procedural and Manipulative Skills

Question 1:

The naphthalene balls kept in the store areas disappear due to

- (a) evaporation
- (b) fumigation
- (c) sublimation
- (d) distillation.

Question 2:

Which of the following can be separated by the method of sublimation?

- (a) sand
- (b) ammonium chloride
- (c) sodium chloride
- (d) chalk powder.

Question 3:

To separate the components of a mixture of sand, common salt and ammonium chloride, the correct sequence is:

- (a) sublimation, dissolving in water, filtration and evaporation
- (b) sublimation, dissolving in water, decantation and filtration
- (c) sublimation, filtration, heating, evaporation
- (d) sublimation, evaporation, filtration and decantation.

Question 4:

Recovery of salt from salt solution can be quickly done by:

- (a) filtration
- (b) evaporation
- (c) distillation
- (d) none of these.

Question 5:

Sublimation can be used to separate

- (a) volatile and non-volatile liquids
- (b) volatile and non-volatile solids
- (c) miscible and immiscible liquids
- (d) none of these.

Question 6:

What is the first step involved in the separation of a mixture of sand, common salt and ammonium chloride?

- (a) Magnetic separation
- (b) chromatography
- (c) sublimation
- (d) sedimentation and decantation.

Question 7:

To separate a mixture of common salt and ammonium chloride by sublimation the following apparatus was given by the laboratory assistant to a student. Two 200 mL beakers, iron stand, China dish, wire gauze, Bunsen burner, a glass rod, cotton wool. The part of the apparatus missing is:

- (a) filter paper
- (b) glass funnel
- (c) thermometer
- (d) petri dish.

Question 8:

To separate a mixture of sand, common salt, iron filings and sulphur, a student added carbon disulphide to the mixture in a test tube and shook it well. He observed that one component dissolved. This component must be:

- (a) sulphur
- (b) sand
- (c) common salt
- (d) iron filing.

Question 9:

Which of the following can be subjected to sublimation?

- (a) NH_4Cl
- (b) Camphor
- (c) Naphthalene
- (d) All of these.

Question 10:

While heating ammonium chloride and NaCl mixture, keep your face away from vapours because

- (a) Chlorine vapours may cause eye irritation
- (b) Ammonia vapours may cause eye and nose irritation
- (c) Sodium chloride vapours may cause irritation in eyes
- (d) Ammonium chloride vapours may block the nose.

Question 11:

What is the order of methods applied to separate the components of a mixture of salt, sand and ammonium chloride?

- (a) Dissolving in water, evaporation and sublimation
- (b) Dissolving in water, filtration, evaporation and sublimation
- (c) sublimation, dissolving in water, filtration and evaporation
- (d) Moving a magnet, dissolving in water and sublimation

Question 12:

The components of compound can be separated by using

- (a) Physical method
- (b) Chemical method
- (c) Cannot be separated by using any method
- (d) None of these

Questions based on Observational Skills

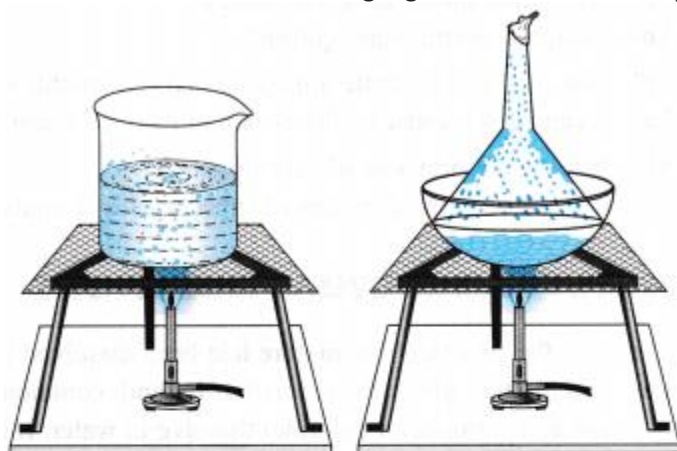
Question 13:

The colour of pure ammonium chloride is

- (a) blue
- (b) white
- (c) green
- (d) brown.

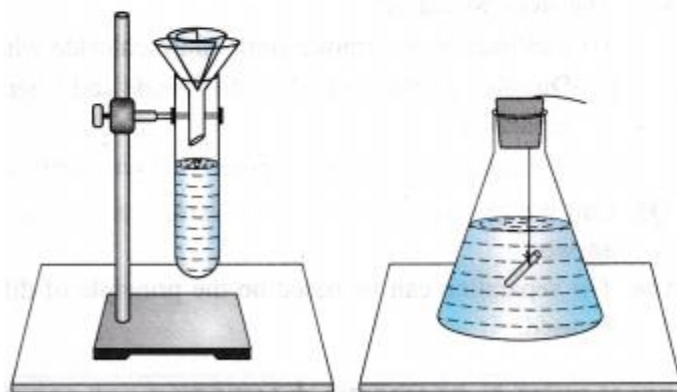
Question 14:

Which one of the following figure describes the process of sublimation?



