



Mark Scheme (Results)

Summer 2025

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

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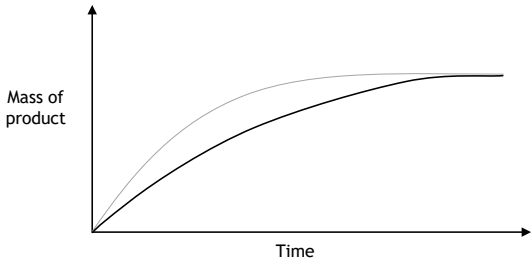
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General Marking Guidance

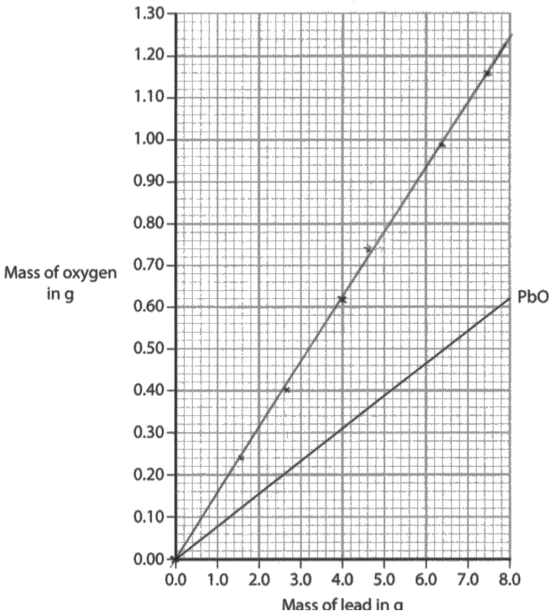
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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.

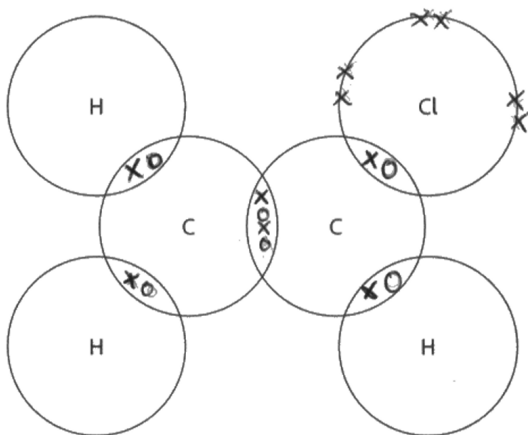
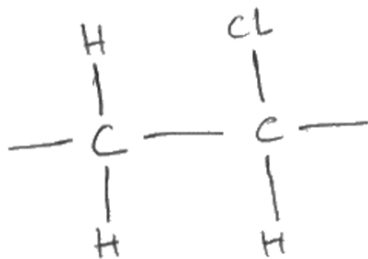
Question number	Answer	Notes	Marks
1 (a)	increased / greater decreased / lowered unchanged		3
(b)	Q	ACCEPT lowercase q	1
(c)	 M1 gradient is lower than the curve M2 levels off at same height as the curve		2
Total 6			

Question number	Answer	Notes	Marks																
2 (a)	<table><thead><tr><th>Ion</th><th>Charge</th></tr></thead><tbody><tr><td></td><td>3-</td></tr><tr><td>hydrogen</td><td>2-</td></tr><tr><td></td><td>1-</td></tr><tr><td>sulfate</td><td>0</td></tr><tr><td></td><td>1+</td></tr><tr><td>zinc</td><td>2+</td></tr><tr><td></td><td>3+</td></tr></tbody></table>	Ion	Charge		3-	hydrogen	2-		1-	sulfate	0		1+	zinc	2+		3+		3
Ion	Charge																		
	3-																		
hydrogen	2-																		
	1-																		
sulfate	0																		
	1+																		
zinc	2+																		
	3+																		
(b)	M1 (amount of hydrogen = amount of zinc =) 0.25 (mol) M2 (volume of hydrogen = 0.25 x 24 000 =) 6000 (cm³)	ACCEPT 16.25 ÷ 65	2																
			Total 5																

Question number	Answer	Notes	Marks
3 (a)	Li ⁺	ACCEPT lithium	1
(b)	M1 (the gas given off is) carbon dioxide M2 bubble the gas through limewater M3 turns cloudy / milky		3
(c)	Li ₂ CO ₃		1
			Total 5

