

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel International GCSE (9–1)

Friday 12 June 2026

Morning (Time: 1 hour 15 minutes)

Paper reference **4CH1/2CR**

Chemistry

UNIT: 4CH1

PAPER: 2CR

You must have:

Calculator

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.

Information

- The total mark for this paper is 70.
- 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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The Periodic Table of the Elements

1	2	3					4	5	6	7	0						
		1 H hydrogen 1															
Key																	
		relative atomic mass atomic symbol name atomic (proton) number															
7 Li lithium 3	9 Be beryllium 4																
23 Na sodium 11	24 Mg magnesium 12																
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30						
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

* The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

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Answer ALL questions.

Some questions must be answered with a cross ☒. 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 elements, compounds and mixtures.

(a) Name the element that burns with a lilac flame.

(1)

(b) Name the technique used to separate a mixture of liquids with different boiling points.

(1)

(c) The box gives the names of some substances.

air

helium

gallium

mercury

sulfur dioxide

Choose substances from the box to answer these questions.

(i) Identify the substance that is a mixture.

(1)

(ii) Identify the substance in Group 3 of the Periodic Table.

(1)

(d) Explain why hydrogen chloride is a compound.

(2)

(Total for Question 1 = 6 marks)



P 7 9 5 2 9 A 0 3 2 0

2 This question is about aluminium.

(a) (i) Why does solid aluminium conduct electricity?

(1)

- ☐ **A** electrons are free to move in the solid
- ☐ **B** electrons and neutrons are free to move in the solid
- ☐ **C** electrons and protons are free to move in the solid
- ☐ **D** ions are free to move in the solid

(ii) Explain why aluminium is malleable.

(2)

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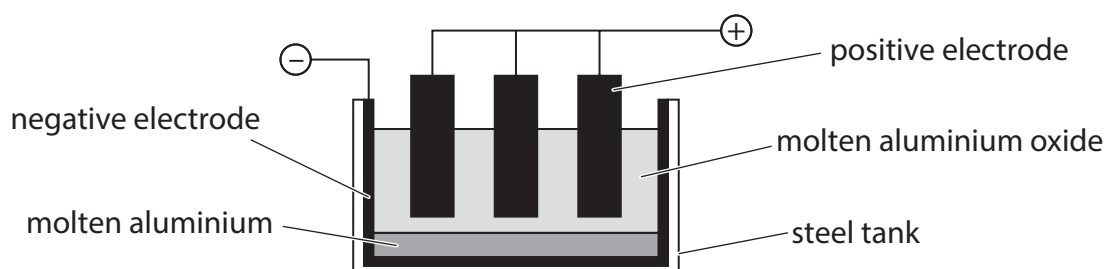
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(b) Aluminium is extracted from aluminium oxide by electrolysis.

The diagram shows the electrolysis of aluminium oxide.



(i) Why is aluminium **not** extracted by heating aluminium oxide with carbon?

(1)

- ☐ **A** aluminium is more reactive than carbon
- ☐ **B** carbon is an oxidising agent
- ☐ **C** the reaction has a low activation energy
- ☐ **D** the reaction is explosive



(ii) Aluminium is formed at the negative electrode.

Name the product formed at the positive electrode.

(1)

(iii) Suggest why the electrolysis of aluminium oxide is expensive.

(1)

(c) Aluminium is used to make cans for drinks because it is malleable.

Give another reason why aluminium is used to make cans for drinks.

(1)

(Total for Question 2 = 7 marks)

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3 This question is about the solubility of salts.

(a) State what is meant by the term **saturated solution**.

