

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE (9–1)

Monday 19 May 2025

Morning (Time: 1 hour 40 minutes) **Paper reference 4WCH1/1CR**

Chemistry (Modular)

UNIT 1: 4WCH1

PAPER: 1CR

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in the calculations and state the units where required.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1** (a) The diagram shows an incomplete Periodic Table.
Use information from the diagram to answer all parts of this question.

	Be														O		
												Al					
K																	
										Ag						Xe	

- (i) Give the symbol of a Group 1 metal.

(1)

- (ii) Give the symbol of a noble gas.

(1)

- (iii) Give the symbols of two elements in the same period.

(1)

- (b) (i) Give the number of electrons in the outer shell of an atom of aluminium.

(1)

- (ii) Draw a diagram to show the electron configuration of aluminium.

(2)

(c) A sample of sulfur contains 94% of the isotope ^{32}S and 6% of the isotope ^{34}S

Calculate the relative atomic mass of the sample.

(2)

relative atomic mass =

(Total for Question 1 = 8 marks)



2 This question is about the three states of matter, solid, liquid and gas.

- (a) Solids, liquids and gases can be changed from one state to another.
The box gives the names of some changes of state.

condensing	evaporation	freezing
melting	sublimation	

Use words from the box to answer the questions.

- (i) Give the name of the change from liquid to solid.

(1)

- (ii) Give the name of the change from liquid to gas.

(1)

- (iii) Give the name of the change from solid to gas.

(1)

- (b) Describe the arrangement, movement and energy of the particles in a gas.

(3)

(Total for Question 2 = 6 marks)

3 This question is about acids and metal carbonates.

(a) Give the formula of the ion found in all aqueous solutions of acids.

(1)

(b) Potassium carbonate is a weak base.

Suggest the pH of potassium carbonate solution.

(1)

(c) Potassium carbonate reacts with hydrochloric acid.

Give the name of the salt formed.

(1)

(d) The formula of potassium carbonate is K_2CO_3

Calculate its relative molecular mass.

(3)

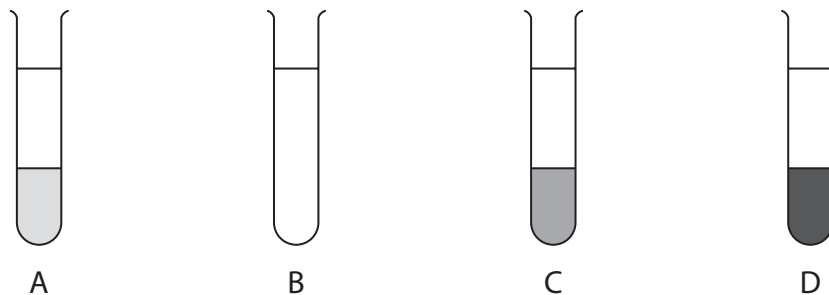
relative molecular mass =



(e) Four test tubes each contain 5 cm^3 of water.

A different metal carbonate is added to each test tube.

The diagram shows the results after the metal carbonates have been stirred in the water.



Explain which test tube, A, B, C or D, could contain potassium carbonate.

(2)

(Total for Question 3 = 8 marks)



4 This question is about mixtures.

- (a) The table shows experimental values for the boiling point temperature ranges of four different substances.

Substance	Temperature in °C
P	78 to 79
Q	100 to 105
R	126 to 132
S	200 to 210

Explain which substance, P, Q, R or S, is most likely to be pure.

(2)

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.....

.....

.....



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(4)

(Total for Question 4 = 6 marks)



5 This question is about rusting.

(a) Give the names of two substances that react with iron to form rust.

(2)

1

2

(b) Iron can be coated with zinc to prevent rusting.

(i) Name this coating process.

(1)

.....

(ii) Explain how the zinc coating prevents the iron from rusting.

(2)

.....

.....

.....

.....

(c) Iron is in the lower part of the reactivity series.

Iron(II) sulfate solution reacts with magnesium metal.

(i) State this type of reaction.

(1)

.....

(ii) Give a chemical equation for the reaction between iron(II) sulfate solution and magnesium.

Include state symbols.

(2)

.....

(Total for Question 5 = 8 marks)

.....



6 This question is about products from crude oil.

- (a) Most of the compounds in crude oil are from the same homologous series.

Give the name of this homologous series.

(1)

- (b) Many fuels are obtained from the fractional distillation of crude oil.

Explain how the combustion of a common impurity in fuels causes acid rain.

(3)

- (c) The equation shows the cracking of a hydrocarbon produced from the fractional distillation of crude oil.



- (i) Give the temperature and the catalyst used in catalytic cracking.

(2)

temperature

catalyst

(ii) Explain why cracking is a useful process in the oil industry.

