Topical Past Papers

Edexcel IGCSE Chemistry (4CH1)

[Paper 2C]

Exam Series: January 2017 - June 2024

Format Type A:
Answers to all questions are provided as an appendix

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Introduction

Each Topical Past Paper Questions Compilation contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest Edexcel IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Edexcel IGCSE or A Level exams.
2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.
3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.
4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.
5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for Edexcel IGCSE or A level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Edexcel International GCSE Chemistry (4CH1) Paper 2C Topical Past Papers
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Pearson Edexcel
- Subject code: 4CH1
- Years covered: January 2017 - June 2024
- Paper: 2C
- Number of pages: 690
- Number of questions: 189

Contents

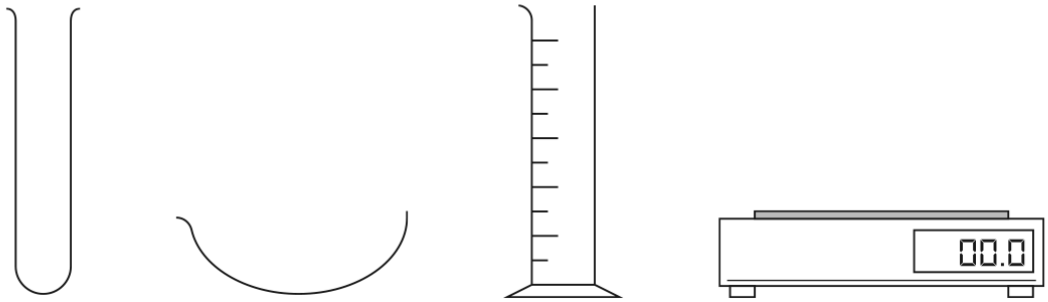
Chapter 1

Assessing Investigative / Experimental Skills

1.1 Assessing Investigative / Experimental Skills

1. 4CH1_2CR_que_20201121 Q: 1

The diagram shows some pieces of apparatus.



(a) Complete the table by giving the name of each piece of apparatus.

(4)

Letter	Name
A	
B	
C	
D	

(b) Which piece of apparatus can be used to measure the volume of a liquid?

(1)

☒ **A**

☒ **B**

☒ **C**

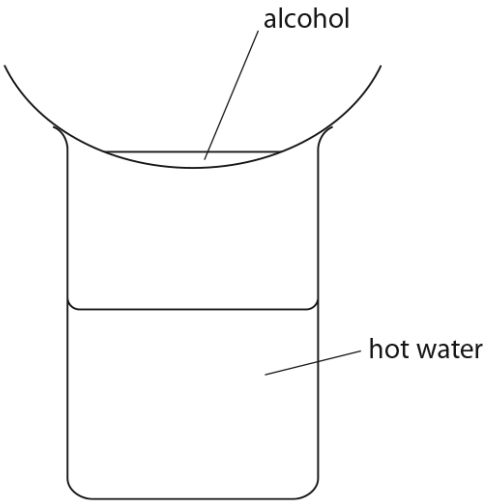
☒ **D**

(Total for Question 1 = 5 marks)

2. 4CH1_2C_que_20190613 Q: 3

Methanol, ethanol, propanol and butanol are alcohols. They are all liquids that evaporate easily when warmed.

A student uses this apparatus to compare the time taken for the four liquids to evaporate.



She uses this method.

- pour some methanol into an evaporating basin
- place the evaporating basin on top of a beaker containing hot water
- measure the time taken for the methanol to evaporate completely
- repeat the experiment with each of the other alcohols, using the same apparatus

(a) State two variables the student should control to make sure her results are valid.

(2)

1 .....

.....

2 .....

.....

(b) State why it is not safe to heat the evaporating basin directly with a Bunsen flame.

(1)

.....

.....

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH_3OH	20	24	22	26	23
ethanol	C_2H_5OH	32	34	35	30	33
propanol	C_3H_7OH	45	47	50	48	48
butanol	C_4H_9OH	64	63	90	60	

(i) Calculate the mean (average) time for butanol to evaporate.

(2)

mean time = ...s

(ii) Explain how the results show which alcohol evaporates most easily.

(2)

.....

.....

.....

.....

(iii) State the relationship between the number of carbon atoms in the molecule and how easily the alcohol evaporates.

(2)

.....

.....

.....

.....

