Class 9 Science Practice Worksheet

New NCERT Syllabus (2026-27) - Exploration Science

Chapter 5: Exploring Mixtures and Their Separation

Section A: Conceptual Section (5 Questions)

Q1. Identify the structural properties of matter mixtures:

(a) A solution that cannot dissolve any more solute at a given specific temperature is called a _____ solution.

(b) The components of a colloidal system consist of a dispersed phase and a _____ medium.

(c) When a strong beam of light passes through a true solution, it does not scatter light because the solute particle size is less than _____ nm.

Q2. Match the specific mixture types with their appropriate classification terms (Solution, Suspension, or Colloid):

(a) Muddy river water left standing: _____

(b) A mixture of iodine dissolved in alcohol (Tincture of Iodine): _____

(c) Milk or shaving cream: _____

Q3. State whether the following statements are True or False:

(a) The process of sublimation can be used to separate a mixture of common salt and ammonium chloride. (***)***

***(b) A heterogeneous mixture always has a completely uniform composition throughout its mass. (***)

(c) Chromatography is a separation technique based on the different solubilities of components in a moving solvent. (_____) [1]

Q4. Write down the precise name of the laboratory separation method used for the following tasks:

(a) Separating cream completely from fresh milk: _____

(b) Separating a mixture of two highly miscible liquids whose boiling points differ by more

than 25°C: _____

(c) Separating distinct colored pigments from a natural flower petal extract:

_____

Q5. A student prepares a chemical solution by dissolving 40 grams of common salt solute in 360 grams of liquid water solvent. Calculate the exact concentration of this solution in terms of mass-by-mass percentage (mass/mass %). Show your calculation steps.

Section B: Logical Section (5 Questions)

Q6. Look carefully at two bottles in a laboratory: Bottle X contains a clear liquid that does not settle down upon standing and shows no light scattering. Bottle Y contains a cloudy liquid that scatters a beam of light clearly, but its particles do not settle over time.

(a) Logically deduce the mixture type inside Bottle X: _____

(b) Logically deduce the mixture type inside Bottle Y: _____

(c) What is the formal scientific name given to the light-scattering phenomenon seen in Bottle Y? _____ [1]

Q7. Two components, Liquid A (boiling point 56°C) and Liquid B (boiling point 59°C), are completely mixed together. A student suggests using simple distillation to separate them. Explain logically why this method will fail, and suggest the correct modification needed.

Q8. You are given a dry powder mixture containing three distinct items: iron filings, common salt, and fine sand grains. Design a logical, sequential workflow of steps to isolate each substance cleanly.

Q9. Iron filings mixed with sulfur powder can behave in two different ways depending on how they are treated:

(a) If the dry powders are simply mixed together at room temperature, can they be

separated using a hand magnet? Why or why not?

(b) If the mixture is heated strongly until it glows, can a magnet still pull out the iron? Logically explain the structural change.

Q10. Predict structural solubility adjustments logically: The solubility of potassium chloride in water is 35 grams at 20°C, but it increases to 54 grams at 80°C. If a saturated solution of potassium chloride is prepared at 80°C and then slowly cooled down to room temperature (20°C), logically deduce what visible change will occur in the beaker. [1]

Section C: High Thinking Section / HOTS (5 Questions)

Q11. A lab assistant needs to recover pure copper sulfate crystals from a highly contaminated sample containing insoluble sand and soluble impurities. Explain why the method of crystallization is preferred over direct evaporation to dryness to obtain a pure sample. Outline the critical filtration step. [1]

Q12. Analyze a concentration scenario: A chemist requires a 15% mass-by-volume (mass/volume %) solution of glucose to run a biochemistry simulation. If they have a volumetric flask filled to a total solution volume of 250 mL, calculate the exact mass of dry glucose solute in grams that must be weighed out and dissolved.

Q13. Air is a homogeneous mixture of various gases like nitrogen (boiling point -196°C), oxygen (boiling point -183°C), and argon (boiling point -186°C). Explain the high-level logic of fractional distillation used to separate these gases from liquid air. Which gas distills out first as the temperature is slowly raised?