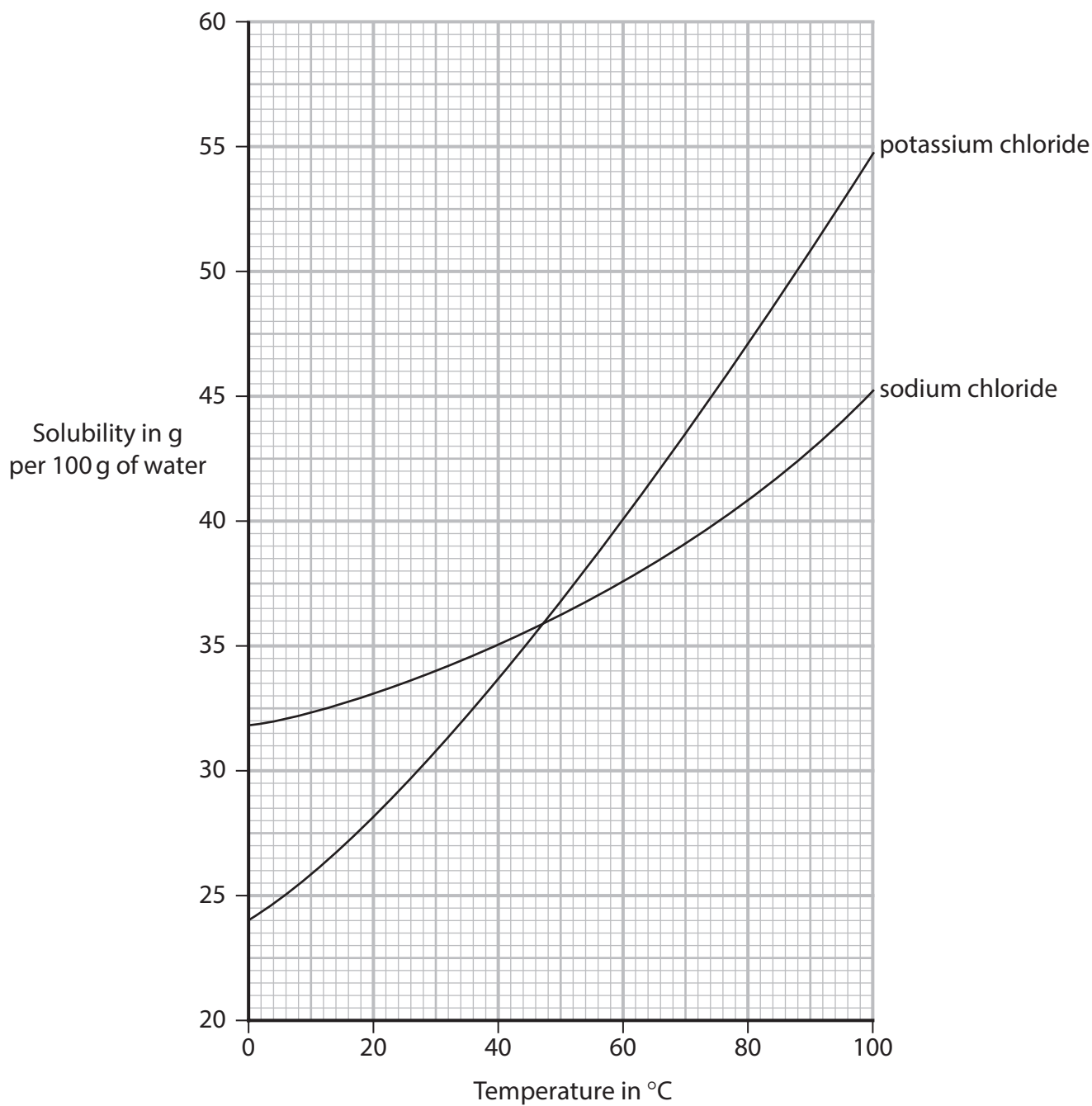
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(b) The graph shows the solubilities of sodium chloride and potassium chloride at different temperatures.



- (i) Deduce the temperature at which sodium chloride and potassium chloride have the same solubility.

(1)

temperature = °C

- (ii) A saturated solution of potassium chloride in 100 g of water is cooled from 80 °C to 60 °C.

Determine the mass, in grams, of potassium chloride that crystallises.