(3)

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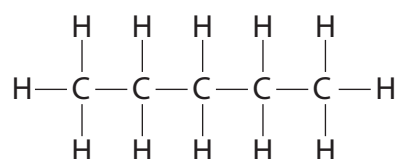


(d) The formula C_5H_{12} represents three isomers.

(i) Explain what is meant by the term **isomers**.

(2)

(ii) This is the displayed formula of one of the isomers.



Draw the displayed formula of each of the other two isomers.

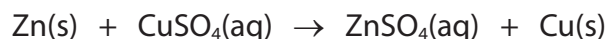
(2)

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(Total for Question 6 = 13 marks)

- 7 A student investigates the reaction between zinc and copper(II) sulfate solution.

This is the equation for the reaction.



This is the student's method.

Step 1 add 25.0 cm³ of copper(II) sulfate solution to a glass beaker

Step 2 record the temperature of the solution

Step 3 add between 5 g and 6 g of zinc powder (an excess) and stir the mixture

Step 4 record the highest temperature reached

- (a) (i) Explain an improvement to step 1 to produce a more accurate temperature rise.

(2)

- (ii) Give a reason why the student does not need to know the exact mass of zinc added in step 3.

(1)

- (iii) State the colour change in the solution.

(1)

from to



- (b) (i) The table shows the student's results.

volume of copper(II) sulfate solution in cm^3	25.0
initial temperature of the copper(II) sulfate solution in $^{\circ}\text{C}$	18.5
final temperature of the copper(II) sulfate solution in $^{\circ}\text{C}$	48.6

Calculate the heat energy change (Q) in joules (J).

[for the solution, $c = 4.2 \text{ J}/^{\circ}\text{C}/\text{g}$]

[mass of 1.0 cm^3 of solution = 1.0 g]

(3)

$Q = \dots\dots\dots \text{ J}$

- (ii) The student repeats the experiment and calculates Q as 3800 J .
The solution used contains 6.38 g of copper(II) sulfate.

Calculate the molar enthalpy change, ΔH , in kJ/mol .

Include a sign in your answer.

[for CuSO_4 , $M_r = 159.5$]

(4)

$\Delta H = \dots\dots\dots \text{ kJ/mol}$

(Total for Question 7 = 11 marks)

8 This question is about the extraction and uses of metals.

(a) Which metal is the least reactive?

(1)

- ☐ **A** gold
- ☐ **B** lithium
- ☐ **C** magnesium
- ☐ **D** zinc

(b) Copper can be extracted from copper ores.

(i) Before copper metal can be extracted, the ore must be dug out of the ground.

Suggest one disadvantage of digging for ores.

(1)

(ii) Bronze is an alloy of copper and tin.

A sample of bronze contains 89% copper atoms and 11% tin atoms.

There are 1200 atoms in this sample.

Calculate the number of copper atoms in this sample.

(2)

number of copper atoms =



(iii) Draw a diagram to show how the atoms of copper and tin are arranged in bronze.

Include at least three rows of atoms with about ten atoms in each row.

(2)

(iv) Explain why the alloy bronze is harder than pure copper.

(2)

(Total for Question 8 = 8 marks)



9 This question is about the solubility of sodium chloride in water.

- (a) State the term used for sodium chloride when dissolved in water to form a solution.

(1)

- (b) (i) Describe an experiment to find the maximum mass of sodium chloride that can be dissolved in a known volume of water.

(6)



- (ii) In the experiment, the mass of sodium chloride obtained is 6.7 g and the mass of water removed is 18.4 g.

Calculate the solubility of sodium chloride, in g per 100 g of water.

(2)

solubility = g per 100 g of water

- (c) The solvent used affects solubility.

State one other factor that affects solubility.

(1)

- (d) In another experiment, 1.42 mol of sodium chloride is dissolved in 250 cm³ of water.

Calculate the molar concentration of this solution.

Use the expression

$$\text{amount} = \frac{\text{molar concentration} \times \text{volume}}{1000}$$

(3)

molar concentration = mol/dm³

(Total for Question 9 = 13 marks)

QUESTION 10 CONTINUES ON NEXT PAGE



10 This question is about vanadium and its reactions.

- (a) Vanadium(V) oxide (V_2O_5) is an oxidising agent.

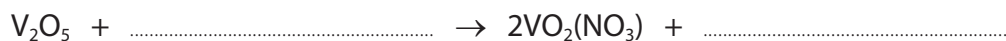
Explain the term **oxidising agent**.

(2)

- (b) Vanadium(V) oxide (V_2O_5) acts as a base when it reacts with nitric acid.

Complete the equation to show a balanced reaction.

(3)



- (c) Vanadium(V) oxide (V_2O_5) can be reduced to form a new oxide.
The new oxide contains 2.04 g vanadium and 1.28 g oxygen.

Calculate the empirical formula for the new oxide.

(4)

empirical formula =

(Total for Question 10 = 9 marks)

TOTAL FOR PAPER = 90 MARKS

