11.SEPARATION OF SOLID - SOLID MIXTURES

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Which of the following is a sublimable solid?
   A) Sodium chloride B) Camphor
   C) Potassium nitrate D) Limestone

Answer:B

Solution:A sublimable solid is one that changes directly from the solid state to the gaseous state without passing through the liquid state when heated.

Let's check the options:

A) Sodium chloride – Does not sublime; it melts when heated.

B) Camphor – Sublimes at room temperature and upon heating.

C) Potassium nitrate – Melts, does not sublime.

D) Limestone – Decomposes on strong heating ($CaCO_3 \rightarrow CaO + CO_2$), not sublimation.

2. In the mixture of sulphur and sand, separation is best achieved by:
   A) Sublimation B) Magnetic separation
   C) Solvent extraction using CS_2 D) Fractional crystallization

Answer:C

Solution:Sulphur dissolves in carbon disulfide (CS2), sand does not.

Sublimation: Sulphur sublimes, but not as easily as camphor or iodine; sand remains.

But the simplest and most effective lab method is solvent extraction using CS2 because sulphur dissolves completely, leaving sand behind.

3. The principle of magnetic separation depends on: **(FA & SA- 2 Marks)**
   A) Density difference B) Electrical conductivity difference
   C) Magnetic property D) Solubility difference

Answer:C

Solution:Magnetic separation works when one component is magnetic (like iron) and the other is non-magnetic.

4. Winnowing is based on:

A) Magnetic property B) Particle size difference
C) Density difference in air D) Sublimation property

Answer:C

Solution:Winnowing uses air to separate lighter husk from heavier grains → based on density difference in air (or difference in aerodynamic properties).

5. Which of the following pairs can be separated by fractional crystallization?
A) Sodium nitrate and sodium chloride
B) Sodium chloride and sand
C) Iodine and iron filings
D) Sulphur and iron

Answer:A

Solution:Fractional crystallization works when two solutes have different solubilities in a solvent and crystallize at different concentrations/temperatures.
Sodium nitrate and sodium chloride have different solubility curves in water ? can be separated by fractional crystallization.

6. Sublimation involves direct conversion of: **(FA & SA- 3 Marks / 4 Marks)**
A) Solid → Liquid B) Solid → Vapour
C) Liquid → Vapour D) Vapour → Solid

Answer:B

Solution:In sublimation, a solid changes directly into vapour without passing through the liquid state (e.g., iodine, camphor, naphthalene)

7. Electrostatic separation works on the difference in:
(FA & SA- 5 Marks / 8 Marks)
A) Density of solids B) Electrical conductivity
C) Solubility in solvents D) Magnetic property

Answer:B

Solution:It uses electrical charge: particles are charged differently based on electrical conductivity, so they separate in an electric field.

8. Separation of bran from flour is achieved by:
A) Handpicking B) Sieving C) Winnowing D) Sublimation

Answer:B

Solution:Bran particles are larger and coarser compared to fine flour particles.
Sieving is used to separate particles of different sizes.

9. Separation of chalk powder and sand by water is an example of:
A) Solvent extraction B) Gravity separation
C) Flotation method D) Magnetic separation

Answer:B

Solution:Chalk powder is lighter and may float/suspend, sand is heavier and settles.
Adding water and allowing sand to settle, then decanting or filtering — this is gravity separation (also called sedimentation and decantation).
Flotation method usually uses differences in wettability with air bubbles, not just water settling.

10. Which of the following cannot be separated by sublimation?
A) Naphthalene + sand B) Ammonium chloride + NaCl
C) Iodine + sand D) Sodium chloride + potassium chloride

Answer:D

Solution:Sublimation works if one component sublimes and the other does not.

A) Naphthalene + sand → Naphthalene sublimes, sand remains → separable.

B) Ammonium chloride + NaCl → Ammonium chloride sublimes, NaCl doesn't →separable.

C) Iodine + sand → Iodine sublimes, sand remains → separable.

D) Sodium chloride + potassium chloride → Neither sublimes (both are ionic solids that melt on heating) → cannot be separated by sublimation.

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. Camphor is soluble in
A) Water B) Ethanol C) Ether D) Acetone

Answer:B,C,D

Solution:Water →Insoluble
Ethanol →Soluble
Ether →Soluble
Acetone →Soluble

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12. Benzene can dissolve
A) Sulphur B) Naphthalene C) Phosphorus D) Ammonium chloride

Answer:A,B,C

Solution:Benzene is a non-polar organic solvent.
Sulphur → Slightly soluble when heated
Naphthalene → Soluble
Phosphorus (white) → Soluble
Ammonium chloride → Ionic compound, insoluble in benzene

13. Sublimable solids are
A) Naphthalene B) Dry ice (solid CO_2)
C) Common salt D) Ammonium chloride

Answer:A,B,D

Solution:Naphthalene → Sublimes
Dry ice (solid CO_2) → Sublimes
Common salt → Does not sublime
Ammonium chloride → Sublimes

Statement Type:

A) Both statement I and II are correct and statement II is correct explanation of statement I.