(2)

mass = g

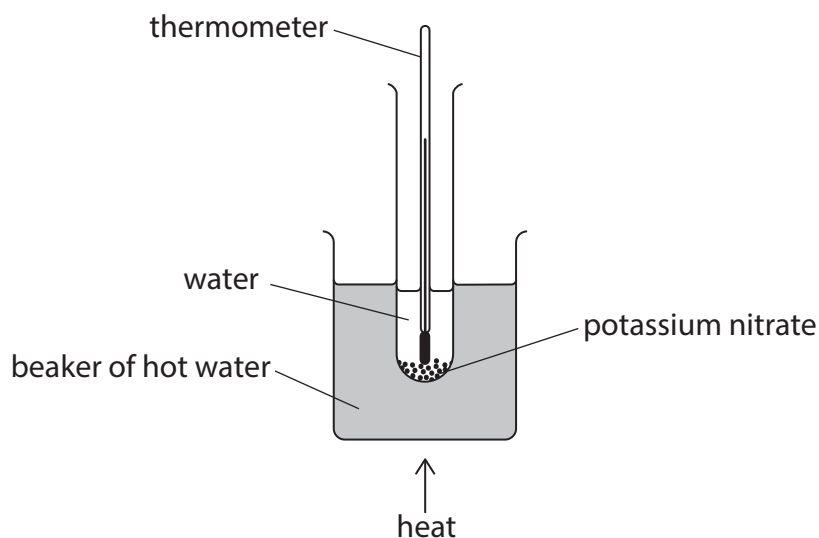
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- (c) A student uses this apparatus to determine the solubility of potassium nitrate in water.



This is the student's method.

- Step 1 add 6.2 g of potassium nitrate to a boiling tube
- Step 2 add 20 cm^3 of water to the boiling tube
- Step 3 place the boiling tube in a beaker of water
- Step 4 heat the beaker gently, stirring the mixture in the boiling tube continuously until the potassium nitrate dissolves
- Step 5 remove the boiling tube from the beaker and allow the mixture to cool
- Step 6 record the temperature at which crystals start to form in the boiling tube

- (i) Name a piece of apparatus that the student could use in step 2 to measure 20 cm^3 of water.

(1)

- (ii) Give a reason why the student uses a beaker of hot water in step 3, rather than directly heating the boiling tube with a Bunsen burner.

(1)



(iii) In step 6, crystals start to form at 32 °C.

Calculate the solubility of the solid, in g per 100 g of water, at 32 °C.

[1.0 cm³ of pure water has a mass of 1.0 g]

(2)

solubility = g per 100 g of water

(Total for Question 3 = 8 marks)

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- 4 The table gives some properties of the halogens fluorine, chlorine, bromine and iodine.

Halogen	Property	
	State at room temperature	Colour
fluorine	gas	pale yellow
chlorine	gas	pale green
bromine	liquid	red-brown
iodine	solid	dark grey
astatine		

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- (a) Complete the table by giving the predicted properties of astatine.

(2)

- (b) A sample of fluorine contains two isotopes.

- (i) Describe, in terms of sub-atomic particles, what is meant by the term **isotopes**.

(2)

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- (ii) The two isotopes in this sample of fluorine are $^{18}_9\text{F}$ and $^{19}_9\text{F}$

The relative atomic mass (A_r) of the sample of fluorine is 18.998

Explain the relative abundances of the two isotopes.

You do not need to do a calculation.

(2)

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- (c) (i) A student is given colourless solutions of chlorine and sodium bromide.

Describe how the student can use these two solutions to show that chlorine is more reactive than bromine.

(3)

- (ii) Explain why chlorine is more reactive than bromine.

Refer to the atomic structures of chlorine and bromine in your answer.

(3)

(Total for Question 4 = 12 marks)



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5 This question is about alcohols.

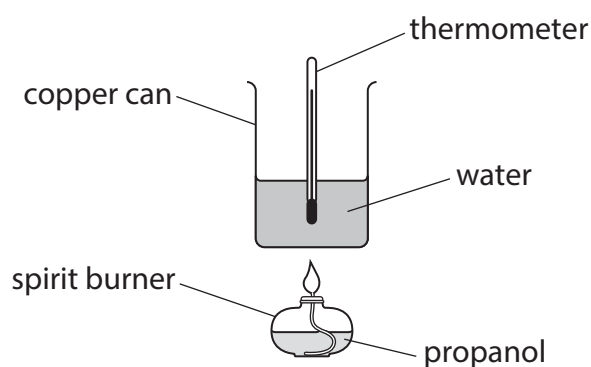
- (a) Give two conditions needed for the production of ethanol by the fermentation of glucose.

