

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)

Friday 13 June 2025

Morning (Time: 1 hour 10 minutes) **Paper reference 4WSD4/1CR**

Science (Double Award) (Modular)

Chemistry

UNIT 4: 4WSD4

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 60.
- 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 This question is about catalysts.

(a) Complete the sentences by writing a suitable word in each blank space.

(3)

If a catalyst is added to a reaction mixture,

the rate of reaction is

The activation energy for the reaction is

The amount of catalyst at the end of a reaction is

(b) A student investigates the effect of different catalysts on the rate of decomposition of a hydrogen peroxide solution.

The table shows the time taken to produce the same volume of oxygen gas using each catalyst.

Catalyst	P	Q	R
Time in seconds	30	14	22

Give the letter of the catalyst that gives the fastest rate of reaction.

(1)

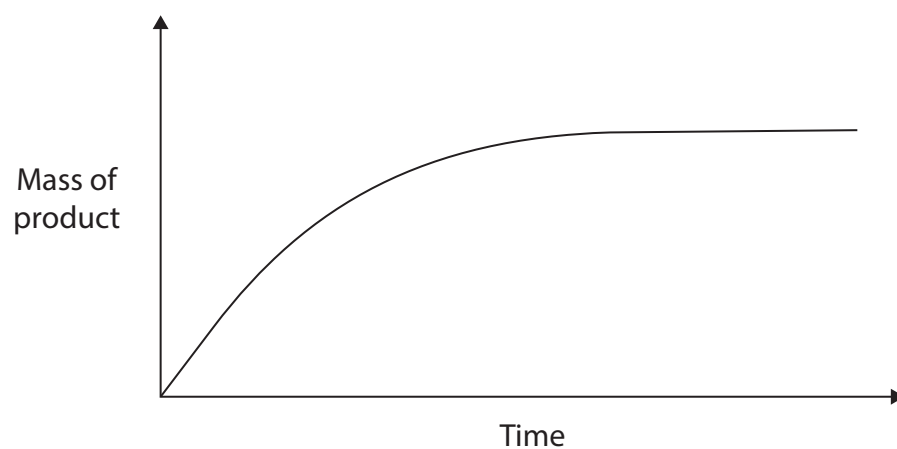
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- (c) The graph shows the mass of product at different times during a catalysed reaction.

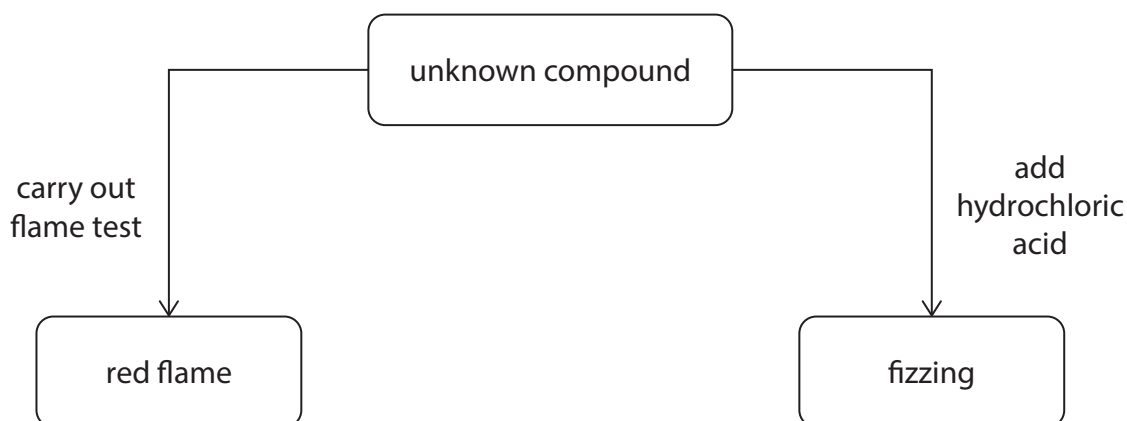
Sketch the shape of the graph when the reaction is **not** catalysed.

(2)



(Total for Question 1 = 6 marks)

2 The flow chart shows the results of tests on an unknown compound.



(a) Identify the positive ion in the compound from the colour of the flame.

(1)

(b) Adding hydrochloric acid to the unknown compound causes fizzing because a gas is given off.

Describe a test on the gas that would confirm that the unknown compound contains carbonate ions.

