



Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Chemistry (4WCH2) Unit 2C

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Question Paper Log Number P81579A

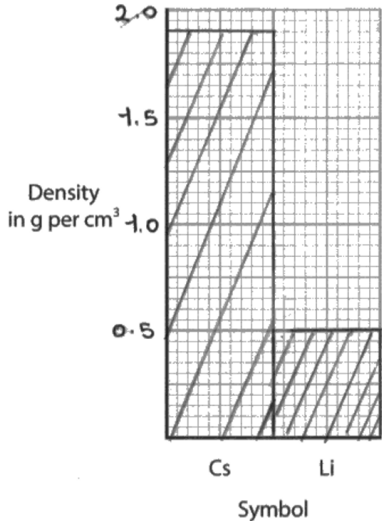
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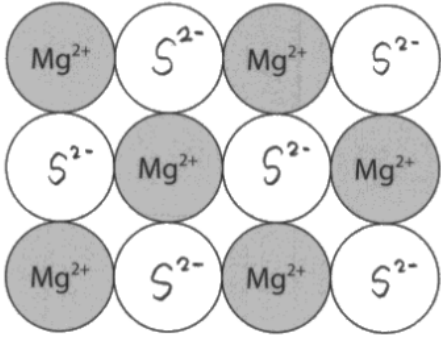
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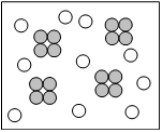
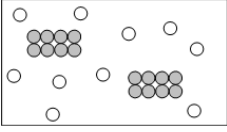
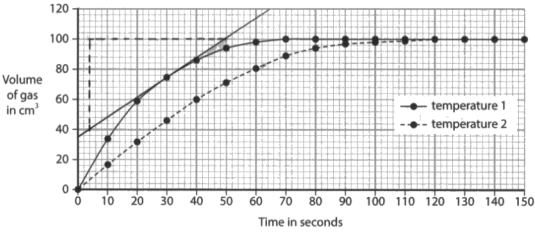
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

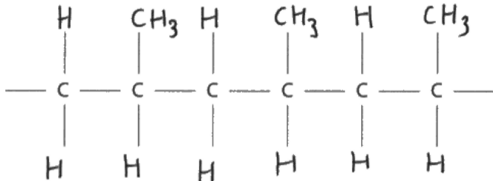
Question number			Answer	Notes	Marks
1	(a)	(i)	caesium		1
		(ii)	sodium		1
	(b)		M1 add (rubidium) to water M2 effervescence / fizzing	ALLOW burns with a (coloured) flame ALLOW solution turns blue/purple with universal indicator IGNORE floats on water IGNORE hydrogen or alkali produced	2
	(c)	(i)			2
		(ii)	M1 appropriate scale on y axis M2 bars correctly drawn for Cs and Li a value between 0.8 and 1.6 inclusive	ALLOW +/- 1 square	1
Total 7					

Question number	Answer	Notes	Marks
2 (a) (i)	ions are fixed (in position) OR ions are not free to move	ACCEPT structure is solid and ionic compounds do not conduct when solid	1
(ii)			1
(iii)	M1 ions (in MgS) have a greater charge M2 stronger (electrostatic) attraction (between ions)		2
(b) (i)	(gas X) chlorine (gas Y) hydrogen	ACCEPT Cl ₂ ACCEPT H ₂ If no other mark awarded, then allow 1 mark if both gases given	2
(ii)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	ACCEPT $2\text{H}^+ \rightarrow \text{H}_2 - 2\text{e}^-$ 1 mark for symbols and electron 1 mark for balancing	2
			Total 8

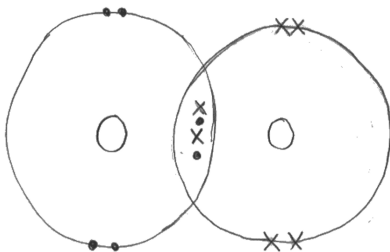
Question number	Answer	Notes	Marks
3 (a)	A (diamond) <i>B is not the correct structure as a fullerene only has 3 bonds per atom</i> <i>C is not the correct structure as graphite only has 3 bonds per atom and is in layers</i> <i>D is not the correct structure as methane is a simple molecule</i>		1
(b)	M1 (pairs of) electrons are shared M2 electrostatic attraction between electrons and nuclei		2
(c)	Any one of the following: • does not conduct electricity • hard	ACCEPT colourless / transparent IGNORE density	1
(d)	M1 ice is a simple (molecular) structure M2 weak intermolecular forces (between water molecules) M3 carbon is a giant (covalent) structure M4 many/strong (covalent) bonds (between atoms) M5 the energy to overcome forces in ice is less than in carbon	ACCEPT ice consists of small molecules	5
(e)	M1 heat the ice M2 the melting point will be 0 °C OR the boiling point will be 100 °C	ACCEPT melt / boil the ice	2
			Total 11

