01 Experimental Chemistry

Set A **Foundations**

Name	Time 1 hour	Total 36 marks	Score ____ / 36

Use a copy of the Periodic Table where you need one.

A From the lesson

7 MARKS

1 Which apparatus should be used to measure out exactly 25.15 cm^3 of a salt solution?

A beaker **B** burette **C** measuring cylinder **D** pipette

Answer ☐ [1]

/1

Source: Learners' Alley, Experimental Chemistry slides

2 What is the freezing point of pure water?

A 100 K **B** 0 K **C** −273 K **D** 273 K

Answer ☐ [1]

/1

Source: Learners' Alley, Experimental Chemistry slides

3 Gas X is less dense than air and is insoluble in water. Gas Y reacts with acids.

(a) Suggest a method that can be used to collect gas X.

..... [1]

(b) Name one drying agent that can be used to dry gas Y.

..... [1]

/2

Source: Learners' Alley, Experimental Chemistry slides

4 A mixture contains W, X, Y and Z. W and X are two immiscible liquids, and X is denser. Y is a solid that is soluble in W but not in X. Z is a solid that is insoluble in both liquids. Outline how you would separate the four substances from each other.

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..... [3]

/3

Source: Learners' Alley, Experimental Chemistry slides

B Practice

29 MARKS

5 Which of the following best describes a pure substance?

A A colourless solution obtained from filtration.

B A white solid with a density of 2 g/cm^3.

C A white solid that does not dissolve in water or organic solvents.

D A yellow solid that melts at 60 °C.

/1

Answer [1]

Source: 2023 HYSS Sec 3 End-of-Year P1 Q2

6 The boiling point of water is 100 °C. The melting point of sodium chloride is 800 °C. What is the most likely boiling point of a sample of water that contains a small quantity of sodium chloride?

A 96 °C **B** 104 °C **C** 450 °C **D** 804 °C

/1

Answer [1]

Source: 2023 HYSS Sec 3 End-of-Year P1 Q3

7 Mercury is a liquid at 25 °C. What are the melting point and the boiling point of mercury?

	melting point / °C	boiling point / °C
A	−39	357
B	−22	−3
C	−8	20
D	30	103

/1

Answer [1]

Source: 2023 HYSS Sec 3 End-of-Year P1 Q4

8 The solubility of three solids in two solvents, water and methylbenzene, is given in the table. What method is suitable for obtaining P from a mixture of the three solids?

solid	solubility in water	solubility in methylbenzene
P	insoluble	insoluble
Q	good	insoluble
R	insoluble	good

A Add methylbenzene and stir, then filter.

B Add methylbenzene and stir, then filter, then add the residue to water and stir, and then filter this mixture.

C Add water and stir, then filter, then add methylbenzene to the filtrate and stir, then evaporate the solvent.

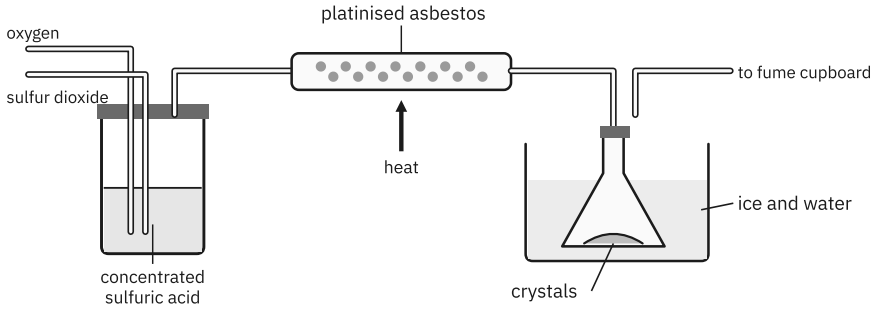
D Add water and stir, then filter, then evaporate the filtrate to dryness.