(3)

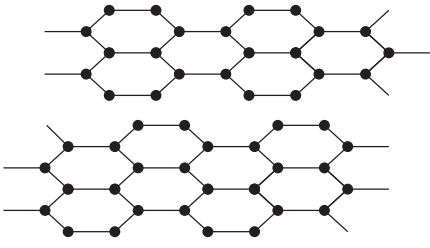
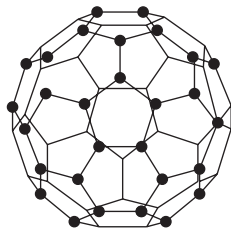
(c) Deduce the formula of the unknown compound.

(1)

(Total for Question 2 = 5 marks)



3 The table gives some information about the element carbon.

Name	Diagram	Structure
graphite		
C ₆₀ fullerene		

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

(2)

(b) Graphite and C₆₀ fullerene can be used as lubricants.

In graphite, the layers move over each other easily.

Suggest why C₆₀ fullerene molecules move over each other easily.

(1)

(c) Graphite conducts electricity better than C₆₀ fullerene.

Explain this difference.

(3)

(Total for Question 3 = 6 marks)

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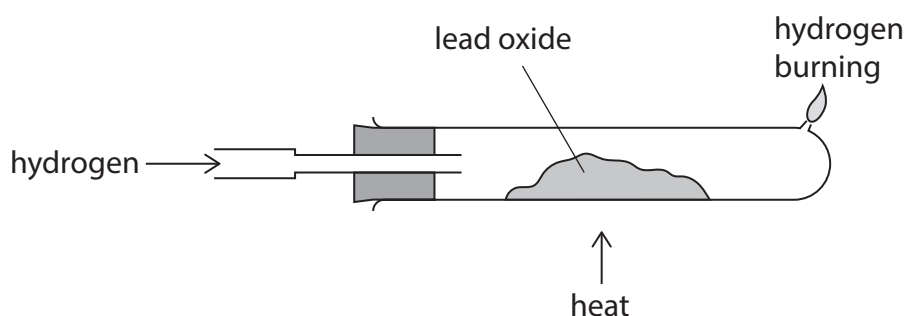
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4 The element lead (Pb) forms different oxides.

- (a) A scientist uses this equipment to find the masses of lead and oxygen in a sample of a lead oxide with the formula PbO .



The scientist finds the mass of the tube and its contents before and after heating.

- (i) State how the scientist can find the mass of oxygen in the sample.

(1)

- (ii) Describe what the scientist should do next to check that the reaction is complete.

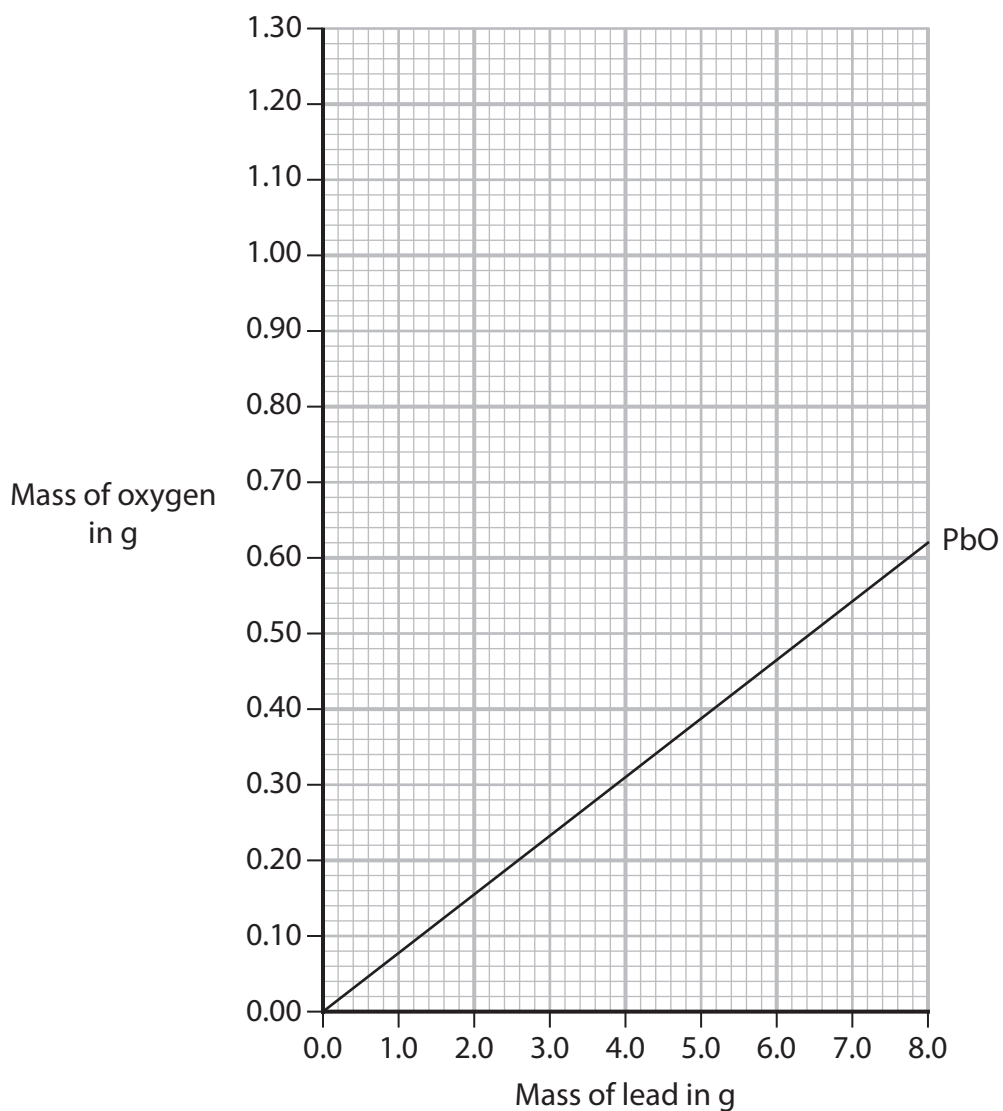
(2)