(Total for Question 3 = 9 marks)

Chapter 2

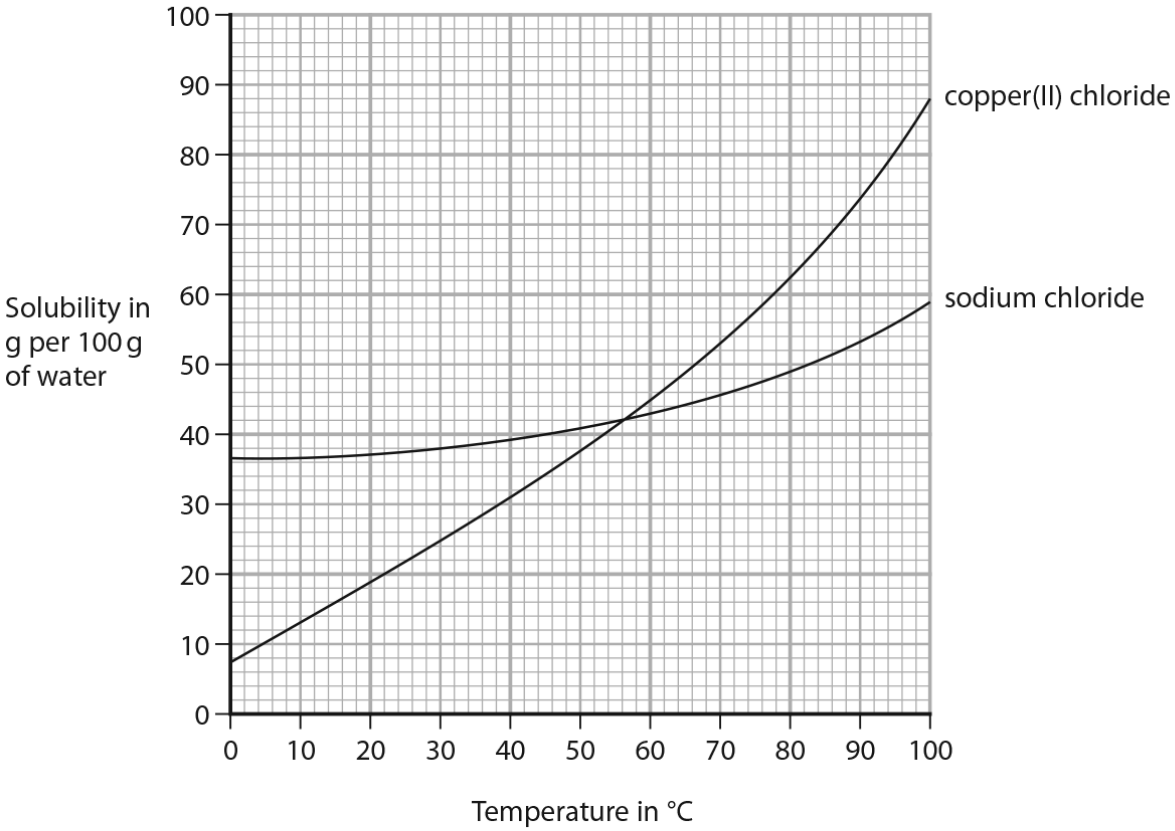
Principles of chemistry

2.1 States of matter

3. 4CH1_2C_que_20220118 Q: 3

This question is about solubility.

(a) The graph shows the solubilities of copper(II) chloride and sodium chloride at different temperatures.



(i) Determine the temperature at which copper(II) chloride and sodium chloride have the same solubility.

Show on the graph how you obtained your answer.

(2)

temperature = ... °C

(ii) A saturated solution of copper(II) chloride in 100 g of water is cooled from 40 °C to 10 °C.

Determine the mass, in grams, of copper(II) chloride that crystallises.

(2)

mass of copper(II) chloride = ... g

(b) A student uses this method to determine the solubility of potassium chloride in water at room temperature.

- record the mass of an empty evaporating basin
- pour some saturated potassium chloride solution into the evaporating basin
- record the mass of the evaporating basin and saturated potassium chloride solution
- heat the evaporating basin to remove all the water
- record the mass of the evaporating basin and the dry potassium chloride

The table shows the student's results.

