

Core Concepts: Understand the definitions of pure substances, mixtures, and formulations. Explain the principles of chromatography, including stationary phase, mobile phase, and Rf values.

Section A: Key Terms & Concepts

1. Match the following scientific keywords to their correct definitions. Write the letter of the definition next to the keyword.

Pure substance _____

Mixture _____

Formulation _____

Chromatography _____

- a) A separation technique used to separate components of a mixture based on their differential partitioning between a stationary phase and a mobile phase.
- b) A single element or compound, not mixed with any other substance.
- c) Two or more substances not chemically bonded together.
- d) A mixture designed to have specific properties, often by mixing components in carefully measured quantities.

2. Complete the following sentences using the most appropriate scientific terms.

- a) A pure substance melts or boils at a _____ temperature, unlike a mixture which melts or boils over a range of temperatures.
- b) In paper chromatography, the paper acts as the _____, while the solvent is the _____.
- c) The _____ in chromatography is a solvent that moves through the stationary phase, carrying the components of the mixture with it.
- d) Formulations are important in industries such as _____, _____, and _____, where precise properties are required.

Section B: Core Concepts & Explanations

3. Explain what a pure substance is and provide one example.

4. Describe what a formulation is, explaining why they are important.

5. Outline the basic principle of how chromatography separates substances.

6. Explain how an Rf (retardation factor) value is calculated and what it indicates in chromatography.

Section C: Exam Application & Extended Writing

7. A student performs paper chromatography on a mixture of food colourings (M) and two known pure food colourings (X and Y). The chromatogram is shown below.

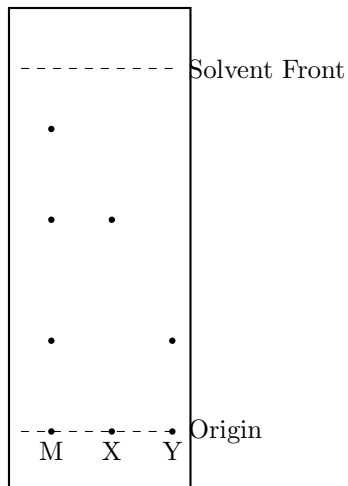


Figure 1: Chromatogram of food colourings

- a) Based on the chromatogram, state whether M, X, and Y are pure substances or mixtures. Identify which components are present in mixture M.
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8. Explain, in detail, how paper chromatography can be used to separate a mixture of coloured inks and how you would identify the different components present in the mixture. (6 marks)