- (iii) Give the word equation for the reaction between hydrogen and this lead oxide.

(1)

(b) The experiment in part (a) is repeated using different masses of PbO.

The graph shows the masses of lead and oxygen found in these experiments.



Determine the gradient of this graph.

(1)

gradient =



(c) The scientist reacts a different lead oxide (compound T) with hydrogen using the same equipment.

The table shows the scientist's results.

Mass of lead in g	Mass of oxygen in g
0.0	0.00
1.6	0.24
2.7	0.40
4.0	0.62
4.6	0.74
6.4	0.99
7.5	1.16

- (i) Plot the results on the grid in part (b).

(1)
- (ii) Draw a line of best fit.

(1)
- (iii) Determine the empirical formula of compound T by comparing the two lines drawn on the grid.

(2)

empirical formula =

(Total for Question 4 = 9 marks)

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5 Chloroethene is used to make the polymer poly(chloroethene).

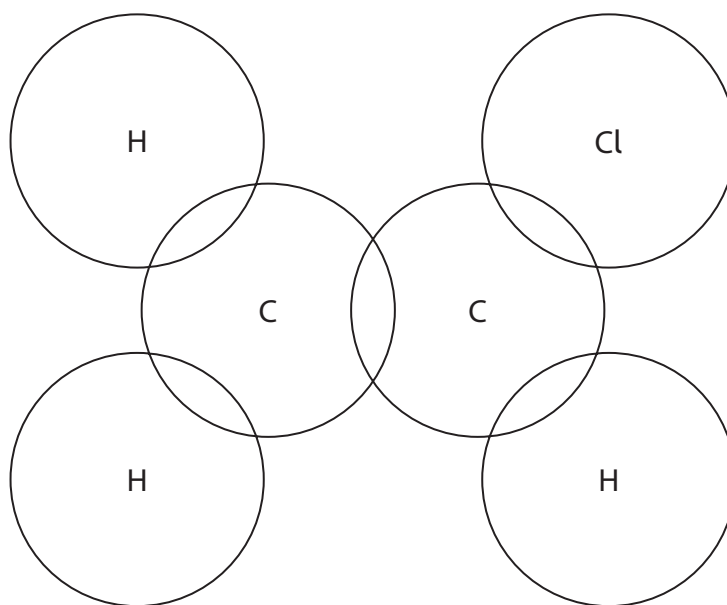
(a) Name the type of polymerisation that produces poly(chloroethene).

(1)

(b) Complete the dot-and-cross diagram for chloroethene.

Show only the electrons in the outer shell of each atom.

(2)



(c) Draw the repeat unit of poly(chloroethene).