	Mass in grams
evaporating basin	58.1
evaporating basin and saturated potassium chloride solution	78.2
evaporating basin and dry potassium chloride	63.2

(i) Calculate the mass of dry potassium chloride obtained.

(1)

mass = ... g

(ii) Calculate the mass of water removed.

(1)

mass = ... g

(iii) Calculate the solubility of potassium chloride in grams per 100 grams of water.

(2)

solubility = ... g per 100 g of water

(iv) Suggest why the student's method is **not** suitable for determining the solubility of hydrated copper(II) sulfate.

(1)

.....

.....

(Total for Question 3 = 9 marks)

4. 4CH1_2C_que_20210429 Q: 4

A student investigates the solubility of potassium nitrate in water.
She measures the masses of potassium nitrate that dissolve in 25 cm^3 of water at different temperatures.

The table shows the student's results. One of the results is anomalous.

Temperature in °C	10	20	30	40	50	60	70
Mass of potassium nitrate in g	8.0	10.0	12.5	16.0	17.5	26.5	34.0

(a) (i) Plot the results on the grid.

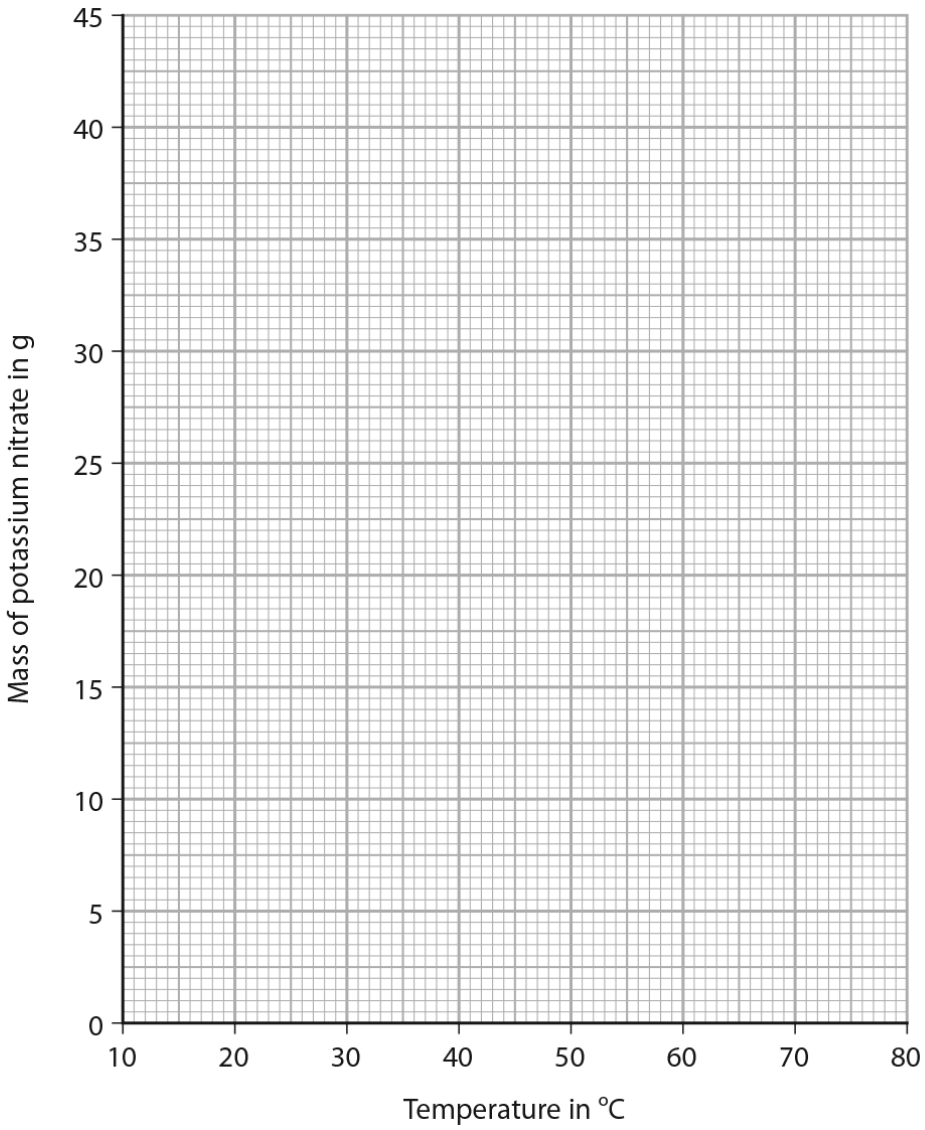
(1)

(ii) Draw a circle around the anomalous result.