Question number	Answer	Notes	Marks
4 (a) (i)	B  <i>A is not correct as it would decrease the rate of reaction.</i> <i>C is not correct as it would decrease the rate of reaction.</i> <i>D is not correct as it would decrease the rate of reaction.</i>		1
(ii)	D  <i>A is not correct as it would increase the rate of reaction.</i> <i>B is not correct as it would increase the rate of reaction.</i> <i>C is not correct as it would increase the rate of reaction.</i>		1
(b) (i)	M1 reaction takes a greater amount of time to complete M2 temperature has decreased / is lower so must be 25 °C	ACCEPT (gradient of the) graph is less steep ACCEPT lower rate of reaction	2
(ii)	 M1 tangent drawn on graph for temperature 1	tangent line spans at least 10-50 seconds	1

(iii)	M1 readings taken from tangent and calculation M2 value in the range of 1.2 to 1.4 (cm³ per second)	step y ÷ step x e.g. (100 - 40) ÷ (50 - 4)	2
(iv)	M1 rate doubles three times / $\times 2^3$ M2 answer from (iii) $\times 8$ e.g. (1.3 $\times 8$ =) 10.4 (cm³ per second)	ACCEPT (increase/difference of) 30 °C ALLOW ECF from (iii) ALLOW use of 1.3 as instead to answer from (iii) value in the range of 9.6 to 11.2 (cm³ per second) scores 2 marks	2
(v)	M1 reaction is too fast at 65 °C to take (volume / time) measurements accurately M2 reaction is too slow at -5 °C so reaction will take too long (to complete) M3 (most) <u>particles</u> have high (kinetic) energy at higher temperature/65 °C AND have low (kinetic) energy at lower temperature/ -5 °C M4 collisions (between particles) are more frequent at higher temperature/65 °C AND are less frequent at lower temperature/-5 °C	ACCEPT too fast to observe / monitor / collect gas ACCEPT volume of gas collected is too small ACCEPT no reaction observed ALLOW higher / lower energy ACCEPT (most) particles have energy (equal to or) greater than activation energy at 65 °C / higher temperature AND energy less than activation energy at -5 °C / lower temperature ACCEPT collisions per unit time	4
			Total 13

Question number	Answer	Notes	Marks
5 (a)	M1 for C_3H_8, $M_r = 44$ AND for C_3H_6, $M_r = 42$ M2 $6\,600\,000 \div 44 \times 42$ M3 6.3×10^6 (g)	ACCEPT conversion to standard form at any point ACCEPT 6 300 000 correct answer without working scores 3	3
(b) (i)	addition		1
(ii)	 M1 CH_3 (or displayed formula) on alternate carbon atoms M2 rest of molecule correct	ACCEPT CH_3 groups on carbon positions 1, 4, and 5 OR carbon positions 2, 3 and 5 OR carbon positions 1, 3 and 6	2
(iii)	M1 (causes an) increase in global temperature / global warming M2 contributes to climate change	ACCEPT acts as a greenhouse gas ACCEPT glaciers melting, forest fires, flooding	2
(iv)	Any one of the following: • non-biodegradable / does not biodegrade • remains in environment for a very long time • shortage of land		1
Total			9

Question number	Answer	Notes	Marks
6 (a)	(i) sulfuric acid / phosphoric acid	ACCEPT dilute or concentrated ALLOW H ₂ SO ₄ / H ₃ PO ₄	1
	(ii) M1 (from) orange M2 (to) green	must be in the correct order	2
(b)	(i) $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$ M1 2CH ₃ COONa M2 CO ₂ + H ₂ O	ALLOW 2NaCH ₃ COO / 2NaOOCCH ₃	2
	(ii) Any two from: M1 bubbles/ fizzing/effervescence M2 sodium carbonate/solid disappears/ gets smaller M3 loss of vinegar smell	IGNORE gas produced even if incorrect ALLOW dissolves	2
(c)	(i) catalyst / to speed up the reaction		1
	(ii) ethanol is (in)flammable /can ignite	ACCEPT ethyl ethanoate is (in)flammable /can ignite ALLOW mixture or it is (in)flammable /can ignite	1
	(iii) distinctive/fruity/sweet smell	ACCEPT oily liquid IGNORE nice smell	1
			Total 10

