NSO NATIONAL SCIENCE OLYMPIAD

Sorting and Separation of Materials

1. Which of the following statements is/are correct?
I. Larger solid particles can be separated from smaller ones by filtration.
II. Cream can be separated from milk by churning.
III. A mixture of mud and water can be separated by loading, sedimentation and decantation.
IV. Grains can be separated from stalks by threshing.

(a) I and II only (b) II and IV only
(c) I, II and III only (d) II, III and IV only

2. Which of the following does not represent a characteristic of pure substance?
(a) It has a uniform texture throughout (homogeneous).
(b) It has a fixed boiling point or melting point.
(c) It is made up of different types of particles.
(d) It can be an element or a compound.

3. What are the characteristics of metals?
(a) Good conductors of electricity and heat, solid at room temperature; transparent shine brightly when polished.
(b) Good conductors of electricity and heat; solid at room temperature; opaque except in extremely thin films; do not shine at all when polished.
(c) Bad conductors of electricity and heat; solid at room temperature; opaque except in extremely thin films.
(d) Good conductors of electricity and heat; solid at room temperature; opaque except in extremely thin films; shine brightly when polished.

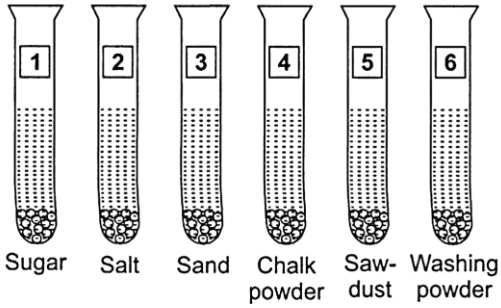
4. Select an incorrect reason for separating components of a mixture.
(a) To separate two or more different but useful components.
(b) To remove undesirable and useless components.
(c) To remove pure or harmless components.
(d) To obtain pure sample of a substance.

5. Match the column I with column II and select the correct option from the codes given below:

	Column I	Column II
P.	A mixture having same composition and properties throughout	(i) Sediment
Q.	A mixture, different parts of which liquid have different composition and properties	(ii) Supernatant
R.	The solid that settles when a heterogeneous solid-liquid mixture is allowed to stand	(iii) Homogeneous mixture
S.	The liquid above the solid settling from a heterogeneous solid-liquid mixture	(iv) Heterogeneous mixture

(a) P - (ii), Q - (iv), R - (iii), S - (i)
(b) P - (i), Q - (iii), R - (ii), S - (iv)
(c) P - (iii), Q - (iv), R - (i), S - (ii)
(d) P - (iii), Q - (iv), R - (ii), S - (i)

6. Take 10 mL of water in 6 test tubes each and add different samples of substances to each test tube as shown in the given figure. Shake the test tubes vigorously for a couple of seconds and leave them undisturbed. In which of these test tubes, sample substances will remain insoluble in water?



(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 3, 4 and 5 (d) 4, 5 and 6

7. Three groups of materials are given below:
I: Salt, sugar, flour
II: Copper, gold, silver
III: Petrol, kerosene, paper
Identify the property common to each group.

	I	II	III
(a)	Solid	Bad conductors of heat	Liquid
(b)	Edible	Non-metallic	Non-Inflammable
(c)	Edible	Metallic	Inflammable
(d)	Solid	Good conductors of heat	Non-Inflammable

8. Match the column I with column II and select the correct option from the codes given:

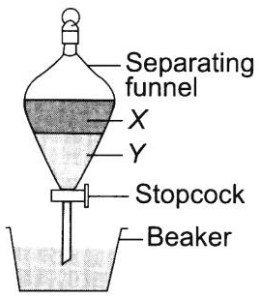
Column I	Column II
P. Chalk-water	(i) A gaseous mixture mixture
Q. Glucose solution	(ii) A solid-gas mixture
R. Fizzy drink	(iii) A homogeneous solid-liquid mixture
S. Smoke	(iv) A heterogeneous solid-liquid mixture
T. Air	(v) Agas-liquid mixture

(a) P - (iii), Q - (iv), R - (v), S - (i), T - (ii)
(b) P - (v), Q - (iii), R - (iv), S - (ii), T - (i)
(c) P - (ii), Q - (i), R - (iv), S - (v), T - (iii)
(d) P - (iv), Q - (iii), R - (v), S - (ii), T - (i)

9. A few statements about centrifugation method are given:
I. The mixture containing very small suspended particles is rotated at a high speed in a centrifuge machine.
II. The denser particles stay at the top.
III. The method is used to separate water from wet clothes in a washing machine.
IV. The method can be used in laboratories for separating plasma and platelets.
The correct statements are

(a) I and IV only (b) I, II and III only
(c) II, III and IV only (d) I, III and IV only

10. Shobha took two liquids (coconut oil and water) in a separating funnel as shown in the figure. What would she observe after some time?