(1)

(iii) Ignoring the anomalous result, draw a curve of best fit.

(1)



(b) Suggest **two** possible mistakes that could have caused the anomalous result.

(2)

1 .....

.....

2 .....

.....

(c) Use your graph to find the maximum mass of potassium nitrate that dissolves in 25 cm^3 of water at 75 °C.

Show on your graph how you obtained your answer.

(2)

mass = ... g

(d) Use your graph to calculate the solubility of potassium nitrate in g per 100 g of water at 25 °C.

[1.0 cm^3 of water has a mass of 1.0 g]

(2)

solubility = ... g per 100 g of water

(Total for Question 4 = 9 marks)

2.2 Elements, compounds and mixtures

5. 4CH1_2C_que_20201121 Q: 1

A student is given a mixture of salt solution and sand.

She wants to obtain pure water from the mixture.

(a) She separates the sand from the salt solution.

Which method of separation should she use?

(1)

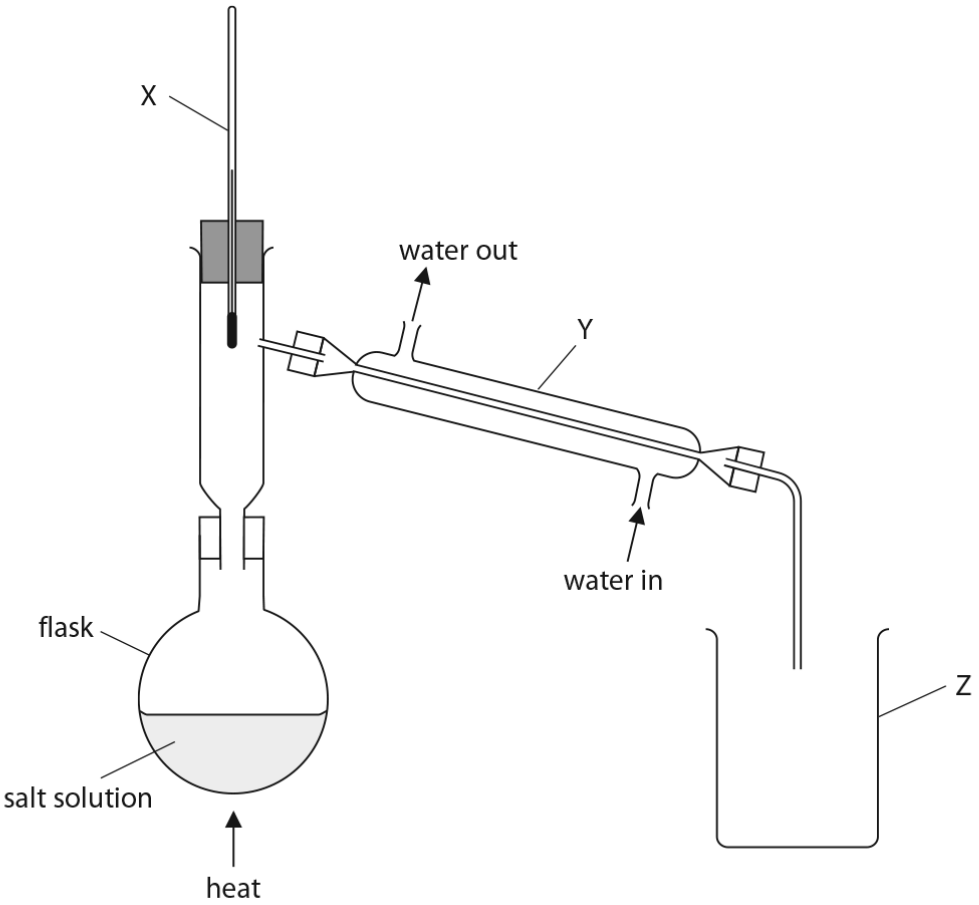
☒ **A** crystallisation

☒ **B** filtration

☒ **C** fractional distillation

☒ **D** simple distillation

(b) The student then uses this apparatus to obtain pure water from the salt solution.



(i) Name the pieces of apparatus labelled X, Y and Z.

