Lesson Plan: Exploring Mixtures and their Separation (CBSE Class IX 2026-27)

Teacher:

Class: IX

Subject: Science (Subject Code - 086)

Theme/Unit: Exploring Mixtures and their Separation

Chapter: 5 – Exploring Mixtures and their Separation

Estimated Number of Periods: 12

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1. Gist of the Lesson & Curricular Goals

- **Core Syllabus:** Homogeneous and heterogeneous mixtures; Solutions, suspensions, colloids and their properties; Concentration of solutions (% m/m, % m/v, % v/v); Solubility; Separation techniques (crystallization, distillation, paper chromatography, sublimation, centrifugation, and coagulation).

- **Educational Aim:** To investigate the nature and properties of chemical substances, safely handle laboratory apparatus, and apply scientific principles to separate mixtures found in daily life and industrial applications.

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2. Teaching-Learning Plan & Pedagogy

Key Concepts	Competencies (C) & Learning Outcomes	Teaching-Learning Activities (Pedagogy)	Assessment Strategies
Types of Mixtures & Concentration	**C-1.2:** Differentiates between homogeneous and heterogeneous mixtures. • *Outcome:*	• **Real-World Connection:** Analyze the labels of commercial products like milk powder, 5% glucose drips, and 5% v/v vinegar.	• **[Demonstrate Knowledge - VSA]:** *Define* a homogeneous mixture. • **[Application - SA]:** *Calculate* the

	Students will define and calculate the concentration of solutions (% m/m, % m/v, % v/v).	• **Numerical Practice:** Calculate mass by mass percentage ensuring students divide by the *total solution mass* (solute + solvent), not just the solvent.	mass by mass percentage of a solution containing 10 g of salt dissolved in 90 g of water.
Solubility & Crystallization	**C-5.1:** Analyses graphs of solubility. • *Outcome:* Students will explain how temperature affects solubility and demonstrate crystallization.	• **Data Analysis:** Interpret a solubility curve graph (solubility vs. temperature) to predict crystal formation upon cooling. • **Mandatory Practical (Activity 5.3):** Prepare a hot saturated solution of copper sulfate and allow it to cool slowly to obtain pure crystals.	• **[Formulate & Analyze - Case-Based]:** *Interpret* a given solubility curve to find which salt deposits the most crystals when cooled from 80°C to 20°C. • **[Application - Objective]:** *Identify* the purpose of adding dilute sulfuric acid during the crystallization of copper sulfate.
Separating Homogeneous Mixtures	**C-1.2:** Demonstrates separation techniques. • *Outcome:* Students will draw and explain the	• **Visual Mapping:** Draw the setup for distillation, explaining how a difference of at least 25°C in boiling points allows for the separation of miscible liquids	• **[Demonstrate Knowledge - SA]:** *Outline* the principle behind paper chromatography. • **[Analyze &**

	processes of distillation and paper chromatography.	(e.g., acetone and water). • **Hands-on (Activity 5.5):** Use chromatographic paper (or filter paper) to separate the dyes in black ink or leaf extracts using water as a solvent.	**Evaluate - LA]:** *Examine* why fractional distillation is required for crude petroleum instead of simple distillation.
Separating Heterogeneous Mixtures	**C-1.2 & C-8.1:** Classifies mixtures and creates models. • *Outcome:* Students will separate immiscible liquids, sublimable solids, and suspensions.	• **Demonstration:** Use a separating funnel to separate mustard oil and water based on density. Sublime camphor from a sand mixture. • **Model Making:** Build a "Paperfuge" (a hand-powered centrifuge using cardboard and string) to explain how outward forces separate heavier particles from lighter liquids.	• **[Application - SA]:** *Explain* the process of coagulation using alum in muddy water. • **[Formulate & Analyze - Assertion-Reasoning]:** *Evaluate* statements regarding the sublimation of solid carbon dioxide (dry ice).
Colloids & The Tyndall Effect	**C-8.2:** Formulates hypotheses and observes phenomena.	• **Scientific Inquiry:** Pass a laser pointer through beakers of salt water (solution), muddy	• **[Demonstrate Knowledge - Objective]:** *Identify* blood as a solution, suspension, or

	• *Outcome:* Students will classify colloids and demonstrate light scattering.	water (suspension), and milk/water (colloid). Observe which ones scatter light (Tyndall Effect). • **Compare & Contrast:** Chart the differences based on particle size (<1 nm, 1-1000 nm, >1000 nm).	colloid. • **[Application - SA]:** *Distinguish* between the dispersed phase and the dispersion medium in an emulsion like milk.

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3. Assessment Structure & Weightage

Assessments are strictly modeled on the CBSE 2026-27 Theory Question Paper Design (80 marks):

- **Demonstrate Knowledge and Understanding (50%):** Assessed via questions asking students to *state, name, list, identify, define, suggest, describe, outline, and summarize* (e.g., defining a saturated solution, stating the principle of centrifugation).
- **Application of Knowledge/Concepts (30%):** Assessed via questions asking students to *calculate, illustrate, show, adapt, explain, and distinguish* (e.g., calculating % v/v, illustrating the setup for separating immiscible liquids).
- **Formulate, Analyze, Evaluate and Create (20%):** Assessed via questions asking students to *interpret, analyze, compare, contrast, examine, evaluate, discuss, and construct* (e.g., analyzing solubility graphs, evaluating the best separation method for a complex mixture).

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4. Digital Integration & Portfolio Enrichment (Internal Assessment - 20 Marks)

- **Subject Enrichment (Practical Work - 5 Marks):** Evaluated strictly on laboratory skills during the crystallization of copper sulfate and paper chromatography. Students will be assessed on their safe handling of chemicals, accurate use of the apparatus, and the clarity of the separated components in their practical records.

- **Digital Integration Strategy:** To reinforce molecular-level understanding ahead of Periodic Assessments, utilize digital simulation tools (like PhET Interactive Simulations for Concentration). Students can digitally add solute to a virtual beaker and instantly observe how evaporation or adding more solvent dynamically alters the molarity and percentage concentration.

- **Portfolio Task (5 Marks):** Students will undertake a "Kitchen Chemistry Audit." They will collect labels from 5 packaged household items (e.g., talcum powder, vinegar, juice concentrate, medicinal syrups) and prepare a brief report recording how concentration is expressed on each (% m/m, % m/v, or % v/v). They will *calculate* the absolute mass or volume of the active solute in the total package, securely adding this real-world application to their academic portfolio.