NCERT Exemplar Solutions for Class 6 Science
Chapter 4: Sorting Materials and Groups

Multiple Choice Questions

1. An iron nail is kept in each of the following liquids. In which case would it lose its shine and appear dull?

(a) Mustard oil
(b) Soft drink
(c) Coconut oil
(d) Kerosene

Solution: (b) Soft drink

Explanation: Soft drinks contain water, carbon dioxide, and acids which cause the iron nail to undergo corrosion (rusting). This chemical reaction makes the nail lose its metallic shine and appear dull. Oils like mustard oil, coconut oil, and kerosene do not contain water or acids, so they do not cause rusting.

2. Pick one material from the following which is completely soluble in water.

(a) Chalk powder
(b) Tea leaves
(c) Glucose
(d) Sawdust

Solution: (c) Glucose

Explanation: Glucose is a simple sugar that dissolves completely in water, forming a clear solution. Chalk powder, tea leaves, and sawdust are insoluble in water and either settle down or float on the surface.

3. You are provided with the following materials:

(i) Magnifying glass
(ii) Mirror
(iii) Stainless steel plate
(iv) Glass tumbler

Which of the above materials will you identify as transparent? (a) (i) and (ii)
(b) (i) and (iii)
(c) (i) and (iv)
(d) (iii) and (iv)

Solution: (c) (i) and (iv)

Explanation: Transparent materials allow light to pass through them completely, enabling us to see objects clearly through them. A magnifying glass and glass tumbler are both made of transparent glass. A mirror has a reflective coating that makes it opaque, and a stainless steel plate is a metal, which is also opaque.

4. Boojho found a bag containing the following materials:

(i) Mirror
(ii) Paper stained with oil
(iii) Magnet
(iv) Glass spectacles

Help Boojho in finding out the material(s) which is/are opaque. (a) (i) only
(b) (iv) only

(c) (i) and (iii)
(d) (ii) and (iv)
Solution: (c) (i) and (iii)
Explanation: Opaque materials do not allow light to pass through them. A mirror is opaque because it has a reflective coating on one side that blocks light transmission. A magnet is typically made of iron or other metals, which are opaque. Paper stained with oil becomes translucent, and glass spectacles are transparent.
5. While doing an activity in class, the teacher asked Paheli to handover a translucent material. Which among the following materials will Paheli pick and give her teacher?
(a) Glass tumbler
(b) Mirror
(c) Muslin cloth
(d) Aluminium foil
Solution: (c) Muslin cloth
Explanation: Translucent materials allow some light to pass through but objects cannot be seen clearly through them. Muslin cloth is translucent because light passes through it, but we cannot see objects clearly through it. A glass tumbler is transparent, while a mirror and aluminium foil are opaque.
6. Which pair of substances among the following would float in a tumbler half filled with water?
(a) Cotton thread, thermocol
(b) Feather, plastic ball
(c) Pin, oil drops
(d) Rubber band, coin
Solution: (b) Feather, plastic ball
Explanation: Objects float in water when their density is less than that of water. Feathers and plastic balls are light and have low density, so they float on water. Cotton thread and thermocol also float, but this option wasn't as clearly correct as (b). Pins and coins are dense and sink, while rubber bands typically sink as well.
7. Which among the following are commonly used for making a safety pin?
(a) Wood and glass
(b) Plastic and glass
(c) Leather and plastic
(d) Steel and plastic
Solution: (d) Steel and plastic
Explanation: Steel is used for the main body of safety pins because it can be shaped into sharp points and is strong and durable. Plastic is used for the protective cap or covering at the tip to prevent injury and to make the pin safer to handle.
8. Which of the following materials is not lustrous?
(a) Gold
(b) Silver
(c) Wood
(d) Diamond
Solution: (c) Wood

Explanation: Lustrous materials have a shiny appearance and reflect light well. Gold, silver, and diamond all have lustrous surfaces. Wood has a dull, non-reflective surface and is therefore not lustrous.

9. Which of the following statements is not true?

(a) Materials are grouped for convenience
(b) Materials are grouped to study their properties
(c) Materials are grouped for fun
(d) Materials are grouped according to their uses

Solution: (c) Materials are grouped for fun

Explanation: Materials are systematically grouped for scientific and practical purposes: for convenience in identification, to study their properties systematically, and to categorize them according to their uses. Grouping materials is not done for entertainment but for educational and practical purposes.

10. Find the odd one out from the following.

(a) Tawa
(b) Spade
(c) Pressure cooker
(d) Eraser

Solution: (d) Eraser

Explanation: A tawa (griddle), spade, and pressure cooker are all made of metal, while an eraser is made of rubber. Therefore, the eraser is the odd one out based on the material composition.

11. Which type of material is used for making the front glass (windscreen) of a car?

(a) Transparent
(b) Translucent
(c) Opaque
(d) All the above

Solution: (a) Transparent

Explanation: Car windscreens are made of transparent glass to ensure that drivers can see the road and surroundings clearly. This is essential for safe driving. Translucent or opaque materials would impair vision and make driving dangerous.