(3)

X .....

Y .....

Z .....

(ii) State what remains in the flask when the separation is complete.

(1)

.....

(Total for Question 1 = 5 marks)

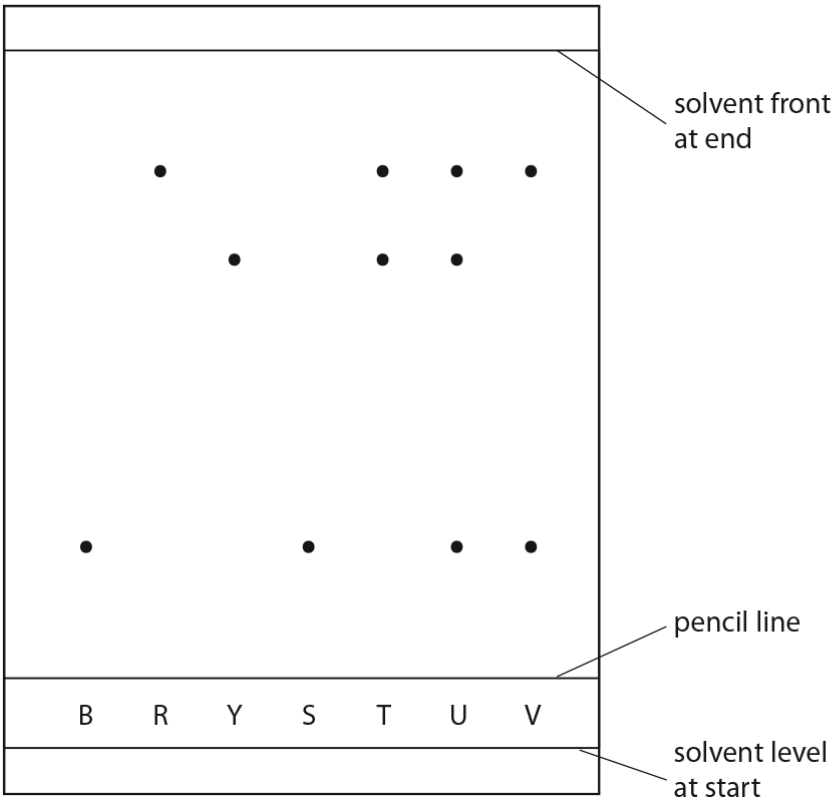
6. 4CH1_2C_que_20201121 Q: 2

In a chromatography experiment a student uses samples of three pure food dyes, blue (B), red (R) and yellow (Y).

He also uses samples of four unknown substances, S, T, U and V.

The student puts a small drop of each substance on the pencil line.

The diagram shows the student's chromatogram at the end of the experiment.



(a) Which of the unknown substances contains only one food dye?

(1)

☒ **A** substance S

☒ **B** substance T

☒ **C** substance U

☒ **D** substance V

(b) Explain which pure food dyes are in substance V.

(2)

.....

.....

.....

.....

(c) (i) Calculate the R_f value of the yellow food dye Y.

(3)

R_f = ...

(ii) State how the chromatogram suggests that the yellow food dye Y is less soluble in the solvent than the red food dye R.

(1)

.....

.....

(Total for Question 2 = 7 marks)