(A)

(B)



(C)

(D)

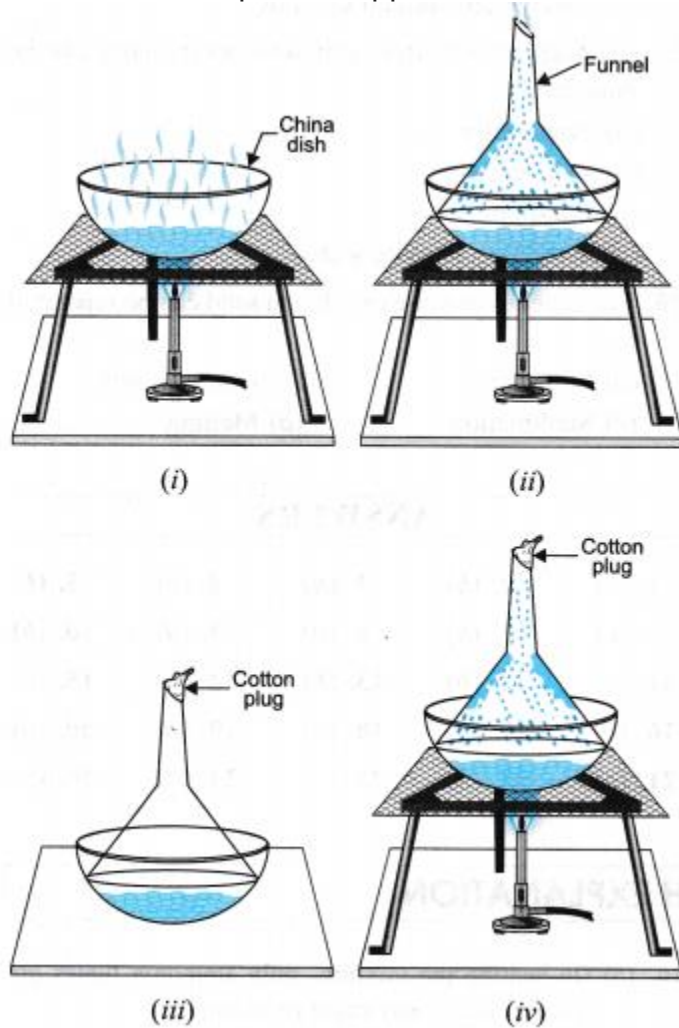
Question 15:

When a mixture of common salt and ammonium chloride is heated, it is observed that:

- (a) solid common salt gets deposited on the cooler parts of the funnel while solid ammonium chloride remains in the China dish.
- (b) mixture of common salt and ammonium chloride turns into greenish crystals when allowed to cool,
- (c) ammonium chloride gets deposited on the cooler parts of the funnel and solid common salt remains in the China dish.
- (d) droplets containing both common salt and ammonium chloride appear on the upper part of the funnel while some molten mixture of common salt and ammonium chloride remains in the China dish.

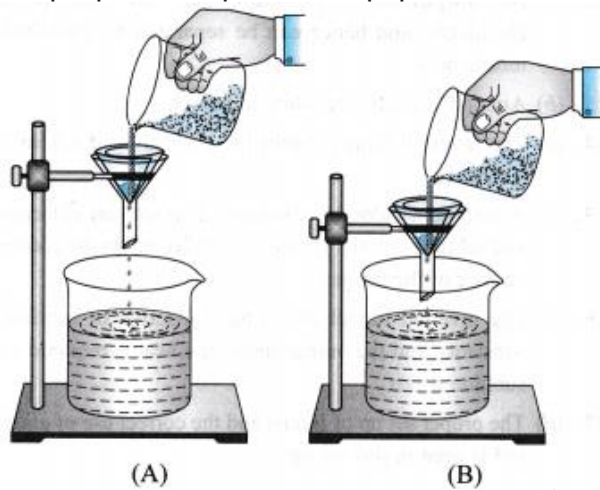
Question 16:

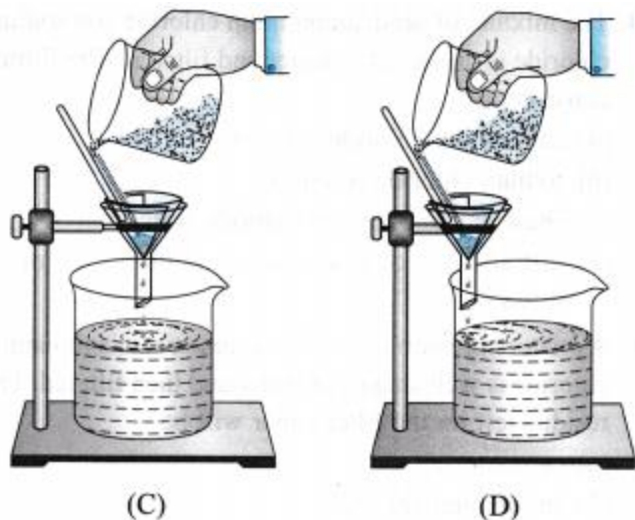
The correct set-up of the apparatus for sublimation is:



