01 Experimental Chemistry

Set B Exam practice

Name | Time 1 hour | Total 31 marks | Score ____ / 31

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

Marks by notes section For the marker: total each row. A score below the target means that section of the notes needs revising.

Notes section	Questions	Marks	Target	Score
1 Measuring Physical Quantities	1, 6	2	2	
3 Separation and Purification	2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13	29	18	

A Multiple choice

9 MARKS

1 Which apparatus is most suitable for measuring 22.15 cm^3 of sodium hydroxide?

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

/1

Answer ☐ [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q1

2 Hexane and water are immiscible liquids. Which method could be used to separate a mixture of hexane and water, and how is the purity of the separated hexane checked?

	method of separation	purity check
A	filtration	find the boiling point
B	filtration	by sublimation
C	use a separating funnel	find the boiling point
D	use a separating funnel	by sublimation

/1

Answer ☐ [1]

Source: BMSS Prelim 2024 P1 Q2, adapted

3 Butyl ethanoate and water are two immiscible liquids with similar boiling points. Which method is most suitable to separate a mixture of water and butyl ethanoate?

A evaporation to dryness
B filtration
C simple distillation
D use a separating funnel

/1

Answer ☐ [1]

Source: Broadrick Prelim 2024 P1 Q3

4 A student wants to separate a mixture of iodine and sodium chloride. Which method should she use?

A crystallisation **B** sublimation **C** filtration **D** distillation

/1

Answer [1]

Source: 2025 TKGS Sec 4 Prelim P1 Q2

5 Liquids Y and Z are immiscible. Y has a lower boiling point than Z. Y has a lower density than Z. Y and Z can be separated from each other both by fractional distillation and by using a separating funnel. Which row correctly gives the first liquid to be collected by each method?

	first liquid collected by fractional distillation	first liquid collected using a separating funnel
A	Y	Y
B	Y	Z
C	Z	Y
D	Z	Z

/1

Answer [1]

Source: BBSS Prelim 2024 P1 Q4

6 Which apparatus is most suitable to measure 27.8 cm^3 of a solution?

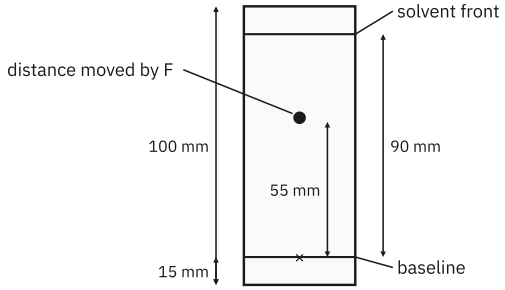
A burette **B** beaker **C** pipette **D** measuring cylinder

/1

Answer [1]

Source: BLSS Prelim 2024 P1 Q3

7 The measurements from a chromatography experiment using substance F are shown. The diagram is **not** drawn to scale. What is the R_f value of F?



A 0.55 **B** 0.61 **C** 0.90 **D** 1.64

/1

Answer [1]

Source: 2024 CHS Sec 3 End-of-Year Section A Q2

8 A student accidentally mixed 50 cm^3 of water with 50 cm^3 of oil. Which method would allow him to obtain 25 cm^3 of the oil most easily?

A filtration **B** fractional distillation

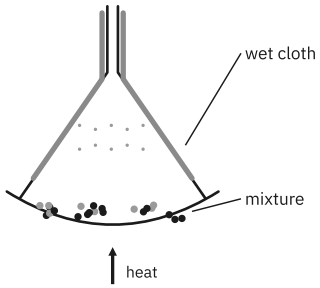
C simple distillation **D** use of a separating funnel

/1

Answer [1]

Source: 2024 CHS Sec 3 End-of-Year Section A Q3

9 Which mixture can be separated by using the set-up below?



A aluminium and silicon dioxide

B ammonium chloride and naphthalene

C iodine and sodium chloride

D silicon dioxide and potassium sulfate

Answer [1]

/1

Source: 2024 CHS Sec 3 End-of-Year Section A Q5

B Structured questions

22 MARKS

10 A sample of black ink contains a mixture of red, blue and yellow dyes. A solvent mixture of ethanol and water can be used to separate the dyes in the black ink. The coloured dyes have different R_f values in solvents with different compositions of ethanol, as shown in the graph in Fig. 7.1.

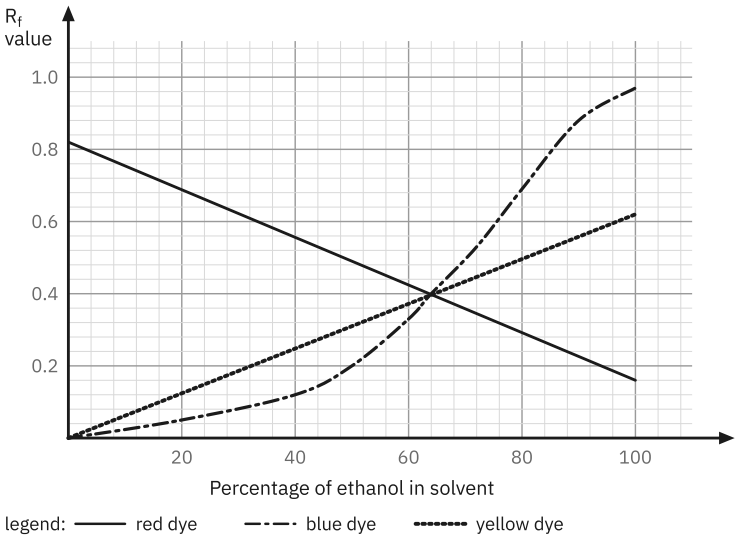


Fig. 7.1

(a) Using the graph, explain why pure water would not be suitable for the separation of the black ink by paper chromatography.