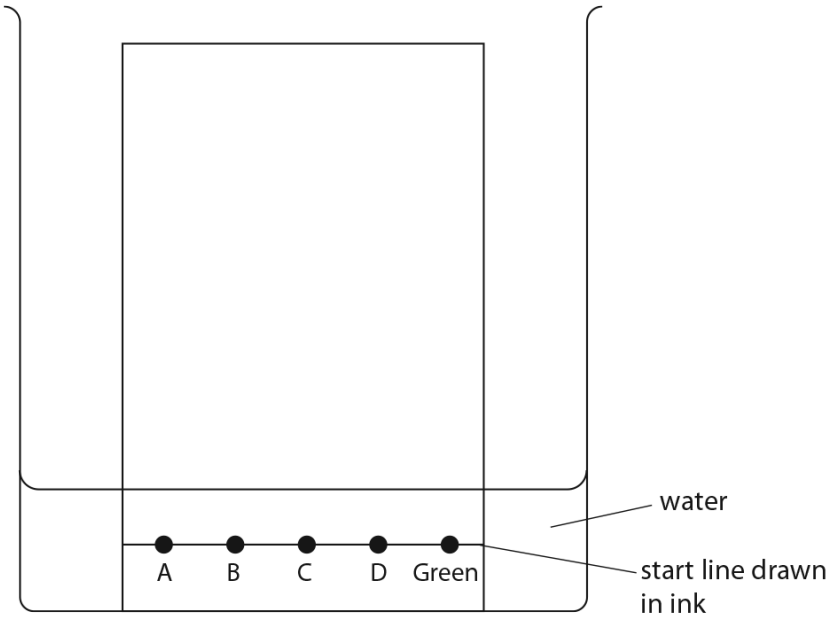
7. 4CH1_2CR_que_20200305 Q: 2

Chromatography is used to analyse mixtures.

A student does a chromatography experiment to analyse the composition of green food colouring in sweets.

She places four known dyes, A, B, C and D, and the green food colouring on chromatography paper.

The diagram shows the student's apparatus at the start of her experiment.



(a) The diagram shows that the student makes two mistakes when setting up her apparatus.

State the two changes that the student should make so that her experiment works.

(2)

1 .....

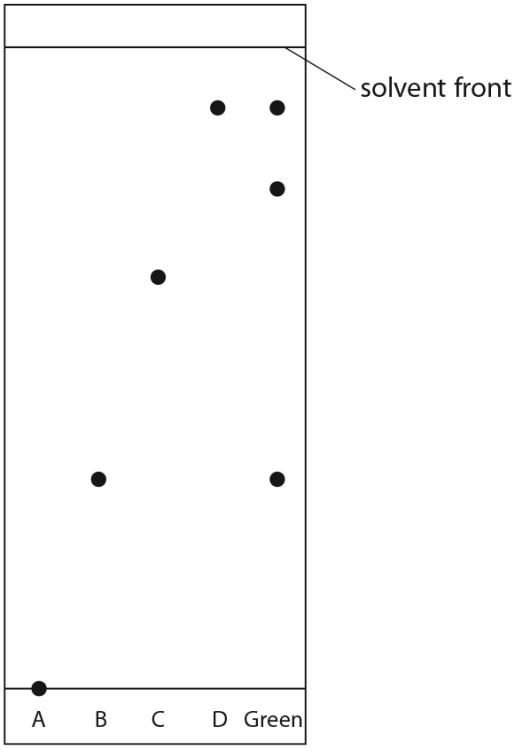
.....

2 .....

.....

(b) Another student does the chromatography experiment correctly.

The diagram shows her chromatogram at the end of the experiment.



(i) Explain what the chromatogram shows about the composition of the green food colouring.

(3)

(ii) The distance between the start line and the spot for dye C is 6.2 cm.

Calculate the R_f value of dye C.

(3)

R_f value = ...

(iii) Suggest why dye A does not move.

(1)

.....

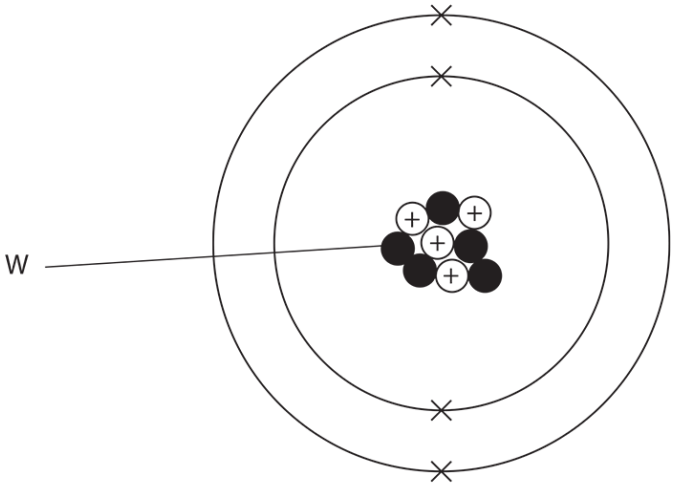
.....

(Total for Question 2 = 9 marks)

2.3 Atomic structure

8. 4ch1-2cr-que-20240612 Q: 2

(a) The diagram represents an atom of an element.



(i) What is the name of the particle labelled W?

(1)

☒ **A** electron

☒ **B** ion

☒ **C** neutron

☒ **D** proton

(ii) What is the mass number of this atom?