Q14. An unknown substance Z is completely dissolved in water. When a beam of light is shone through it, the path of light becomes brilliantly visible. However, when the mixture is passed through a standard semi-permeable filter paper, no residue is left behind on the paper.

(a) Based on these conflicting behaviors, explain why Z cannot be categorized as a true solution or a standard suspension.

(b) What type of operational mixture is Z, and what is the typical particle size range for its solute components? [1]

Q15. Think deeply about water purification: In municipal water treatment plants, surface water from lakes passes through a sedimentation tank, a loading tank, a filtration tank, and a chlorination tank before reaching houses. Explain the logical purpose of adding alum in the loading tank, and contrast it with the purpose of the chlorination tank.

Answer Key (For Teachers and Parents)

Section A:

Q1: (a) saturated, (b) dispersion, (c) 1 nm.

Q2: (a) Suspension (particles settle down), (b) Solution (homogeneous true solution), (c) Colloid (appears homogeneous but is heterogeneous).

Q3: (a) True, (b) False (heterogeneous mixtures have non-uniform compositions), (c) True.

Q4: (a) Centrifugation, (b) Simple Distillation, (c) Paper Chromatography.

Q5: Total mass of solution = mass of solute + mass of solvent = 40 g + 360 g = 400 g.

Mass percentage = (mass of solute / total mass of solution) × 100 = (40 / 400) × 100 = 10%.

Section B:

Q6: (a) True solution, (b) Colloid, (c) Tyndall Effect.

Q7: Simple distillation fails because the difference in boiling points is too small (only 3°C). For miscible liquids with a boiling point difference less than 25°C, fractional distillation using

a fractionating column must be used to ensure clean separation.

Q8: Step 1: Pass a magnet over the mixture to attract and remove the iron filings. Step 2: Add water to the remaining sand and salt mixture; stir so the salt dissolves completely. Step 3: Filter the mixture; the insoluble sand stays on the filter paper as residue. Step 4: Evaporate or crystallize the filtrate liquid to obtain dry common salt.

Q9: (a) Yes, because it is a physical mixture where both iron and sulfur retain their individual chemical properties. (b) No, because heating causes a chemical reaction forming a new compound, Iron Sulfide (FeS). Iron loses its individual magnetic property within a compound.

Q10: As the saturated solution cools from 80°C to 20°C, its solubility drops. The excess dissolved solute can no longer remain dissolved. Crystals of solid potassium chloride (54 g - 35 g = 19 g per 100 g of water) will precipitate out at the bottom of the beaker.

Section C:

Q11: Crystallization is preferred because direct evaporation decomposes or chars sensitive solids (like sugar or copper sulfate) and leaves behind soluble impurities. Crystallization ensures that impurities remain dissolved in the mother liquor while pure crystals form. The sand is removed first by filtering the hot solution.

Q12: Mass-by-volume % = (mass of solute in grams / volume of solution in mL) × 100.

15 = (mass of glucose / 250) × 100

15 = (mass of glucose × 4) / 10

150 = 4 × mass of glucose -> mass of glucose = 150 / 4 = 37.5 grams.

Q13: Liquid air is warmed slowly in a fractional distillation column. Gases separate based on their boiling points. The gas with the lowest boiling point distills out first. Since -196°C is lower than -186°C and -183°C, nitrogen gas distills out first from the top of the column.

Q14: (a) It cannot be a true solution because it scatters light (Tyndall effect). It cannot be a suspension because its particles are small enough to pass completely through filter paper without settling. (b) Z is a Colloid. The typical particle size range is between 1 nm and 1000 nm (or 10^{-9} m to 10^{-6} m).

Q15: Alum is added in the loading tank to help suspended clay particles coagulate and

become heavier, allowing them to settle down quickly (loading process). The chlorination tank does not remove physical particles; its purpose is chemical/biological—to kill harmful germs and bacteria to make the water safe for drinking. [1, 2, 3]