(2)

(d) The relative molecular mass for a chain of poly(chloroethene) is 254 000

Calculate the number of carbon atoms in this polymer chain.

[for chloroethene, $M_r = 62.5$]

(2)

number of carbon atoms =

(e) Poly(chloroethene) is suitable for making underground water pipes because it is inert.

Explain a problem caused by poly(chloroethene) being inert.

(2)

(Total for Question 5 = 9 marks)

6 The reaction between chlorine and iodine monochloride (ICl) is reversible.

A teacher sets up an experiment to demonstrate this reaction.

Diagram 1 shows the start of the experiment.

start of experiment

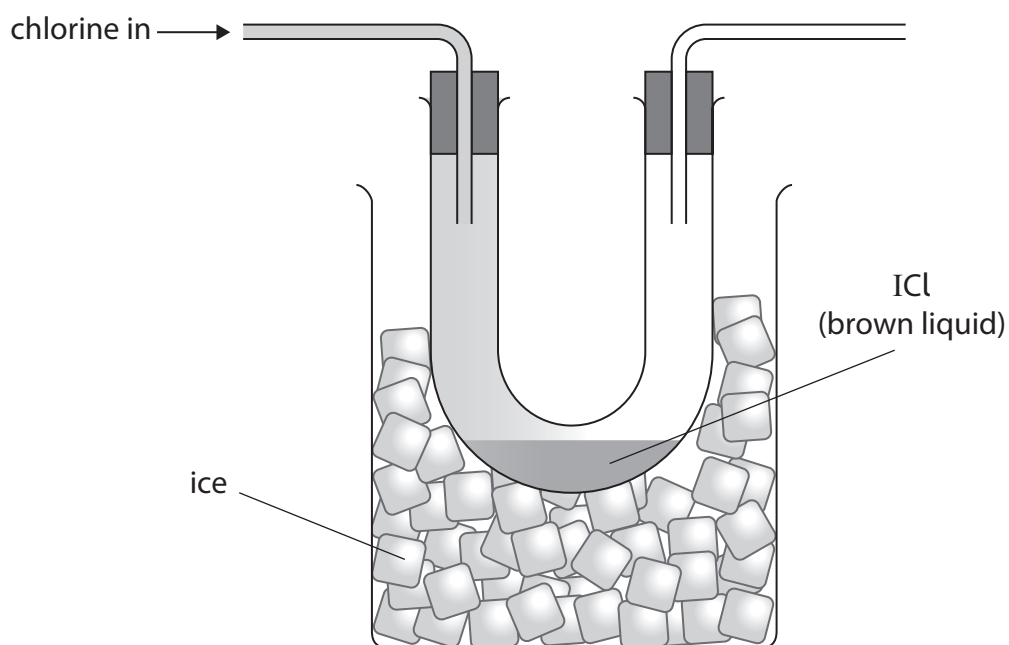


Diagram 1

Diagram 2 shows the same experiment ten minutes later.