(1)

☒ **A** 4

☒ **B** 5

☒ **C** 9

☒ **D** 13

(b) These are the symbols for the two isotopes of lithium.

$^{6}_{3}Li$ $^{7}_{3}Li$

(i) In terms of sub-atomic particles, give one similarity and one difference between the two isotopes.

(2)

similarity

.....

.....

difference

.....

.....

(ii) A sample of lithium contains 7.5% of $^{6}_{3}Li$ and 92.5% of $^{7}_{3}Li$

Calculate the relative atomic mass (A_r) of this sample of lithium.

(2)

A_r = ...

(Total for Question 2 = 6 marks)

Appendix A

Answers

1. 4CH1_2CR_rms_20201121 Q: 1

Question number	Answer	Notes	Marks
(a)	**M1** A test tube / boiling tube **M2** B evaporating basin **M3** C measuring cylinder **M4** D (top-pan) balance	 **ALLOW** evaporating dish/crystallising dish **ALLOW** (weighing) scale(s) **ALLOW** weighing machine	4 Grad
(b)	**C** A is incorrect as a test tube cannot measure a volume of liquid B is incorrect as an evaporating basin cannot measure a volume of liquid D is incorrect as a balance measures mass not volume		1 Comp **Total 5**

2. 4CH1_2C_rms_20190613 Q: 3

Question number	Answer	Additional guidance	Marks
(a)	**M1** the volume of liquid/alcohol **M2** the temperature of the water	**ALLOW** amount of liquid/alcohol **IGNORE** mass **IGNORE** volume of water **ALLOW** temperature of surroundings **IGNORE** references to temperature of the alcohol	2
(b)	alcohols/the liquids are flammable/catch fire easily	**ALLOW** alcohols/the liquids can be easily ignited **ALLOW** any named alcohol from the table	1
(c) (i)	**M1** (64 + 63 + 60) ÷3 **M2 =** 62	 **ALLOW** 62.3 62/62.3 with no working scores 2 **ALLOW** 69/69.25/69.3 for 1 mark	2
(ii)	An explanation including the following two points: **M1** methanol/CH_3OH (evaporates most easily) **M2** because the time taken is the shortest	 **ACCEPT** because has lowest (mean) time	2

Question Number	Answer	Additional Guidance	Marks
(iii)	**M1** as the number of carbon atoms increases **M2** the ease of evaporation decreases/the less easily the alcohol evaporates	 **ALLOW** the less volatile the alcohol **IGNORE** the slower the alcohol evaporates **IGNORE** references to time taken **ALLOW** correct reverse argument	2
		Total	**9**

3. 4CH1_2C_rms_20220118 Q: 3

Question number	Answer	Notes	Marks
(a) (i)	M1 working shown on graph		2
	M2 56 (°C)	ALLOW any value between 56 and 57 inclusive.	
(ii)	M1 31-13		2
	M2 18 (g)	ALLOW ecf if one incorrect reading in M1 correct answer of 18g with or without working scores 2	
(b) (i)	5.1 (g)		1
(ii)	15 (g)		1
(iii)	M1 5.1÷15 **OR** 0.34 (g) **OR** answer to (i) ÷ answer to (ii)		2
	M2 34 (g) **OR** answer to M1 × 100	correct answer of 34 (g) with or without working scores 2	
(iv)	Any one from		1
	M1 (hydrated) copper(II) sulfate would become anhydrous copper sulfate	ALLOW the (hydrated) crystals would decompose	
	M2 (hydrated) copper(II) sulfate would lose water		
			Total for question = 9

4. 4CH1_2C_rms_20210429 Q: 4

Question number	Answer	Notes	Marks
(a) (i)	all points plotted correctly to the nearest grid line		1
(ii)	point at 50 °C and 17.5 g circled on grid/in table	**ALLOW** ECF from incorrect plotting	1
(iii)	smooth curve of best fit		1
(b)	Any two from **M1** less than 25 cm^3 of water was used **M2** the temperature was less than 50 °C **M3** not enough potassium nitrate was added **M4** the solution was not stirred	**ALLOW** ECF from incorrect plotting and incorrect point circled for **M1** and **M2** only	2