Question 17:

The proper set-up of the equipment for filtration is shown in figure:

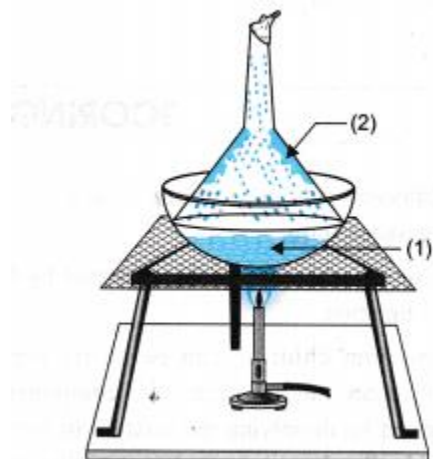




- (a) A
- (b) B
- (c) C
- (d) D

Question 18:

In the diagram, the method of separation of a mixture of ammonium chloride and common salt by the method of sublimation is shown. In this the components 1 and 2 after separation respectively are:



- (a) common salt and ammonium chloride.
- (b) ammonium chloride and common salt.
- (c) both ammonium chloride.
- (d) both common salt.

Questions based on Reporting and Interpretation Skills

Question 19:

A mixture consists of salt, chalk and ammonium chloride, the substance separated first

will be

- (a) salt
- (b) chalk
- (c) salt and ammonium chloride
- (d) ammonium chloride.

Question 20:

The mixture of sand, ammonium chloride and sodium chloride is dissolved in water and filtered. The filtrate consists of:

- (a) ammonium chloride solution
- (b) sodium chloride solution
- (c) chalk and ammonium chloride solution
- (d) salt sodium chloride and ammonium chloride solution.

Question 21:

A mixture of marble powder, common salt, ammonium chloride is well shaken in water and then filtered. The residue left on the filter paper will be

- (a) common salt
- (b) ammonium chloride
- (c) marble powder
- (d) common salt and marble powder.

Question 22:

A mixture of common salt and water can be separated completely by the process of:

- (a) filtration
- (b) distillation
- (c) sublimation
- (d) centrifugation

Question 23:

Which of the following will give residue on filter paper?

- (a) water + CuSO_4
- (b) water + NaCl
- (c) water + Chalk
- (d) water + ammonium chloride

Question 24:

Recovery of salt from salt solution in water can be done by:

- (a) evaporation
- (b) sedimentation
- (c) filtration
- (d) dissolving in more water

Question 25:

The aqueous mixture of salt and sand can be separated by

- (a) Filtration
- (b) Condensation
- (c) Sublimation
- (d) Melting

SCORING KEY WITH EXPLANATION

1. (c) Naphthalene sublimes; means solid changes directly into gaseous form.
2. (b) Ammonium chloride can be separated by the method of sublimation.
3. (a) Ammonium chloride can be easily separated by sublimation and the other two components can be separated by dissolving the mixture in water. Sodium chloride dissolves in water but sand does not and can be separated by filtration.
4. (c) Distillation is a fast process and is used to separate the salt quickly and evaporation is a slow process.
5. (b) Volatile solids substances quickly changes from solid to gas as compared to non-volatile solids.
6. (c) Ammonium chloride sublimes and can be separated from the given mixture by sublimation.
7. (b) Glass funnel will be required to collect the fumes.
8. (a) Sulphur dissolves in carbon disulphide and the other substances will not dissolve in it.
9. (d) Ammonium chloride, camphor and naphthalene, all undergo sublimation as they are volatile.
10. (b) On heating the mixture only ammonia fumes are released which may cause irritation.
11. (c) Ammonium chloride can be easily separated by sublimation and the other two components can be separated by dissolving the mixture in water. Salt dissolves in water and sand is filtered out.
12. (b) In compounds, the components are combined chemically and hence can be separated by chemical means only.
13. (b) Ammonium salts are white in colour.
14. (b) The inverted funnel shows the collection of sublime substance.
15. (c) Ammonium chloride is volatile than sodium chloride and sublimes easily. Hence, it is collected on the cooler surface of the funnel.
16. (d) The inverted funnel shows the collection of sublime substance and the burner shows the heat is required to sublime it fast.
17. (d) The proper set up of funnel and the correct use of glass rod is seen in this set up.
18. (a) Ammonium chloride sublimes and is collected on the cooler surface of funnel but sodium chloride remains in the dish as it has high melting point.
19. (d) Ammonium chloride can be easily separated by sublimation and the other two components can be separated by dissolving the mixture in water and by filtration.
20. (d) Both sodium chloride salt and ammonium chloride salt are soluble in water but sand is not.

- 21. (c) Marble powder is not soluble in water but common salt and ammonium chloride dissolves in water.
- 22. (b) Common salt dissolves in water and can be separated by distillation from the solution.
- 23. (c) Only chalk is not soluble in water amongst the given mixtures hence can be separated by filtration.
- 24. (a) Dissolved salt can be obtained by evaporation (slow process) or by distillation (fast process) from the solution.
- 25. (a) Sand does not dissolve in water and can be separated by filtration.