B) Both statement I and II are correct and statement II is not correct explanation of statement I.

C) Statement I is correct and statement II is incorrect.

D) Statement I is incorrect and statement II is correct.

14. **Statement I** : We can separate cobalt filings from copper filings by magnetic separation.
Statement II : One of the components is magnetic in nature.

Answer:A

Solution:Cobalt is ferromagnetic (strongly magnetic), copper is not.
So magnetic separation works.
Statement II is true and explains why Statement I is true.

15. **Statement I** : Mixture of rice and husk can be separated by winnowing.
Statement II : Winnowing separates substances based on density difference in air.

Answer:A

Solution:Winnowing works because husk is lighter and air carries it away, rice is heavier and falls straight down → based on density difference in air.
Both correct, and II explains I.

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Comprehension Type:

Comprehension - I

By sublimation method, components are separated when one of them directly changes to vapour without forming liquid.

16. Which among the following can be separated from common salt by sublimation?
A) Naphthalene B) Iodine C) Camphor D) Potassium nitrate

Answer:A,B,C

Solution:We have common salt (NaCl) mixed with another substance.
Sublimation works if that other substance sublimes (changes directly from solid to vapor on heating) while NaCl does not sublime.
Naphthalene → sublimes
Iodine → sublimes
Camphor → sublimes
Potassium nitrate → does not sublime (melts)

Comprehension - II

Fractional crystallisation is used to separate components having different solubility in the same solvent at different temperatures.

17. Potassium chloride and potassium nitrate mixture can be separated by:
A) Solvent method B) Magnet
C) Fractional crystallisation D) Sublimation

Answer:C

Solution:Mixture: Potassium chloride (KCl) and potassium nitrate (KNO_3)

Solvent method — Both are soluble in water, so simple dissolution won't separate them without using a property like different solubility changes with temperature.

Magnet — Neither is magnetic, so no.

Fractional crystallisation — Yes, because their solubilities in water vary differently with temperature (KNO_3 solubility increases steeply with temperature, KCl solubility increases only slightly). By dissolving in hot water and cooling, KNO_3 crystallizes out first.

Sublimation — Neither sublimes under normal conditions, so no.

Integer type:

18. Among charcoal, sand, and iron filings – how many are heavier components in water?_____

Answer:2

Solution:Charcoal: It is lighter than water floats.

Sand: It is heavier than water → settles down.

Iron filings: They are much heavier than water → settle down.

So, the heavier components in water are:Sand and Iron filings

Matrix Matching Type:

19.

COLUMN -I	**COLUMN-II**
A) Acetone	1. Phosphorus
B) Carbon disulphide	2. Nail polish
C) Water	3. Naphthalene
D) Benzene	4. Potassium nitrate

Answer:A-2,B-1,C-4,D-3

Solution:

A) Acetone	2. Nail polish
B) Carbon disulphide	1. Phosphorus
C) Water	4. Potassium nitrate
D) Benzene	3. Naphthalene

20.

COLUMN -I	**COLUMN-II**
A) Mixture of wheat and husk	1.Magnetic separation
B) Mixture of sand and sawdust	2. Gravity separation
C) Mixture of iodine and salt	3. Sublimation
D) Mixture of iron and sulphur	4. Winnowing

Answer:A–4, B–2, C–3, D–1

Solution:

A) Mixture of wheat and husk	4. Winnowing
B) Mixture of sand and sawdust	2. Gravity separation
C) Mixture of iodine and salt	3. Sublimation
D) Mixture of iron and sulphur	1.Magnetic separation

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. A mixture of camphor and common salt is best separated by:
   A) Distillation B) Sublimation
   C) Crystallisation D) Magnetic separation

Answer:B

Solution:Camphor sublimes, salt does not.
Sublimation is the best method.

2. If a mixture contains sulphur powder and copper filings, the best method to separate them is:
   A) Gravity separation B) Magnetic separation
   C) Solvent extraction with CS_2 D) Sieving

Answer:C

Solution:Sulphur dissolves in CS_2, copper does not.
So solvent extraction with CS_2 is best.

3. Which statement is correct regarding fractional crystallisation?
   A) It separates substances based on boiling point differences.
   B) It separates substances based on different solubilities in the same solvent.
   C) It separates substances only when one is magnetic.
   D) It separates substances based on density difference.