(2)

1

2

- (b) A student uses this apparatus to find the molar enthalpy change, ΔH , for the combustion of propanol, C_3H_7OH



- (i) These are the student's results.

mass of water	125 g
initial temperature of water	19.5°C
maximum temperature of water	52.8°C

Calculate the heat energy change, Q , in joules.

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

(3)

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



- (ii) In a different experiment, the student burns 0.75 g of propanol.

The heat energy change for this experiment is 19 500 J.

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

Include a sign in your answer.

[for propanol, $M_r = 60$]

(3)

$\Delta H =$ kJ/mol

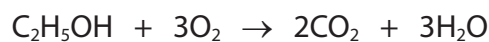
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(c) This is the equation for the combustion of ethanol.



- (i) Explain, in terms of bonds broken and bonds made, why this reaction is exothermic.

(2)

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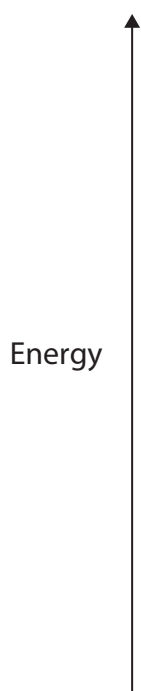
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- (ii) Draw an energy level diagram for this reaction.

You should show ΔH as a single-headed arrow.

(3)



(Total for Question 5 = 13 marks)



6 This question is about sugars.

(a) Sugar A has this percentage composition by mass.

$$C = 44.7\% \quad H = 7.5\% \quad O = 47.8\%$$

Determine the empirical formula of sugar A.

[A_r values: $C = 12$ $H = 1$ $O = 16$]

(4)

empirical formula =

(b) A 5.00 cm^3 sample of blood contains 0.00510 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$

Calculate the concentration, in mol/dm^3 , of glucose in this sample.

Give your answer to three significant figures.

[$1 \text{ dm}^3 = 1000 \text{ cm}^3$]

[for $\text{C}_6\text{H}_{12}\text{O}_6$ $M_r = 180$]

(3)

concentration = mol/dm^3

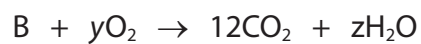
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(c) This equation represents the complete combustion of 1 mol of sugar B.



8.55 g of sugar B is burned, producing 7200 cm³ of carbon dioxide at rtp.

Use the equation to calculate the M_r of sugar B.

[one mole of any gas occupies 24 000 cm³ at rtp]

(3)

$M_r = \dots\dots\dots$

(Total for Question 6 = 10 marks)

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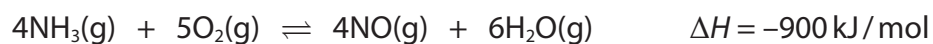
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7 This question is about nitric acid.

This is the equation for a reaction that occurs in the manufacture of nitric acid.



After several hours in a closed system, this reaction reaches dynamic equilibrium.

(a) (i) Give the meaning of the symbol $\rightleftharpoons$

(1)

(ii) State what is meant by the term **dynamic equilibrium**.

(2)

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(b) Typical conditions for this reaction are a temperature of 800°C and a pressure of 10 atm.

- (i) Explain the effects on rate of reaction and yield of products if the temperature is changed to 1000°C but the pressure is kept at 10 atm.

(5)

rate of reaction

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yield of products

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- (ii) Lowering the pressure would increase the yield of products.

Give a reason why a lower pressure is not used.

(1)

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QUESTION 7 CONTINUES ON BACK PAGE



- (c) A student does a titration using dilute nitric acid and a solution of sodium hydroxide with a known concentration.

These are the first four steps in the student's method.

- add 25.0 cm^3 of nitric acid to a conical flask
- add sodium hydroxide solution to a burette and record the initial volume
- add a few drops of methyl orange indicator to the flask
- use the burette to add sodium hydroxide solution to the flask until the indicator changes colour

Describe how the student could modify their method to obtain an accurate value for the volume of sodium hydroxide solution needed to neutralise 25.0 cm^3 of nitric acid.

(5)

(Total for Question 7 = 14 marks)

TOTAL FOR PAPER = 70 MARKS

