



Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 1CR

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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)	freezing		1
(ii)	evaporation		1
(iii)	sublimation		1
(b)	Any 3 from M1 (particles) are far apart M2 (particles) are randomly / irregularly arranged M3 (particles) have (almost) total freedom of movement / move freely M4 particles have high/higher energy M1 comment on spacing M2 comment on arrangement M3 comment on moving M4 comment on energy	ALLOW no arrangement ALLOW random motion	3
			Total = 6

Question number	Answer	Notes	Marks
2 (a) (i)	water	ALLOW moisture / water vapour / steam	1
(ii)	(hydrated) iron(III) oxide	ALLOW ferric oxide / Fe_2O_3 If alternatives are present all must be correct	1
(b) (i)	M1 (paint) acts as a barrier / coated with paint / protective layer M2 which prevents oxygen / air / water getting to the iron		2 1
(ii)	galvanising / galvanisation	ALLOW sacrificial protection	
(iii)	M1 zinc is more reactive (than iron) M2 zinc oxidises / zinc reacts / zinc loses electrons in preference to iron / zinc oxide forms / zinc corrodes / zinc is a reducing agent	ALLOW zinc is higher in the reactivity series REJECT zinc rusts for M2	2
			Total = 7

Question number	Answer	Notes	Marks
3 (a)	M1 dissolving /dissolves /dissolution? M2 diffusion /diffuses	can be either way round	2
(b)	M1 particles move faster M2 so particles collide and react after a shorter period of time	ALLOW particles have more kinetic energy ALLOW diffuse faster ALLOW more frequent collisions	2
(c) (i)	3 /three		1
(ii)	2+ / Cu ²⁺	ALLOW +2 /Cu ⁺²	1
			Total = 6

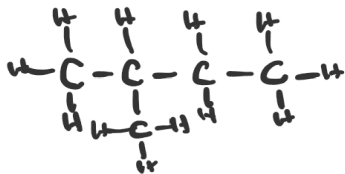
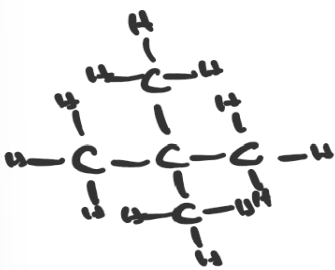
Question number	Answer	Notes	Marks								
4 (a)		REJECT any sign for the relative mass	3								
	<table><tr><th>Relative mass</th><th>Relative charge</th></tr><tr><td>1</td><td>0</td></tr><tr><td>1</td><td>+1</td></tr><tr><td>0.0005 to 0.0006 or 1/1800 to 1/2000</td><td>-1</td></tr></table>			Relative mass	Relative charge	1	0	1	+1	0.0005 to 0.0006 or 1/1800 to 1/2000	-1
	Relative mass			Relative charge							
	1			0							
	1			+1							
0.0005 to 0.0006 or 1/1800 to 1/2000	-1										
(b) (i)	A		1								
(ii)	D		1								
(iii)	C		1								
(c)	similarity number of protons OR number of electrons /electron configuration /3 protons difference number of neutrons /3 or 4 neutrons	ALLOW same atomic number and different mass number for 1 mark if no other mark awarded	2								
(d)	M1 ((79×24)+(10×25)+(26×11))÷100 M2 24.32 M3 24.3	ALLOW ecf from M2 to 1dp 24.3 scores 3 marks	3								
			Total = 11								

Question number	Answer		Notes	Marks
5 (a)			do not accept red alone	3
	Colour	Physical state at room temperature		
	pale yellow	gas		
	pale green	gas		
	brown /orange-brown /red-brown	liquid		
	dark grey	solid		
	black	solid		
(b) (i)	$\text{Cl}_2 + 2\text{NaBr} \rightarrow \text{Br}_2 + 2\text{NaCl}$ M1 all formulae correct M2 equation correctly balanced		IGNORE state symbols even if incorrect M2 dep on M1	2
(ii)	M1 no reaction M2 bromine is less reactive than chlorine / chlorine is more reactive than bromine		ALLOW bromine is not as good an oxidising agent as chlorine do not allow bromide is less reactive than chlorine OR chloride is more reactive than bromine for M2 M2 dep on M1	2
(iii)	M1 astatide (ions)/ At^- are oxidised/reducing agent as they lose electrons M2 bromine (molecules)/ Br_2 are reduced /oxidising agent as they gain electrons		ALLOW astatide (ions) are oxidised as their oxidation state increases do not allow astatine is oxidised OR bromide is reduced ALLOW bromine is reduced as its oxidation state decreases ALLOW astatide (ions) are oxidised and bromine is reduced for 1 mark ALLOW astatide loses electrons and bromine gains electrons for 1 mark	2
				Total = 9

Question number	Answer	Notes	Marks
6 (a)	D (as a proton donor) A is not the correct answer as acids are not electron acceptors B is not the correct answer as acids are not electron donors C is not the correct answer as acids are not proton acceptors		1
(b)	effervescence / bubbles / fizzing / a colourless solution forms /magnesium dissolves / magnesium gets smaller/gets warm	IGNORE gas produced	1
(c)	to ensure all the (hydrochloric) acid has reacted	ALLOW acid used up for reacted ALLOW to ensure it has neutralised	1
(d)	A description connecting any 5 of the following: M1 filter (the excess magnesium) M2 heat M3 until crystals first start to form M4 allow to cool and crystallise M5 pour off excess liquid M6 leave in a warm place to dry	 ALLOW heat to evaporate some of the water ALLOW heat until a saturated solution forms ALLOW filter / decant IGNORE washing the crystals ALLOW dry with a paper towel OR in a warm oven OR dry in a desiccator OR leave to dry If sample is heated to dryness award M1 and M2 only	5
			Total = 8

