



Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 1C and Science
Double Award (4SD0) Paper 1C

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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)	M1 • _____ proton M2 o _____ neutron M3 x _____ electron	must be in the right order if proton and neutron in wrong order allow one mark for M1 & M2.	3								
(b)	<table><tr><td>mass number</td><td>11</td></tr><tr><td>group number</td><td>3</td></tr><tr><td>period number</td><td>2</td></tr><tr><td>electronic configuration</td><td>2,3</td></tr></table>	mass number	11	group number	3	period number	2	electronic configuration	2,3		4
mass number	11										
group number	3										
period number	2										
electronic configuration	2,3										
(c)	boron	ALLOW B	1								
			Total 8								

Question number	Answer	Notes	Marks
2 (a)	Any 2 from M1 effervescence /fizzing /bubbles M2 moves M3 floats M4 gets smaller / disappears	IGNORE gas given off moves on the surface scores M2 and M3 ALLOW dissolves IGNORE heat produced IGNORE colour change	2
(b)	A (lithium hydroxide and hydrogen) B is incorrect as lithium hydroxide and oxygen are not the products C is incorrect as lithium oxide and hydrogen are not the products D is incorrect as lithium oxide and oxygen are not the products		1
(c) (i)	An explanation that links the following three points M1 (colour of solution is) blue/purple M2 (pH value or range between) 10 and 14 M3 (as the solution is) alkaline /an alkali	ALLOW indigo/violet ACCEPT (the solution is) basic	3
(ii)	OH^-	ACCEPT HO^-	1
(d)	C (red) A is incorrect as it is not lilac B is incorrect as it is not orange D is incorrect as it is not yellow		1
			Total 8

Question number	Answer	Notes	Marks
3 (a)	<p>An explanation that links the following two points</p> <p>M1 ink would dissolve in the solvent/pencil would not dissolve in the solvent</p> <p>M2 ink would travel/run/smudge/produce spots on the chromatogram which would interfere with the results/ pencil would not produce spots on the chromatogram so would not interfere with the results OWTTE</p>	<p>ALLOW ink is soluble/pencil is insoluble</p> <p>ALLOW unable to calculate R_f value</p>	2
(b)	<p>An explanation that links the following two points</p> <p>M1 X and Z</p> <p>M2 as they both have a dye that travelled the furthest up the paper</p>	<p>M2 dep on M1</p>	2
(c)	<p>An explanation that links the following three points</p> <p>M1 (W contains only one dye) produces only one spot</p> <p>M2 V is insoluble/not soluble</p> <p>M3 (V may contain more than one dye) as it has not moved (from the start line)/not separated</p>		3
(d)	<p>M1 measurement to spot W = 2.2 cm/ 22 mm or 2.3cm/ 23mm</p> <p>M2 measurement to solvent front = 6.9 cm/ 69 mm</p> <p>M3 (R_f value =) $\frac{2.2}{6.9}$ OR $\frac{2.3}{6.9}$ more than 2 sig figs</p> <p>M4 0.32/0.33</p>	<p>ALLOW within range of 2.2-2.3 cm</p> <p>ALLOW ecf on incorrect measurements in M1 and M2</p> <p>ALLOW ecf corrected to 2 sig figs</p>	4
			Total 11

Question number			Answer	Notes	Marks
4	(a)	(i)	C (13) A is incorrect as there are not 8 atoms B is incorrect as there are not 11 atoms D is incorrect as there are not 19 atoms		1
		(ii)	B (Ca²⁺ and PO₄³⁻) A the charges are incorrect C the charges are incorrect D the charges are incorrect		1
(b)	(i)		M1 Use of addition of Ca = 40 P = 31 O = 16 M2 (40 × 3 + 31 × 2 + 16 × 8 =) 310		2
		(ii)	M1 $\frac{40 \times 3 \times 100}{310}$ M2 39 (%)	ALLOW ecf for <i>M_r</i> incorrectly calculated ALLOW 1 mark for 13 (%) if working shown ALLOW any number of sig figs except 1 e.g. 38.7 for 2 marks or 12.9 for 1 mark	2
(c)			$3\text{Ca}(\text{OH})_2 + 2\text{H}_3\text{PO}_4 \rightarrow (1)\text{Ca}_3(\text{PO}_4)_2 + 6\text{H}_2\text{O}$	ALLOW multiples and fractions	1
					Total 7