Question number	Answer	Notes	Marks
4 (a)	(structure) M1 giant covalent M2 simple molecular	ACCEPT giant atomic / giant molecular	2
(b)	spherical / round shape (molecules)	ACCEPT molecules can roll ALLOW weak intermolecular forces (between molecules)	1
(c)	M1 delocalised electrons (carry an electrical charge / current) M2 electrons can travel along / between layers in graphite M3 electrons cannot leave the C ₆₀ fullerene molecule (because it is a small molecule)	ACCEPT electrons that are free to move (can carry an electrical current) ACCEPT electrons can travel through graphite ACCEPT electrons cannot travel beyond molecule / simple molecular structure	3
			Total 6

Question number	Answer	Notes	Marks
5 (a) (i)	mass before heating — mass after heating OR mass of tube and lead oxide — mass of tube and lead	ALLOW difference in mass (of tube) before and after heating	1
(ii)	M1 reheat and reweigh M2 until there is no further change in mass		2
(iii)	lead oxide + hydrogen → lead + water		1
(b)	reading from y axis ÷ reading from x axis (e.g. $0.62 \div 8.0$)	ACCEPT 0.08, 0.078, 0.0775	1
(c) (i)	 M1 all points correctly plotted		1
(ii)	M1 best fit straight line		1
(iii)	M1 gradient of graph is double OR twice as much oxygen for the same mass of lead M2 (empirical formula =) PbO_2	ACCEPT $0.16 \div 0.08 = 2$ ACCEPT calculation e.g. $1.24 \div 0.62 = 2$ ALLOW mole calculation using masses from graph	2
			Total 9

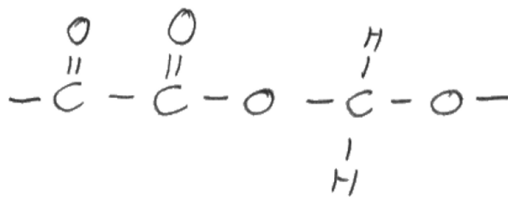
Question number	Answer	Notes	Marks
6 (a)	addition		1
(b)	 M1 four electrons between C atoms M2 rest of the molecule correct	ALLOW dots or crosses	2
(c)	 M1 single bond between carbon atoms AND extension bonds M2 rest of the structure correct	IGNORE brackets and n	2
(d)	M1 (number of repeat units =) 4064 M2 (number of carbon atoms = $4064 \times 2 =$) 8128	ACCEPT $254\,000 \div 62.5$ ACCEPT 8130 ACCEPT any number of sig figs except 1	2
(e)	M1 the polymer does not break down / biodegrade M2 so will remain in the environment	ACCEPT stays underground for many years	2
			Total 9

Question number	Answer	Notes	Marks
7 (a)	M1 melt / molten (sodium oxide) M2 apply an electrical current / electrolysis	if no other mark awarded, allow reaction with more reactive metal for 1 mark	2
(b)	M1 layers / rows (of atoms, ions or particles) M2 can slide over one another	REJECT if mention of molecules or intermolecular forces for M1 REJECT electrons sliding for M2	2
(c)	M1 sodium loses electrons and oxygen gains electrons M2 two atoms of sodium lose one electron and oxygen gains 2 electrons	ACCEPT correctly labelled diagrams mention of sharing electrons scores 0	2
(d)	sodium M1 giant metallic structure M2 attraction between positive ions and delocalised electrons sodium oxide M3 giant ionic structure M4 attraction between oppositely charged ions comparison M5 bonds are weaker in sodium than sodium oxide	REJECT intermolecular forces for M1 and M2 REJECT intermolecular forces/covalent/metallic for M3 and M4 M5 is comparative mark that is independent of M1-M4	5
			Total 11