Very Short Answer Questions

12. It was Paheli's birthday. Her grandmother gave her two gifts made of metals, one old dull silver spoon and a pair of lustrous gold earrings. She was surprised to see the difference in the appearance of the two metals. Can you explain the reason for this difference?

Solution: The difference in appearance is due to the chemical properties of the two metals:

- **Silver** reacts with gases like hydrogen sulphide present in the atmosphere, especially in moist air. This reaction forms a dark layer (tarnish) on the surface, causing the silver to lose its shine and appear dull.
- **Gold** is a noble metal that does not react with atmospheric gases or moisture. It maintains its lustrous appearance over time without tarnishing.

13. Mixtures of red chilli powder in water, butter in water, petrol in water, and honey in water were given to Radha, Sudha, Sofia and Raveena, respectively. Whose mixture is in solution form?

Solution: Raveena's mixture (honey in water) is in solution form.
Explanation: Honey dissolves completely in water to form a homogeneous solution where honey molecules are evenly distributed throughout the water. The other mixtures are not solutions because:

- Red chilli powder is insoluble in water
- Butter is insoluble in water
- Petrol is immiscible with water

14. On a bright sunny day, Shikha was playing hide and seek with her brother. She hid herself behind a glass door. Do you think her brother will be able to locate her? If yes, why? If no, why not?
Solution: Yes, Shikha's brother will be able to locate her.
Explanation: Glass doors are made of transparent material, which allows light to pass through completely. Therefore, objects behind transparent materials can be seen clearly. Shikha would be visible through the glass door, making it easy for her brother to spot her.
15. Take a small cotton ball and place it in a tumbler/bowl filled with water. Observe it for at least 10 minutes. Will it float or sink in water and why?
Solution: The cotton ball will **initially float** but will **eventually sink**.
Explanation:

- **Initially:** The cotton ball floats because it is lighter than water (lower density) and contains trapped air in its fibers.
- **After some time:** The cotton ball gradually absorbs water, becoming heavier. As it becomes water-logged, it loses buoyancy and sinks to the bottom.

16. Which among the following materials would you identify as soft materials and why? Ice, rubber band, leaf, eraser, pencil, pearl, a piece of wooden board, cooked rice, pulses and fresh chapati.
Solution: Soft materials: Rubber band, leaf, eraser, cooked rice, and fresh chapati.
Explanation: These materials are considered soft because they can be:

- Easily compressed or squeezed
- Scratched with fingernails
- Deformed by applying gentle pressure
- Bent without breaking

Hard materials: Ice, pencil, pearl, wooden board, and pulses are hard because they resist deformation and cannot be easily compressed or scratched.
17. You are provided with the following materials – turmeric, honey, mustard oil, water, glucose, rice flour, groundnut oil. Make any three pairs of substances where one substance is soluble in the other and any three pairs of substances where one substance remains insoluble in the other substances.
Solution:
Soluble pairs:

1. Honey + Water
2. Glucose + Water
3. Mustard oil + Groundnut oil

Insoluble pairs:

1. Turmeric + Water
2. Rice flour + Water
3. Mustard oil + Water

Explanation: Polar substances dissolve in polar solvents (like water), while non-polar substances dissolve in non-polar solvents (like oils). This follows the principle "like dissolves like."

18. During summer holidays, a group of children collected various materials and tried to group them based on different properties. Help them fill the table below:

Materials: Lump of salt, green grass, broken glass piece, small thermocol box, pen, iron nail, glass marbles, hair, naphthalene ball, piece of sugar candy

Solution:

Material	Appearance	Transparency	Floats/Sinks	Solubility
Lump of salt	Hard	Opaque	Sinks	Soluble
Green grass	Soft	Opaque	Floats	Insoluble
Broken glass piece	Hard	Transparent	Sinks	Insoluble
Thermocol box	Soft	Opaque	Floats	Insoluble
Pen	Hard	Opaque	Floats	Insoluble
Iron nail	Hard	Opaque	Sinks	Insoluble
Glass marbles	Hard	Transparent	Sinks	Insoluble
Hair	Soft	Opaque	Floats	Insoluble
Naphthalene ball	Hard	Opaque	Floats	Insoluble
Sugar candy	Hard	Opaque	Sinks	Soluble

19. Arrange the jumbled words to arrive at the appropriate names of materials and write two uses of each.

Jumbled words: (a) milaunuim (b) tcaslpi (c) soekrnee (d) gavnier

Solution:

(a) **Aluminium**
- Uses: Making aircraft parts, food packaging (aluminium foil)

(b) **Plastic**
- Uses: Making bottles and containers, electrical insulation

(c) **Kerosene**
- Uses: Fuel for cooking stoves, cleaning solvent

(d) **Vinegar**
- Uses: Food preservative, cooking ingredient/condiment

20. Match the objects given in column I with the materials given in column II.

Solution:

Column I	Column II
(a) Surgical instruments	(iii) Steel
(b) Newspaper	(iv) Plant product
(c) Electrical switches	(i) Plastic
(d) Wool	(ii) Animal product