ten minutes later

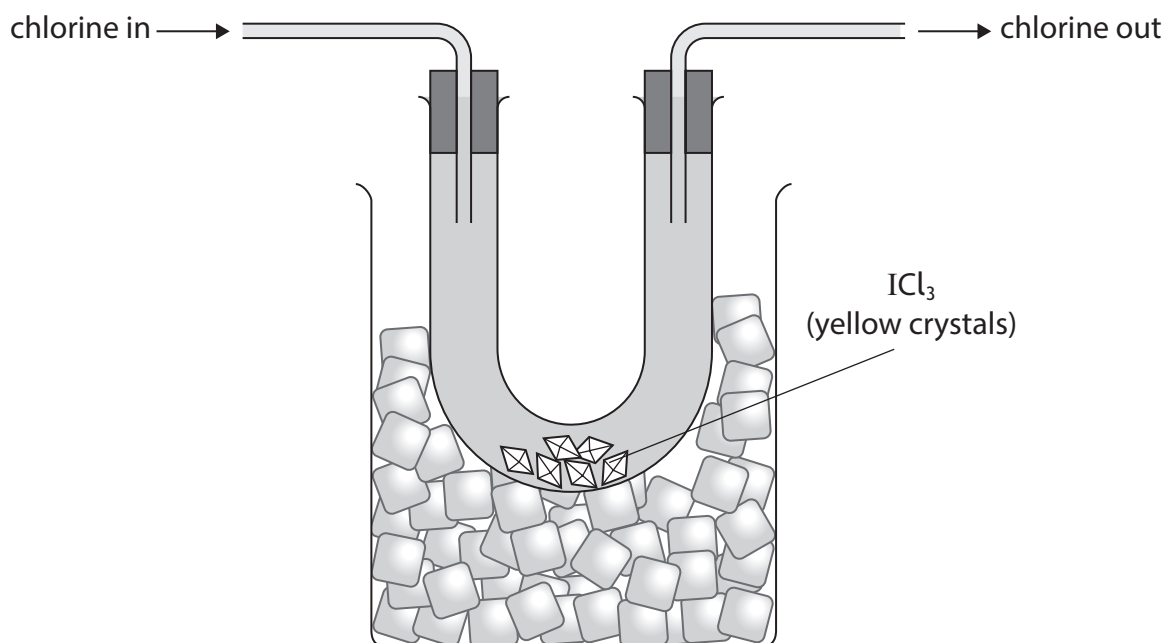


Diagram 2

(a) Describe a test for chlorine.

(2)

(b) Give a chemical equation, including state symbols, to show that the reaction between chlorine and iodine monochloride is reversible.

(2)

(c) (i) Suggest one change that the teacher could make to reverse the reaction.

(1)

(ii) Describe what would be observed during the reverse reaction.

(2)



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- (d) The teacher chose to carry out the experiment using ice rather than at room temperature.

Explain the effect of using ice on the rate of reaction.

(4)

[illegible]

(e) The maximum mass of ICl_3 that could be made in this experiment is 4.67 g.

The actual amount of ICl_3 that the teacher obtains is 6.40×10^{-3} mol.

Calculate the percentage yield of ICl_3 in the teacher's experiment.

[for I, $A_r = 127$ for Cl, $A_r = 35.5$]

(3)

percentage yield = %

(Total for Question 6 = 14 marks)



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7 This question is about halogens.

(a) Which halogen has the palest colour?

(1)

- ☐ **A** astatine
☐ **B** bromine
☐ **C** chlorine
☐ **D** fluorine

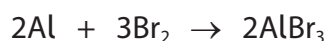
(b) Iodine is a solid at room temperature and pressure, but turns into a gas when heated with a Bunsen burner.

Which row shows the melting point and boiling point of iodine?

(1)

	Melting point in °C	Boiling point in °C
☐ A	-102	-34
☐ B	-7	59
☐ C	114	184
☐ D	1538	2861

(c) The equation shows the reaction of aluminium with bromine.



Calculate the maximum mass of aluminium bromide produced from 5.60 g of bromine.

[for Br_2 , $M_r = 160$ for AlBr_3 , $M_r = 267$]

(3)

maximum mass = g

(d) A student has three solutions labelled, X, Y and Z.

Each solution contains a different halogen, either chlorine, bromine or iodine.

The student decides to use displacement reactions to identify which halogen is in each solution.

The student uses this method.

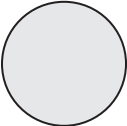
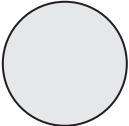
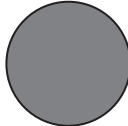
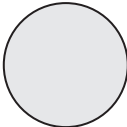
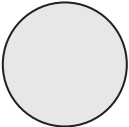
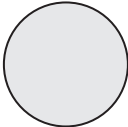
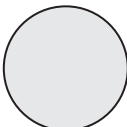
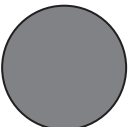
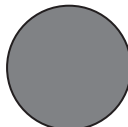
Step 1 pour samples of solution X into three different test tubes

Step 2 add a different potassium halide solution to each test tube

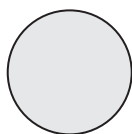
Step 3 record whether the solution in the test tube becomes paler or darker in colour

Repeat steps 1 to 3 for solution Y and for solution Z.

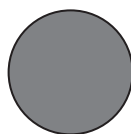
The table shows the student's results.

	Addition of potassium chloride solution	Addition of potassium bromide solution	Addition of potassium iodide solution
Solution X			
Solution Y			
Solution Z			

Key to results



solution turns paler



solution turns darker



Explain how the results show which halogen is in solution X, which halogen is in solution Y and which halogen is in solution Z.

In your answer, refer to:

- what the colour change indicates
- the order of reactivity of the halogens.

(6)

(Total for Question 7 = 11 marks)

(TOTAL FOR PAPER = 60 MARKS)



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