Question number	Answer	Notes	Marks
(c)	**M1** curve extended to 75 °C **M2** correct mass read from graph to the nearest grid line	expected answer around 39 to 40 g 0 marks if curve not extended	2
(d)	**M1** mass at 25 °C read from graph to nearest grid line **M2** mass from graph multiplied by 4	expected answer around 44 g **ALLOW** ECF from incorrect plotting	2 **Total 9**

5. 4CH1_2C_rms_20201121 Q: 1

Question number	Answer	Notes	Marks
(a)	**B** filtration is the correct answer because it will enable sand to be separated from salt solution **A** is not correct because crystallisation will not enable sand to be separated from salt solution **C** is not correct because fractional distillation will not enable sand to be separated from salt solution **D** is not correct because simple distillation will not enable sand to be separated from salt solution		1 comp
(b) (i)	X is a thermometer Y is a (Liebig) condenser Z is a beaker		3 cler
(ii)	salt		1 cler

Total for Q1 = 5

6. 4CH1_2C_rms_20201121 Q: 2

Question number	Answer	Notes	Marks
(a)	**A** substance S is the correct answer because S only contains one dye as it produces only one spot **B** is not correct because T does not only contain one dye as it produces two spots **C** is not correct because U does not only contain one dye as it produces three spots **D** is not correct because V does not only contain one dye as it produces two spots		1 comp
(b)	explanation containing following points M1 (V contains) blue/B and red/R (dyes) M2 because V has spots at same height as those from blue/B and red/R OWTTE		2 grad
(c) (i)	M1 correct measurement of distance moved by spot Y M2 correct measurement of distance moved by solvent M3 use and evaluation of R_f = distance moved by spot Y / distance moved by solvent	ALLOW 5.7-6.1 ALLOW 8.7-9.1 ALLOW 1-4 sig fig ALLOW ECF from M1 M2 only if $R_f < 1$	3 exp
(ii)	spot from yellow food dye/Y does not move as far as spot from red food dye/R OWTTE	ORA	1 exp

Total for Q2 = 7

7. 4CH1_2CR_rms_20200305 Q: 2

Question number	Answer	Notes	Marks
(a)	**M1** level of the water must be below the dyes/start line **M2** the start line must be drawn in pencil	**ACCEPT** dyes/start line should be above water level	2
(b) (i)	2 marks for any two conclusions from (the green food colouring) **M1** contains (dye) B and (dye) D **M2** contains an unknown dye **M3** does not contain A or C **M4** contains three dyes and 1 mark for a correct explanation of given conclusion for the green food colouring eg (explanation for **M1**) because has spots at same level (as B and D) eg (explanation for **M2**) because has a spot at different level (from A B C D) eg (explanation for **M3**) because has no spots at same level (as A and C) eg (explanation for **M4**) because has three spots	ALLOW is not pure	3
(ii)	**M1** (distance moved by solvent correctly measured) = 9.5 (cm) **M2** use of R_f = $\frac{\text{distance moved by the dye C}}{\text{distance moved by the solvent}}$ **M3** evaluation of R_f	**ALLOW** a tolerance of ±2mm eg $\frac{6.2}{9.5}$ **ALLOW** ECF from **M1** eg $\frac{(6.2)}{(9.5)}$ = 0.65(3) **ALLOW** 1-4 sig fig **ALLOW** ECF from **M2**	3
(iii)	(dye A) is not soluble in water	**ALLOW** solvent for water	1

8. 4ch1-2cr-rms-20240612 Q: 2

Question number	Answer	Notes	Marks
(a) (i)	C (neutron) A is not the correct answer because electrons are not in the nucleus B is not the correct answer as ions are not in the nucleus D is not the correct answer as protons have a positive charge		1
(ii)	C (9) A is not the correct answer because the proton number = 4 B is not the correct answer as there are 5 neutrons D is not the correct answer because 13 is the number of protons + neutrons + electrons		1
(b) (i)	similarity = number of protons/proton number difference = number of neutrons	ALLOW number of electrons ALLOW one has 3 neutrons and the other has 4 neutrons IGNORE reference to atomic number and mass numbers	2
(ii)	M1 ((7.5 × 6) + (92.5 × 7)) ÷ 100 M2 6.925/6.93/6.9	 ALLOW 2 or more significant figures Answer 6.925/6.93/6.9 without working scores 2 marks Answer of 7 with correct method scores M1 Answer of 7 without working scores 0	2
			Total marks for question 2 = 6