Question number	Answer	Notes	Marks
7 (a)	M1 (moles of CaCO_3) = $5 \div 100$ OR 0.05 mol M2 (mass of CO_2) = 0.05×44 OR 2.2g M3 (reading on balance) $122.2 - 2.2 = 120.00\text{g}$	ecf for M1 if moles attempted ecf for M2 120 g scores 2 marks	3
(b) (i)	All points plotted correctly $\pm$ half a square		1
(ii)	Curve of best fit joining all the points		1
(iii)	M1 tangent drawn at 2 minutes M2 gradient of tangent M3 g/minute/g minute⁻¹/g/min/g min⁻¹/gram/minute	If no tangent drawn 1 mark for M3 only do not allow g/m for M3	3
(iv)	An explanation that links any 2 pairs of the following points Pair 1 M1 (the curve) is steep(est) at the start M2 because the reaction is fast(est) at the start / because the (acid) concentration is high(est) /more calcium carbonate /more chips Pair 2 M3 (the curve) becomes less steep M4 because the reaction slows down / because the acid becomes more dilute /less calcium carbonate /less chips Pair 3 M5 the curve levels off / the graph plateaus M6 because all the calcium carbonate /chips have reacted /used up	ALLOW the gradient is greater at the start ALLOW the gradient decreases ALLOW the gradient becomes zero/0/flat /horizontal/constant	4
(c)	M1 the rate of reaction increases M2 because the powder has a greater surface area M3 so there are more collisions per unit time	If more energy is implied or move faster lose 1 mark ALLOW more frequent collisions /collide more often	3
			Total = 15

(iii)	an explanation linking any 5 of the following points: NB do not credit high melting point as in the question M1 giant (covalent) structure / lattice M2 covalent bonds are strong M3 which requires a lot of energy to break the (covalent) bonds M4 3D / tetrahedral structure M5 every silicon atom makes 4 bonds / 4 pairs of electrons shared M6 no layers / atoms cannot slide over each other	ALLOW strong attraction between shared pairs of electrons and nuclei M3 being dep on covalent do not allow more energy Lose 1 mark if they mention intermolecular forces or ionic bonding	5
			Total = 13
Question number	Answer	Notes	Marks
9 (a)	alkane(s)	not alkene(s)	1
(b)	M1 when sulfur (impurity in fuels) burns /combusts M2 sulfur dioxide / SO₂ forms M3 which dissolves / reacts with (rain) water	ALLOW sulfur reacts with oxygen do not allow acid rain alone as this is in the question IGNORE mention of nitrogen and NO₂ and carbon dioxide M3 dep on M1 or M2	3
(c) (i)	temperature 600-700°C catalyst alumina/silica/aluminosilicates/zeolites / Al₂O₃ / SiO₂		2
(ii)	M1 long-chain alkanes/hydrocarbons have lower demand or are less useful M2 (cracking produces) shorter alkanes that are more flammable / more useful as fuels or petrol or gasoline	ALLOW short chain hydrocarbons/alkanes are more useful/higher demand	3

		M3 (cracking produces) alkenes that can be used to make polymers /alcohols		
(d)	(i)	M1 same molecular formula	ALLOW same number of carbons and hydrogens	2
	(ii)	M2 different structural/displayed formulae  	ALLOW different of arrangement of atoms	2
				Total = 13

Question number	Answer	Notes	Marks
10 (a) (i)	Any two of the following M1 use a polystyrene cup M2 less heat will be lost M3 leave to reach a steady temperature to record it	ALLOW use a beaker with a lid ALLOW any piece of apparatus which is better insulated	2
(ii)	the zinc/powder/it is in excess		1
(iii)	blue to colourless		1
(b) (i)	M1 $\Delta T = 30.1(^{\circ}\text{C})$ M2 $25 \times 4.2 \times 30.1$	ALLOW ecf from M1	3

	M3 3160.5(J)	ALLOW any number of significant figures from 2	
(ii)	M1 (moles of CuSO_4) $6.38 \div 159.5$ OR 0.04 mol M2 $3800 \div 0.04$ OR 95 000 M3 division by 1000 = 95 (kJ) M4 -95 kJ/mol	ALLOW ecf from M1 ALLOW ecf from M2 correct answer -95 scores 4 ecf -79 scores 3 (using the energy change from (b)(i))	4
			Total = 11

Question number	Answer	Notes	Marks
11 (a)	sodium ions M1 do a flame test M2 yellow / orange flame sulfate ions M3 (make a solution and) add hydrochloric acid M4 add barium chloride solution M5 white precipitate	ALLOW any description of a flame test ALLOW HCl / nitric acid / HNO_3 REJECT sulfuric acid ALLOW BaCl_2 / barium nitrate / $\text{Ba}(\text{NO}_3)_2$ M5 dep on M4	5
(b) (i)	the last two results are the same	ALLOW mass is constant ALLOW heat to constant mass	1
(ii)	1.42 g		1
(iii)	1.80 g		1

(iv)	M1 $1.42 \div 142$ OR 0.01 M2 $1.8 \div 18$ OR 0.10 M3 $0.10 \div 0.01 = 10$	Answer of 10 or $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ scores 3	3
			Total = 11

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