Question number	Answer	Notes	Marks
8 (a)	M1 <u>damp</u> litmus paper (into the gas) M2 turns white	IGNORE colour of paper ACCEPT bleached	2
(b)	$\text{Cl}_2(\text{g}) + \text{ICl}(\text{l}) \rightleftharpoons \text{ICl}_3(\text{s})$ M1 formulae and reversible arrows M2 correct state symbols		2
(c) (i)	any one of: - remove the beaker of ice - heat the U tube / ICl_3 - stop adding the chlorine	ALLOW decrease the pressure ACCEPT pour out the chlorine (by inverting the U tube)	1
(ii)	M1 (yellow) crystals changing / disappear M2 <u>into</u> (more) brown liquid OR <u>into</u> (more) green gas	ACCEPT solid changing / disappear	2
(d)	M1 the ice lowers the temperature M2 decreases the rate of reaction M3 <u>particles</u> have less (kinetic) energy M4 less frequent collisions	ACCEPT makes experiment colder (than room temperature) ACCEPT slower reaction ACCEPT fewer particles have energy same or greater than activation energy ACCEPT collisions per unit time	4
(e)	M1 ($M_r = 127 + (3 \times 35.5) =$) 233.5 M2 (actual mass = $233.5 \times 6.40 \times 10^{-3} =$) 1.4944 (g) M3 (percentage yield = $1.4944 \div 4.67 \times 100\% =$) 32 (%) OR M1 ($M_r = 127 + (3 \times 35.5) =$) 233.5 M2 (theoretical amount = $4.67 \div 233.5 =$) 0.02 (mol) M3 (percentage yield = $6.40 \times 10^{-3} \div 0.02 \times 100\% =$) 32 (%)	ACCEPT 1.494, 1.49 ACCEPT 31.99, 31.9	3
			Total 14

Question number	Answer	Notes	Marks
9 (a)	D fluorine is correct A astatine is incorrect the lower down group 7 that the element is, the darker it is B bromine is incorrect the lower down group 7 that the element is, the darker it is C chlorine is incorrect the lower down group 7 that the element is, the darker it is		1
(b)	C (melting point / °C) 114 (boiling point / °C) 184 is correct A (melting point / °C) -102 (boiling point / °C) -34 is incorrect as the substance would be a gas at rtp B (melting point / °C) -7 (boiling point / °C) 59 is incorrect as the substance would be a liquid at rtp D (melting point / °C) 1538 (boiling point / °C) 2861 is incorrect as the iodine turns into a gas when heated with a Bunsen burner		1
(c)	M1 (amount of bromine =) 0.035 (mol) M2 (amount of aluminium bromide =) 0.0233 (mol) M3 (mass of aluminium bromide = 0.0233 x 267 =) 6.22 (g)	ACCEPT 5.60 ÷ 160 ACCEPT 0.035 ÷ 3 x 2 ACCEPT 0.023 ACCEPT 6.23, 6.14	3

(d)	M1 the halogens become less reactive down the group M2 a dark grey circle means that a halogen has been displaced / a reaction takes place M3 (because) the displaced / less reactive halogen is darker in colour M4 (solution) X = bromine because it displaces iodine but not chlorine (from the halide solutions) M5 (solution) Y = iodine because it does not displace chlorine or bromine (from halide solutions) M6 (solution) Z = chlorine because it displaces bromine and iodine (from the halide solutions)	ORA throughout ACCEPT the order of decreasing reactivity is chlorine, bromine, iodine ALLOW the order of decreasing reactivity (of the solutions) is Z, X, Y ACCEPT light grey circle means no reaction ACCEPT if there is no reaction then the solution (colour) just becomes diluted ACCEPT (solution) X shows one dark grey circle only with potassium iodide so it is bromine ACCEPT (solution) Y shows no dark grey circles so it is iodine ACCEPT (solution) Z shows the most / two dark grey circles so it is chlorine if none of M4, M5 and M6 are met, award one mark for X = bromine Y = iodine Z = chlorine	6
			Total 11

Question number	Answer	Notes	Marks
10 (a)	M1 changes colour from orange to green with ethanol M2 does not change colour with ethanoic acid		2
(b) (i)	M1 wear gloves / safety spectacles / a laboratory coat M2 acids are corrosive		2
(ii)	M1 Bunsen burner flame is too hot M2 mixture is flammable / evaporates		2
(iii)	B fruity is correct A bleach is incorrect as this is the smell of chlorine C smoky is incorrect as this is the smell of a burning hydrocarbon D vinegar is incorrect as this is the smell of ethanoic acid		1
(iv)	ethyl propanoate		1
(c)	 M1 one displayed ester group M2 rest of the molecule	IGNORE brackets and n	2
(d)	M1 (amount of ethanedioic acid =) 0.012 (mol) M2 (amount of sodium hydroxide =) 0.014 (mol) M3 (remaining amount of ethanedioic acid =) 5.0×10^{-3} (mol) M4 (mass of ethanedioic acid = $90 \times 5.0 \times 10^{-3}$ =) 0.45 (g)	ACCEPT $0.40 \times 30 \div 1000$ ACCEPT $0.20 \times 70 \div 1000$ ACCEPT $0.012 - (0.014 \div 2)$ ECF from M1 and M2 ECF from M3	4
			Total 14