	Answer	Notes	Marks
5 (a)	<p>M1 butane contains hydrogen/H and carbon/C (atoms)</p> <p>M2 only</p> <p>M3 and contains only single bonds</p>	<p>REJECT hydrogen and carbon molecules for M1</p> <p>M2 dep on hydrogen and carbon</p> <p>ACCEPT does not contain double bonds/multiple bonds</p>	3
(b) (i)	$2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$ <p>M1 all formulae correct</p> <p>M2 balancing of correct formulae</p>	<p>ALLOW multiples and fractions</p>	2
(ii)	carbon	<p>ALLOW soot / C</p> <p>ALLOW water / water vapour / steam</p>	1
(iii)	carbon monoxide reduces the capacity of blood to transport oxygen OWTTE	<p>ACCEPT correct references to haemoglobin</p> <p>ALLOW produces carboxyhaemoglobin</p>	1
(c) (i)	<p>M1 isomers have the same molecular formula</p> <p>M2 but different structural/displayed formulae</p>	<p>ALLOW same number of carbons and hydrogens</p> <p>ALLOW different arrangement of atoms</p>	2
(ii)	<p>M1</p> <pre> H H H H H — C — C — C — C — H H H H H </pre> <p>M2</p> <pre> H H H H — C — C — C — H H H—C—H H H </pre>	<p>Must show all bonds for both M1 and M2</p>	2

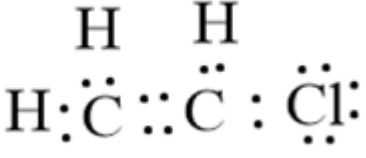
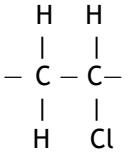
(d)	<p>An explanation that links the following three points</p> <p>M1 hexane is a larger molecule/longer chain ORA</p> <p>M2 stronger intermolecular forces between the molecules ORA</p> <p>M3 so more energy to overcome the forces ORA</p>	<p>ALLOW contains more carbon (and hydrogen) atoms</p> <p>no M2 or M3 if any mention of breaking covalent bonds</p>	<p>3</p> <p>Total 14</p>
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Question number	Answer	Notes	Marks
6 (a)	<p>M1 oxygen /O₂</p> <p>M2 water /H₂O</p>	<p>ALLOW air</p> <p>ALLOW moisture /water vapour /steam</p>	2
(b)	<p>A (galvanisation)</p> <p>B oxidation is not the name of the process</p> <p>C reduction is not the name of the process</p> <p>D sacrificial protection is not the name of the process</p>		1
(c)	<p>C (aluminium zinc iron copper)</p> <p>A this is not the correct order of reactivity</p> <p>B this is not the correct order of reactivity</p> <p>D this is not the correct order of reactivity</p>		1
(d)	<p>M1 add sodium hydroxide (solution)</p> <p>M2 a brown precipitate (forms)</p>	<p>ACCEPT red-brown /orange-brown</p> <p>M2 dependent on M1</p>	2
(e) (i)	<p>An explanation that links the following points</p> <p>M1 iron(III) oxide /Fe₂O₃ loses oxygen so is reduced</p> <p>M2 carbon monoxide gains oxygen so is oxidised</p> <p>OR</p> <p>M1 iron(III) oxide /Fe₂O₃ is reduced and carbon monoxide /CO is oxidised</p> <p>M2 iron(III) oxide /Fe₂O₃ loses oxygen and carbon monoxide /CO gains oxygen</p>	<p>ACCEPT Fe³⁺ gains electrons and is reduced</p>	2

(ii)	M1 (amount of Fe =) $28 \div 56$ OR $0.5(0)$ (mol) M2 (amount of Fe_2O_3 =) $0.5 \div 2$ OR 0.25 (mol) M3 (mass of Fe_2O_3 = 0.25×160 =) 40 (g)	ALLOW ecf throughout correct answer without working scores 3	3
(iii)	M1 $\frac{21}{28} \times 100$ M2 75 (%)	correct answer without working scores 2 ALLOW ecf for any correct calculation involving 21 as the numerator 0.75 scores 1	2
			Total 13