Explanation:
- Surgical instruments need to be strong and sterilizable (steel)
- Newspaper is made from wood pulp (plant product)
- Electrical switches use plastic for insulation

- Wool comes from sheep (animal product)

21. Pick five objects from the word box which are opaque and would sink in water.
Solution:

1. **Coin** - Metal, opaque, dense
2. **Stone** - Mineral, opaque, dense
3. **Key** - Metal, opaque, dense
4. **Pencil** - Wood/graphite, opaque, dense
5. **Eraser** - Rubber, opaque, dense enough to sink

Long Answer Questions
22. Chalk, iron nail, wood, aluminium, candle, cotton usually look different from each other. Give some properties by which we can prove that these materials are different.
Solution:
The materials can be differentiated based on several properties:
Physical Properties:

Material	Hardness	Surface Texture	Lustre	Color	Density
Chalk	Hard	Rough	Non-lustrous	White	Medium
Iron nail	Hard	Smooth	Lustrous	Grey/metallic	High
Wood	Hard	Rough	Non-lustrous	Brown/varied	Medium
Aluminium	Hard	Smooth	Lustrous	Silver	Low
Candle	Soft	Smooth	Non-lustrous	White/colored	Low
Cotton	Soft	Fibrous	Non-lustrous	White	Very low

Additional distinguishing properties:

- **Conductivity:** Iron nail and aluminium conduct electricity; others don't
- **Magnetic properties:** Only iron nail is magnetic
- **Solubility:** Chalk partially dissolves in water; others are insoluble
- **Flexibility:** Cotton is flexible; metals and chalk are rigid
- **Melting point:** Candle melts easily; metals have high melting points

23. Why do you think oxygen dissolved in water is important for the survival of aquatic animals and plants?
Solution:
Dissolved oxygen in water is crucial for aquatic life for the following reasons:
For Aquatic Animals:

- **Respiration:** Fish and other aquatic animals extract dissolved oxygen from water through their gills for cellular respiration
- **Energy production:** Oxygen is essential for breaking down food molecules to release energy (ATP production)
- **Metabolic processes:** All cellular activities require oxygen for proper functioning

For Aquatic Plants:

- **Respiration:** Like all living organisms, aquatic plants need oxygen for cellular respiration, especially during nighttime when photosynthesis stops
- **Root respiration:** Submerged plant roots require dissolved oxygen for their metabolic activities

- **Cellular processes:** Oxygen is needed for various biochemical reactions within plant cells

Ecological Balance:

- Dissolved oxygen maintains the aquatic ecosystem's health
- Insufficient oxygen leads to death of aquatic organisms
- Normal levels: 5-6 mg/L; below 3 mg/L is harmful to most aquatic life

24. Differentiate among opaque, translucent and transparent materials, giving one example of each.

Solution:

Property	Opaque	Translucent	Transparent
Light transmission	No light passes through	Partial light passes through	Complete light passes through
Visibility of objects	Objects cannot be seen	Objects can be seen but not clearly	Objects can be seen clearly
Image formation	No image formed	Blurred/unclear image	Clear, sharp image
Examples	Wood, stone, metal	Frosted glass, tissue paper, oiled paper	Clear glass, crystal clear water, air

Detailed Examples:

Opaque Materials:

- **Wood:** Completely blocks light; you cannot see through a wooden door
- **Stone:** No light transmission; objects behind stones are invisible

Translucent Materials:

- **Frosted glass:** Allows light to pass but scrambles it; you can see light but not clear images
- **Tissue paper:** Light passes through but objects appear blurred

Transparent Materials:

- **Clear glass:** Allows light to pass without distortion; objects are clearly visible
- **Clean water:** Light passes through easily; underwater objects are clearly visible

25. Sugar, salt, mustard oil, sand, sawdust, honey, chalk powder, petals of flower, soil, copper sulphate crystals, glucose, wheat flour are some substances given to Paheli. Help her in identifying soluble and insoluble substances in water.

Solution:

Soluble in Water:

1. **Sugar** - Forms sweet solution
2. **Salt** - Dissolves completely to form saline solution
3. **Honey** - Mixes completely with water
4. **Copper sulphate crystals** - Dissolves to form blue solution
5. **Glucose** - Dissolves completely forming clear solution

Insoluble in Water:

1. **Mustard oil** - Immiscible with water; forms separate layers
2. **Sand** - Settles at the bottom; does not dissolve
3. **Sawdust** - Floats on surface; does not dissolve
4. **Chalk powder** - Settles down; only slightly soluble

5. **Petals of flower** - Remain unchanged; do not dissolve
6. **Soil** - Settles at bottom; insoluble particles
7. **Wheat flour** - Forms suspension; particles settle down

Scientific Explanation:

- **Soluble substances** have particles that interact well with water molecules and break apart to form solutions
- **Insoluble substances** have particles that do not interact significantly with water molecules and remain as separate phases
- The principle "like dissolves like" applies: polar substances dissolve in polar solvents (water), while non-polar substances do not

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Note: This document provides comprehensive solutions with detailed explanations to help students understand the underlying scientific concepts and principles related to material properties and classification.