/1

Answer [1]

Source: 2023 HYSS Sec 3 End-of-Year P1 Q5

9 In the experimental set-up shown below, sulfur dioxide was reacted with oxygen to form sulfur trioxide by passing the mixture through heated platinised asbestos (a substance that speeds up the reaction). What is the function of the concentrated sulfuric acid?



A to acidify the mixture

B to act as a drying agent

C to act as a medium for the two reactant gases to mix

D to remove impurities

/1

Answer [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q2

10 Which apparatus is not required in titration experiments?

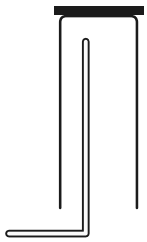
A burette **B** conical flask **C** measuring cylinder **D** white tile

/1

Answer [1]

Source: Broadrick Prelim 2024 P1 Q1

11 The apparatus below shows the method to collect gas X. Which properties of gas X can be deduced?



A denser than air

B insoluble in water and denser than air

C less dense than air

D soluble in water and less dense than air

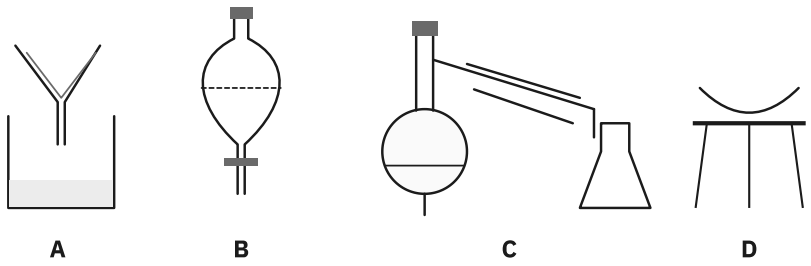
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Answer [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q3

12 A mixture contains solid Y mixed with ethanol. Solid Y is insoluble in ethanol. Ethanol has a boiling point of 78 °C and Y has a boiling point of 103 °C. Which of the following apparatus represents the best

method used to obtain both solid Y and ethanol?



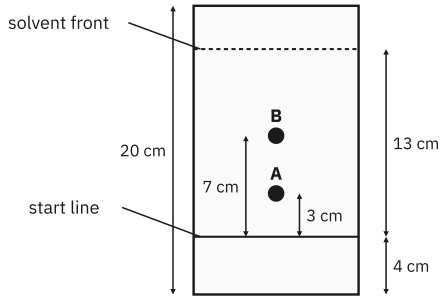
A set-up A **B** set-up B **C** set-up C **D** set-up D

/1

Answer [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q4

13 The diagram shows the chromatogram obtained by analysis of a single dye. Which of the following is the correct R_f value of spot B?



A 0.231 **B** 0.350 **C** 0.412 **D** 0.538

/1

Answer [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q6

14 Aqueous iron(II) sulfate, a pale green solution, is distilled. What is the temperature shown by the thermometer and the colour of the distillate in the conical flask?

	temperature / °C	colour of distillate
A	100	colourless
B	100	pale green
C	106	colourless
D	106	pale green

/1

Answer [1]

Source: 2024 SMSS Sec 3 End-of-Year P1 Q2

15 Chromatography can be used to separate and identify components of a mixture. A student wanted to find out whether a sample of black dye is pure. She drew a start line in pencil on a sheet of chromatography paper and placed spots of known dyes A, B, C, D and E and the black dye on the start line. She ran the chromatography using ethanol as the solvent. Fig. 11.1 shows the results.

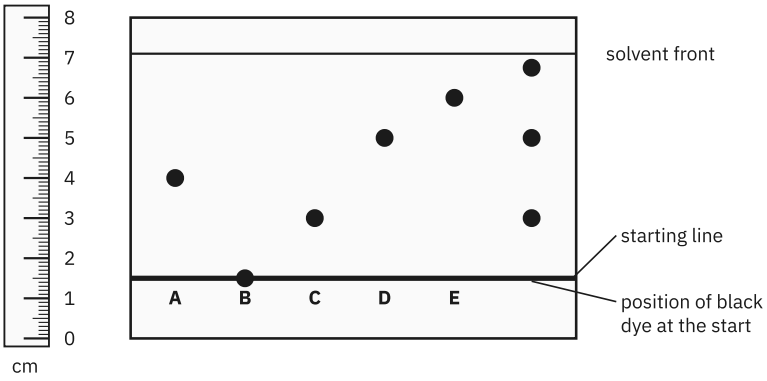


Fig. 11.1

(a) Using the results in Fig. 11.1, explain whether the sample of black dye is pure.