(a) Layer 'X' is coconut oil, 'Y' is water and two distinct layers are formed.
(b) Layer 'X' is water, 'Y' is coconut oil and two distinct layers are formed.
(c) Layers 'X' and 'Y' are miscible to some extent, hence do not form distinct layers.
(d) Coconut oil is first collected in the beaker.

11. Study the given table showing some daily D used items which can be made from more than one material.

	Items	Wood	Plastic	Metal	Glass
(i)	Cooking pot	√	√	×	×
(ii)	Storage contain-er	√	√	√	√
(iii)	LPG cylinder	√	√	×	√
(iv)	Tea cup	√	√	√	×

Which of these are incorrect?
(a) (i) and (iv) (b) (i), (iii) and (iv)
(c) (i) and (iii) (d) (ii) and (iii)

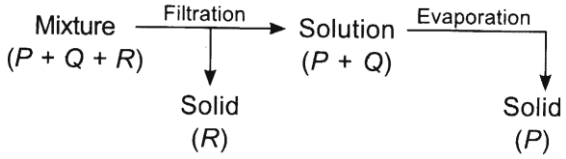
12. A science teacher labelled three glass slides as P, Q and R. She painted slide Q with light blue colour, slide R with black colour and slide P was left as such.
Then she asked students to put the slide on a white paper having (X) mark on it. Students will be able to see the mark clearly (or partially)
(a) In slide P as it is translucent
(b) In slide Q as it is translucent
(c) In slide R as it is opaque
(d) In all the slides as paint does not change the nature of glass.

13. Depending upon the nature of the constituents present in a mixture, Suhana, a class 6 student suggested some methods of separation as shown in the table.

	Types of mixture	Methods of separation
1.	Solid - Solid	Handpicking, Sieving
2.	Solid - Liquid (insoluble)	Sedimentation-Decantation, Filtration
3.	Liquid - Liquid (immiscible)	Decantation, Separating funnel
4.	Solid - Liquid (soluble)	Filtration, Decantation
5.	Liquid - Liquid (miscible)	Distillation

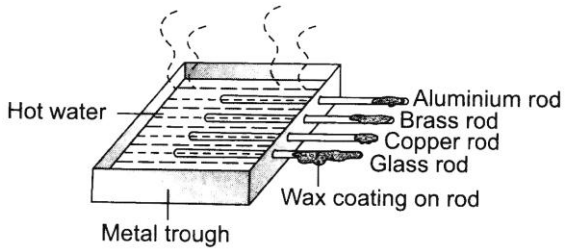
Which of these is/are incorrect method(s) of separation?
(a) 1 and 2 only (b) 3 only
(c) 1 and 5 only (d) 4 only

14. Study the given flowchart carefully.



P, Q and R could be respectively
(a) Chalk powder, water and sawdust
(b) Salt, water and sugar
(c) Sugar, water and sawdust
(d) Sawdust, water and sugar.

15. Four rods of equal length and thickness but of different materials are coated with wax in the same manner. They are fixed to a trough containing hot water. The given diagram illustrates what happens to the wax on each rod after five minutes.

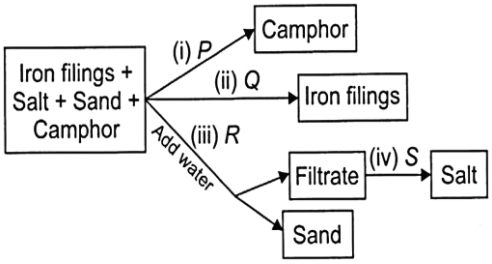


What can you conclude from the given diagram?
(i) The aluminium rod conducts heat better than the brass rod.
(ii) The aluminium rod conducts heat better than the copper rod.
(iii) The glass rod conducts heat better than the copper rod.
(iv) The wax on the copper rod melts faster than the wax on the brass rod.

(a) (i) and (iv) (b) (ii) and (iii)
(c) (i), (ii) and (iii) (d) (ii), (iii) and (iv)

Achievers Section (HOTS)

16. Study the given flowchart and identify the processes P, Q, R and S carried out in the given sequence for separation of the mixture.



	P	Q	R	S
(a)	Sublimation	Magnetic	Filtration	Evaporation
(b)	Magnetic separation	Filtration	Sublimation	Evaporation
(c)	Evaporation	Magnetic separation	Evaporation	Filtration
(d)	Sublimation	Magnetic separation	Evaporation	Filtration

17. Properties of three substances X, Y and Z are given below :
X : Heavy and non-magnetic
Y : Light and non-magnetic
Z : Magnetic
If X, Y and Z are of same size and colour then, which of the following can be used to separate these particles from their mixture?