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..... [2]

(b) A student separated the black ink using a certain mixture of ethanol and water. The chromatogram showed only one spot. State the percentages of ethanol and water in the solvent used.

..... [1]

(c) The black ink was separated using 80% ethanol. What is the distance travelled by a spot of the blue dye if the solvent front on the chromatogram is 10.0 cm? Show your working.

[2]

/5

Source: 2024 SMSS Sec 3 End-of-Year P2 Q2

11 Four amino acids P, Q, R and S were analysed using paper chromatography with two solvents. Table 8.1 shows the R_f values.

amino acid	P	Q	R	S
R_f in solvent 1	0.30	0.00	0.60	0.90
R_f in solvent 2	0.60	0.52	0.25	0.85

(a) Amino acids are colourless. Describe how the amino acids can be made visible on the chromatogram.

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[1]

(b) Which amino acid is the most soluble in both solvents? Explain your choice.

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[2]

(c) Which solvent is better for analysing these four amino acids? Use information from Table 8.1 to explain.

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[2]

/5

Source: 2025 Compassvale Sec 4 Exp Prelim P2 Q4

12 Ethanol, C_2H_5OH, and propylene glycol, $C_3H_8O_2$, can be separated by fractional distillation. Ethanol has a boiling point of 78 °C and propylene glycol has a boiling point of 188 °C. A thermometer is placed at point T, the top of the fractionating column where the vapour leaves for the condenser.

(a) Answer the following.

(i) State the liquid that is collected first.

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[1]

(ii) Explain why water must enter the condenser from the bottom.

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..... [1]

(iii) Explain why the bulb of the thermometer is placed at point T.

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..... [1]

(iv) Suggest if this method is suitable for a mixture containing water and oil. Explain your answer.

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..... [1]

/4

Source: 2023 HYSS Sec 3 End-of-Year P2 Q2, adapted

13 An ester is a substance formed by the reaction of an alcohol and an organic acid. Propyl ethanoate is formed by the reaction of propanol (boiling point 97 °C) and ethanoic acid (boiling point 120 °C), with a small amount of concentrated sulfuric acid as a catalyst. The glassware in Figure 1.1 and Figure 1.2 can be used to make the ester, both using the same quantities of chemicals from the start.

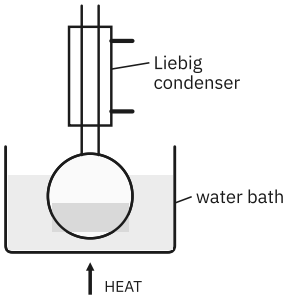


Figure 1.1

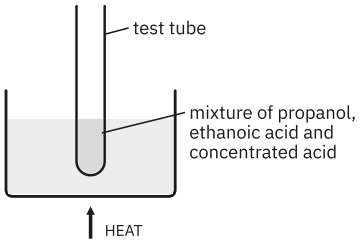


Figure 1.2

(a)

(i) Suggest a reason for using a water bath instead of direct heating.

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..... [1]

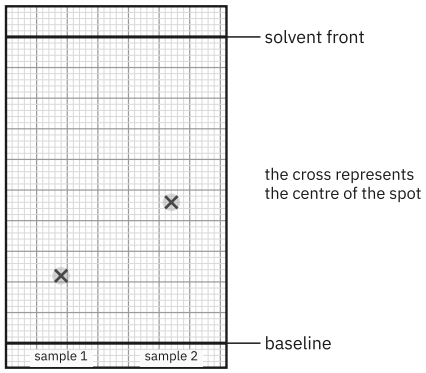
(ii) After heating the reaction mixture for a while, a student discovered that the percentage yield of ester from the set-up in Figure 1.2 is less than that from the set-up in Figure 1.1. Explain why.

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..... [2]

(b) Esters can be used as solvents in chromatography. The chromatogram of two samples of plant acids below is drawn to scale. An ester was used as the solvent and the chromatogram was sprayed with a locating agent, bromothymol blue.



plant acid	R_f value
tartaric acid	0.22
citric acid	0.30
oxalic acid	0.36
malic acid	0.46
succinic acid	0.60

(i) Suggest why it was necessary to spray the chromatogram with bromothymol blue.

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[1]

(ii) Using evidence from the chromatogram, state which sample is more soluble in the ester.

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[1]

(iii) Explain what is meant by the R_f value of a sample.

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[1]

(iv) Calculate the R_f values of the two samples and use the data in the table to identify the plant acids.

/8

[2]

Source: SJI 2020 Year 3 End-of-Year P2 A1