Question number	Answer	Notes	Marks												
7 (a)	relights a glowing splint		1												
(b)	 M1 four electrons shown between the two atoms M2 rest of diagram correct	ALLOW any combination of dots and crosses	2												
(c) (i)	M1 $230 \times (21 \div 100)$ M2 $100 - 48.3$ M3 52	ACCEPT 48.3 ACCEPT 51.7 correct answer without working scores 3	3												
(ii)	$4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$ M1 left-hand side of the equation M2 right-hand side of the equation	ACCEPT multiples	2												
(iii)	<table border="1"><thead><tr><th>Ion</th><th>Number of these ions in Fe_3O_4</th></tr></thead><tbody><tr><td>Fe^+</td><td>0</td></tr><tr><td>Fe^{2+}</td><td>1</td></tr><tr><td>Fe^{3+}</td><td>2</td></tr><tr><td>Fe^{4+}</td><td>0</td></tr><tr><td>Fe^{5+}</td><td>0</td></tr></tbody></table>	Ion	Number of these ions in Fe_3O_4	Fe^+	0	Fe^{2+}	1	Fe^{3+}	2	Fe^{4+}	0	Fe^{5+}	0	All four rows correct scores 2 ALLOW 1 mark for any three rows correct	2
Ion	Number of these ions in Fe_3O_4														
Fe^+	0														
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Fe^{4+}	0														
Fe^{5+}	0														
			Total 10												

Question number	Answer	Notes	Marks
8 (a) (i)	cool the mixture		1
(ii)	$\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightleftharpoons \text{NH}_4\text{Cl}(\text{s})$ M1 formulae and reversible arrow M2 state symbols	ACCEPT equation written other way around	2
(b) (i)	M1 (damp) red litmus paper turns blue M2 white precipitate		2
(ii)	CaI_2		1
(iii)	ammonium chloride M1 no (visible) colour change / stays same colour M2 bromine cannot displace chlorine from its compound compound Z M3 solution turns brown / darker M4 bromine displaces iodine from its compound	ACCEPT stays (pale) yellow/ orange ACCEPT bromine is less reactive than chlorine ECF from (ii) only if a halide e.g. no colour change ACCEPT bromine is more reactive than iodine ECF for the halide identified in (ii) e.g. bromine cannot displace itself	4
			Total 10

Question number	Answer	Notes	Marks									
9 (a)	<table><thead><tr><th>Condition</th><th>Value</th></tr></thead><tbody><tr><td rowspan="3">pressure in atmospheres</td><td>60</td></tr><tr><td>120</td></tr><tr><td>180</td></tr><tr><td rowspan="2">temperature in °C</td><td>240</td></tr><tr><td>300</td></tr></tbody></table>	Condition	Value	pressure in atmospheres	60	120	180	temperature in °C	240	300		2
Condition	Value											
pressure in atmospheres	60											
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	300											
(b) (i)	M1 (the peak of) the curve would become lower M2 because the activation energy is decreased	ACCEPT other suitable descriptors for curve	2									
(ii)	M1 (the reaction is in) equilibrium M2 (the reaction profile shows that) the reaction is exothermic M3 (increase in temperature causes) reaction to move in reverse / towards the reactants	ACCEPT the <u>reverse</u> reaction is endothermic	3									
(c)	M1 (for C₂H₅OH) <i>M_r</i> = 46 M2 (amount of C₂H₅OH =) 0.04 (mol) M3 (amount of ethene =) 0.8 (mol) M4 (volume of ethene =) 19.2 (dm³) M5 (volume of ethene =) 19 200 (cm³) Alternative method M1 (100% yield mass of C₂H₅OH =) 36.8 (g) M2 (for C₂H₅OH) <i>M_r</i> = 46 M3 (amount of ethanol/ethene =) 0.8 (mol) M4 (volume of ethene =) 19.2 (dm³) M5 (volume of ethene =) 19 200 (cm³)	ALLOW percentage conversion at any point ACCEPT 1.84 ÷ 46 ACCEPT 0.04 ÷ 5 × 100 ACCEPT 0.8 × 24 ACCEPT 1.84 ÷ 5 × 100 ACCEPT 36.8 ÷ 46 ACCEPT 0.8 × 24	5									
			Total 12									