(a) Handpicking followed by filtration
(b) Winnowing followed by magnetic separation
(c) Magnetic separation followed by sieving
(d) Sublimation followed by distillation

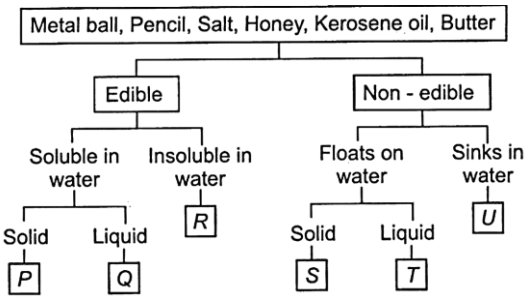
18. The table below shows the properties of four substances K, L, M and N.

Substance	Colour	Taste	Magnetic	Dissolves in water
K	White	Salty	No	Yes
L	Blue	Sweet	No	No
M	White	Sweet	Yes	Yes
N	Black	Metallic	Yes	No

Which two substances would be most difficult to separate when mixed in water?
(a) K and L (b) K and M
(c) L and M (d) M and N

19. The given flowchart was prepared by Natasha for sorting materials into different groups. She

handed over the chart to her teacher with few blanks. Fill in the blanks from the given options.



(a) P-Butter, Q-Honey, R-Salt, S-Metal ball, T-Kerosene oil, U-Pencil
(b) P-Salt, Q-Honey, R-Butter, S-Pencil, T-Kerosene oil, U-Metal ball
(c) P-Salt, Q-Butter, R-Honey, S-Metal ball, T-Pencil, U-Kerosene oil
(d) P-Pencil, Q-Honey, R-Butter, S-Salt, T-Kerosene oil, U-Pencil

20. A brief information about three substances is given :
X: Transparent, smooth to touch and insulator.
Y: Yellow in colour, good conductor of heat and electricity, lustrous.
Z: Man made material, an insulator, used to make switches and handles of cooking utensils.

X, Y and Z could be respectively
(a) Water, copper, aluminium
(b) Glass, gold, plastic
(c) Paper, aluminium, copper
(d) Silver, gold, copper.

Answer key

1. D	**2.** C	**3.** D	**4.** C	**5.** C
6. C	**7.** C	**8.** D	**9.** D	**10.** A
11. B	**12.** B	**13.** D	**14.** C	**15.** A
16. A	**17.** B	**18.** B	**19.** B	**20.** B

HINTS & EXPLANATIONS

1. (d): Larger solid particles are separated from smaller ones by sieving.

2. (c): A pure substance is made up of only one type of particles.

3. (d) Not Available

4. (c): Mixtures are usually separated to obtain a particular substance that we need or to get rid of one or more unwanted substances.

5. (c) Not Available

6. (c): Sand, chalk powder and sawdust are insoluble in water. They settle down in the test tubes. Sugar, salt and washing powder are soluble in water.

7. (c): Salt, sugar, flour - Edible Copper, gold, silver - Metallic Petrol, kerosene, paper - Inflammable.

8. (d): Chalk-water mixture -A heterogeneous solid-liquid mixture Glucose solution - A homogeneous solid- liquid mixture
Fizzy drink - A gas-liquid mixture
Smoke - A solid-gas mixture
Air - A gaseous mixture

9. (d): Denser particles stay at the bottom.

10. (a): Oil and water are immiscible liquids and form two distinct layers in which oil floats on the top of water.

11. (b): Both cooking pot and LPG cylinder cannot be made from wood, plastic and glass. Besides, tea cups are generally made of glass, ceramic and porcelain, etc.

12. (b): Slide P is transparent, Q is translucent and R is opaque.

13. (d): Soluble solid - liquid mixture cannot be separated by filtration and decantation.
It can be separated by evaporation.

14. (c): In the mixture of sugar, water and sawdust, firstly sawdust (R) being insoluble in water, is removed by filtration and then sugar (P) is separated from water (Q) by evaporation.

15. (a): By observing the amount of wax melted in each case in the figure, we can conclude about the conductivity of the rods. As the wax melted maximum on copper rod, it is a good conductor of heat followed by aluminium and brass. Glass is an insulator.

16. (a): Camphor being sublimable in nature, is separated by sublimation (process in which solid is directly converted into vapours on heating). Iron being magnetic in nature, is separated by magnetic separation method. Sand particles being large in size and insoluble in water are separated by filtration.
They are obtained in the filter paper.
On evaporating the filtrate, salt is separated.

17. (b): Heavier (X) particles and lighter (Y) particles are first separated by winnowing and then magnetic (Z) particles are separated from the remaining mixture by magnetic separation.

18. (b): Separation of K and M would be most difficult because both the substances are soluble in water, non-magnetic and have same colour.

19. (b) Not Available

20. (b) Not Available