Answer:B

Solution:It uses differences in solubility and crystallization behavior in the same solvent.

4. A farmer separates paddy (rice with husk) from heavier impurities like stones. Which combination of methods is most suitable?
   A) Handpicking + Sieving
   B) Winnowing + Handpicking
   C) Sublimation + Crystallisation
   D) Solvent extraction + Gravity method

Answer:B

Solution:Winnowing removes lighter husk from grains, but stones are heavier — so winnowing won't remove stones.
Handpicking can remove stones.
So Winnowing + Handpicking is practical.

5. Why is water not a suitable solvent for separating sulphur from sand?
   A) Sulphur reacts with water.
   B) Both sulphur and sand are insoluble in water.
   C) Sulphur is soluble in water, sand is not.
   D) Water evaporates before dissolving sulphur.

Answer:B

Solution:Sulphur is insoluble in water, sand is also insoluble in water $\rightarrow$ no

separation by dissolution.

6. Which of the following mixtures can be separated by sublimation?
   A) Chalk powder + Salt B) Iodine + Sand
   C) Iron + Sulphur D) Sugar + Salt

Answer:B

Solution:Iodine sublimes, sand does not.

7. Which of the following is NOT an advantage of magnetic separation?
   A) It is fast.
   B) It requires no chemicals.
   C) It can separate all types of solids.
   D) It works on iron, nickel, and cobalt.

Answer:C

Solution:It cannot separate all types of solids — only magnetic from non-magnetic.

8. A mixture of two soluble salts with different solubilities can be separated by:
   A) Filtration B) Fractional crystallisation
   C) Winnowing D) Magnetic separation

Answer:B

Solution:Used for two soluble salts with different solubilities.

9. Which property is used in winnowing?
   A) Solubility B) Density difference
   C) Magnetic property D) Sublimation tendency

Answer:B

Solution: Winnowing exploits differences in density/weight in air (lighter particles blown away).

10. A student is given a mixture of iron filings, iodine, and sand. What is the correct sequence of separation methods?
    A) Sublimation $\rightarrow$ Magnetic separation $\rightarrow$ Gravity
    B) Magnetic separation $\rightarrow$ Sublimation $\rightarrow$ Gravity
    C) Gravity $\rightarrow$ Sublimation $\rightarrow$ Magnetic separation
    D) Solvent extraction $\rightarrow$ Sublimation $\rightarrow$ Gravity

Answer:B

Solution:First, use magnet to remove iron filings (magnetic separation).
Then sublime iodine (sublimation).
Sand remains — no gravity step needed unless further separation, but here only three components.

JEE MAINS LEVEL QUESTIONS

1. Which method is most suitable to separate grains from husk?

(FA & SA- 2 Marks)

   A) Gravity separation B) Sieving
   C) Winnowing D) Fractional crystallization

Answer:C

Solution:Husk is lighter, grains heavier — traditional method is winnowing (air

blow).

2. Which one is NOT a magnetic substance?
   A) Iron B) Cobalt C) Nickel D) Zinc

Answer:D

Solution:Iron, cobalt, nickel are magnetic; zinc is not.

3. Which method will you suggest to separate a mixture of salt and sawdust?
   A) Magnetic separation B) Sieving
   C) Gravity separation in water D) Sublimation

Answer:C

Solution:Salt dissolves in water, sawdust floats/insoluble $\rightarrow$ add water, salt dissolves, filter out sawdust, evaporate water to get salt.
This is gravity separation in water (or dissolution + filtration).

4. In sublimation, the vapours are usually condensed on:
   A) Walls of the china dish B) Funnel walls or cooling surface
   C) Glass rod dipped in the mixture D) Filter paper

Answer:B

Solution:In lab, a funnel or cold surface is used to condense vapors.

5. The principle behind fractional crystallization is:

(FA & SA- 3 Marks / 4 Marks)

   A) Difference in densities
   B) Difference in solubilities in same solvent
   C) Difference in magnetic properties
   D) Difference in electrical conductivity

Answer:B

Solution:Different solubilities in the same solvent at different temperatures.

6. In the mixture of camphor and NaCl, the sublimable component is:
   A) Sodium chloride B) Camphor
   C) Both D) None

Answer:B

Solution:Camphor sublimes.

7. Handpicking is effective when:
   A) The substances are soluble in water
   B) Substances are magnetic in nature
   C) The components are easily visible and different in size/shape
   D) The mixture contains very fine powders

Answer:C

Solution:Components are easily visible and different in size/shape/color.

8. Froth flotation is a specialized form of:
   A) Sublimation B) Flotation method
   C) Electrostatic separation D) Sieving

Answer:B

Solution:It's a type of flotation method using air bubbles and wetting properties.