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[1]

(b) Suggest another method that the student can use to determine whether the sample of black dye is pure. State the expected observations clearly.

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[2]

(c) Explain why dye B remains on the start line at the end of the experiment.

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[1]

(d) The R_f value of an industrial dye, safranin, in ethanol is 0.45. Using the results in Fig. 11.1, suggest which of the dyes A, B, C, D or E could be safranin. Show your working clearly.

16

[2]

Source: 2025 CHIJ Sec 4 Prelim P2 Q2

16 Crude oil is a naturally occurring viscous black oil made up of many hydrocarbons. In oil industries, crude oil is heated and its components turn into vapour. They are then cooled, condensed back into liquids, and collected as different fractions. Each fraction contains different hydrocarbons. Petroleum gases such as propane and butane are collected at the top of the column, where it is coolest.

(i) Name the separation technique used to separate crude oil.

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[1]

(ii) Explain how the physical property of the components of crude oil allows them to be separated by this separation technique.

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[1]

(iii) Suggest and explain if oil industries can use separating funnels to separate the components of crude oil.

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[1]

/3

Source: 2023 GESS Sec 3 End-of-Year P2 A10(a)

17 A sample of black ink contains a mixture of blue, red and yellow dyes. The solvent used to separate the dyes in black ink is usually a mixture of ethanol and water. The coloured dyes have different R_f values in solvents with different compositions of ethanol, as shown in Fig. 5.1.

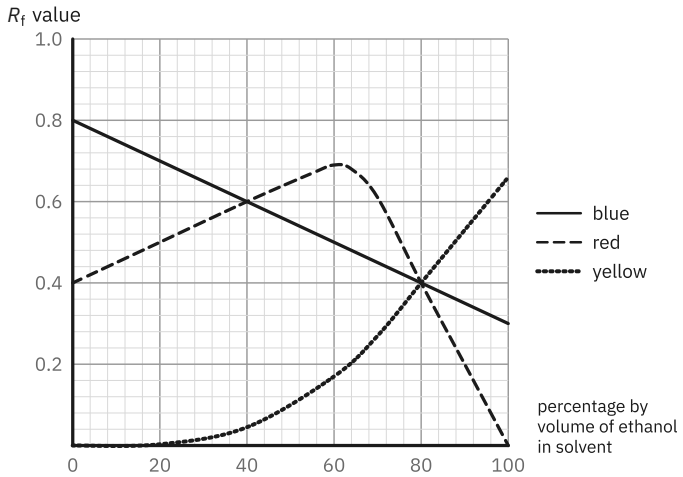


Fig. 5.1

(a) What property must all the dyes in the black ink have in order for separation to occur?

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[1]

(b) Use Fig. 5.1 to explain why the solvent used to separate the dyes in black ink is usually a mixture of ethanol and water.

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..... **[3]**

(c) What is the R_f value of the blue dye dissolved in a mixture of 32 cm^3 of ethanol in 200 cm^3 of solvent? Show your working.

[2]

(d) A student carried out paper chromatography on the black dye using a mixture of ethanol and water as solvent.

(i) The student observed only one spot on the resulting chromatogram. Can the student conclude that the black dye is a pure substance? Explain your reasoning using information from the graph.

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..... **[2]**

(ii) State two precautions that the student needs to take during the paper chromatography.

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..... **[2]**

/10

Source: Compassvale Sec 4 Exp Prelim 2024 P2 Q5