9. Which method is commonly used in metallurgy for mineral separation?
   A) Winnowing B) Electrostatic separation
   C) Handpicking D) Sieving

Answer:B

Solution:Electrostatic separation is used in mineral processing.

10. A mixture of iodine and sand is best separated by:

(FA & SA- 5 Marks / 8Marks)

   A) Sieving B) Gravity separation
   C) Sublimation D) Fractional crystallization

Answer:C

Solution:Iodine sublimes, sand does not.

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

1. Choose the correct statements:
   A) Camphor is soluble in alcohol
   B) Sodium chloride is soluble in acetone
   C) Wax is soluble in kerosene
   D) Sugar is soluble in benzene

Answer:A,C

Solution:A) Camphor is soluble in alcohol – Yes, camphor dissolves in ethanol.
B) Sodium chloride is soluble in acetone – No, NaCl is ionic, insoluble in acetone.
C) Wax is soluble in kerosene – Yes, both are non-polar hydrocarbons.
D) Sugar is soluble in benzene – No, sugar is polar, benzene is non-polar.

ComprehensionType:

Comprehension-I

Using solvents, components of a mixture can be separated based on solubility.

2. Identify the solvent used to separate Iodine and Sand:
   A) Water B) Alcohol C) Carbon disulphide D) Kerosene

Answer:B

Solution:Iodine is a non-polar substance, making it soluble in organic solvents such as alcohol, carbon disulfide, and kerosene, but it is only slightly soluble in polar solvents like water. Sand is insoluble in all these solvents.
While carbon disulfide and kerosene also dissolve iodine, alcohol is a more common and widely recognized solvent for this purpose in a laboratory setting

Comprehension-II

There are several methods to separate solid-solid mixtures, based on physical properties such as particle size, density, magnetism, and solubility.*

3. Rice and Sand can be separated by:
   A) Sieving B) Magnetic separation
   C) Solvent extraction D) Handpicking

Answer:A

Solution:Rice grains are much larger than sand particles.
Separation based on particle size difference is done by sieving.

4. Iron filings and Sulphur can be separated by:
   A) Magnetic separation B) Solvent extraction
   C) Filtration D) Gravity separation

Answer:A

Solution:Iron is magnetic, while sulphur is non-magnetic.
Hence, they can be separated using a magnet.

Integer type:

5. Among Paint, Wax, Camphor, Oil, Sugar, how many are soluble in alcohol?_____

Answer:3

Solution:Paint $\rightarrow$ complex mixture (often in organic solvents) $\rightarrow$ Soluble $\rightarrow$ partially; alcohol dissolves paint base
Wax $\rightarrow$ non-polar hydrocarbon $\rightarrow$ Slightly soluble or insoluble
Camphor $\rightarrow$ organic, slightly polar $\rightarrow$ Soluble
Oil $\rightarrow$ non-polar hydrocarbon $\rightarrow$ Insoluble
Sugar $\rightarrow$ polar $\rightarrow$ Soluble

6. Consider the following mixtures:
   i) Sugar and Salt
   ii) Sand and Iron filings
   iii) Chalk powder and Flour
   iv) Camphor and Sand
   v) Gunpowder
   How many of these are solid-solid mixtures ?

Answer:5

Solution:i) Sugar and Salt – both solids
ii) Sand and Iron filings – both solids
iii) Chalk powder and Flour – both solids
iv) Camphor and Sand – both solids
v) Gunpowder – mixture of solids (charcoal, sulfur, KNO_3)
All 5 are solid-solid mixtures.

Matrix Matching Type:

7. **Column I (Mixture)** — **Column II (Separation Method)**

A) Iron filings + Sulphur	1) Evaporation
B) Sand + Water	2) Filtration
C) Camphor + Sand	3) Magnetic separation
D) Sugar + Water	4) Sublimation

Answer:A–3, B–2, C–4, D–1

Solution:

A) Iron filings + Sulphur	3) Magnetic separation
B) Sand + Water	2) Filtration
C) Camphor + Sand	4) Sublimation
D) Sugar + Water	1) Evaporation

KEY

				TEACHING TASK					
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	C	C	C	A	B	B	B	B	D
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
B,C,D	A,B,C	A,B.D	A	A	A,B,C	C	2	A-2,B-1,C-4,D-3	
20-A–4, B–2, C–3, D–1									
				LEARNERS TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)						
1	2	3	4	5	6	7	8	9	10
B	C	B	B	B	B	C	B	B	B
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
C	D	C	B	B	B	C	B	B	C
			JEE ADVANCED LEVEL QUESTIONS						
1	2	3	4	5	6	7			
A,C	B	A	A	3	5	A–3, B–2, C–4, D–1			

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