Question number	Answer	Notes	Marks
7 (a)	$2\text{NaOH(aq)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{Na}_2\text{SO}_4\text{(aq)} + 2\text{H}_2\text{O(l)}$ M1 equation correct and balanced M2 state symbols correct	If H ₂ is shown as a product in the equation allow (g) for M2	2
(b)	An explanation that links the following points M1 use a polystyrene cup instead of a beaker / or use a lid on the beaker M2 as less heat is lost	ALLOW any other acceptable answer REJECT prevent heat loss	2
(c) (i)	all points plotted correctly to the nearest small square		1
(ii)	circle the correct anomalous point at 15 cm ³		1
(iii)	M1 first best fit line M2 second best fit line		2
(d)	M1 volume of acid (approximately 27.5) M2 maximum temperature (approximately 28.6)	values from the candidates graph to the nearest small square	2
(e)	An explanation that links the following points M1 took the temperature too early M2 so highest temperature was not reached OR M1 did not stir the mixture M2 so highest temperature was not reached	do not allow use too little of the acid as this would affect the rest of the graph	2
I			Total 12

Question number	Answer	Notes	Marks
8 (a)	<p>An explanation that links the following three points</p> <p>M1 covalent bonds are strong</p> <p>M2 many (covalent) bonds (need to be broken)</p> <p>M3 a large amount of (heat/thermal) energy is needed to break the bonds</p>	<p>ACCEPT strong (electrostatic) forces between the shared pair of electrons and nuclei</p> <p>IGNORE more energy</p> <p>NOT just heat</p> <p>Any mention of intermolecular forces/forces between molecules or ions/ionic bonding/metallic bonding scores 0 out of 3</p>	3
(b)	<p>An explanation that links six of the following points but must include M3 and M7 for full marks</p> <p>M1 carbon atoms are joined together by covalent bonds</p> <p>M2 (structure is) in layers /in a 2D structure</p> <p>M3 (layers) can slide over each other (therefore it is soft)</p> <p>M4 (because there are) weak forces between layers</p> <p>M5 each carbon atom is bonded to three others (carbons)</p> <p>M6 there are delocalised electrons (between the layers)</p> <p>M7 electrons are free to move (therefore they can conduct electricity)</p>	<p>ACCEPT sheets</p> <p>If reference to weak intermolecular forces or layers of molecules then no M4</p> <p>IGNORE free/spare electron/unbonded</p> <p>IGNORE reference to can carrying a charge/current</p>	<p>6</p> <p>Total 9</p>

Question number	Answer	Notes	Marks
9 (a) (i)	<p>M1 two shared pairs between carbon atoms</p> <p>M2 rest of molecule fully correct</p> 	<p>ALLOW any combination of dots and crosses</p> <p>M2 dep on M1</p>	2
(ii)	<p>a description that refers to the following points</p> <p>M1 attraction between a shared pair of electrons</p> <p>M2 and two nuclei</p> <p>OR</p> <p>M1 attraction between nuclei</p> <p>M2 and a shared pair of electrons</p>	<p>Do not allow nucleus</p> <p>Do not allow nucleus</p>	2
(iii)		<p>ALLOW with or without extension bonds</p> <p>IGNORE brackets and n</p>	1
(iv)	<p>A description that refers to the following two pairs of points</p> <p>M1 disposal of poly(chloroethene) in landfill</p> <p>M2 takes up space / takes a very long time to decompose/ they are inert OWTTE</p> <p>M3 burning poly(chloroethene)</p> <p>M4 hydrogen chloride / toxic gases produced</p>	<p>IGNORE non-biodegradable</p> <p>M2 dependent on M1</p> <p>M4 dependent on M3</p> <p>ALLOW produces greenhouse gases</p>	4
(b)	<p>M1 $\frac{22.0}{12}$ $\frac{4.6}{1}$ $\frac{73.4}{80}$</p> <p>M2 $\frac{1.83}{0.92}$ $\frac{4.6}{0.92}$ $\frac{0.92}{0.92}$</p>	<p>0 marks if division by atomic numbers or upside down calculation</p> <p>correct answer without</p>	3

	<p>OR 2 5 1</p> <p>M3 C₂H₅Br</p>	<p>working scores 3</p> <p>ALLOW symbols in any order</p>	
(c)	<p>A description that refers to any five of the following points with a <u>maximum of three marks from each section/reactant</u>:</p> <p>ethane</p> <p>M1 a substitution reaction</p> <p>M2 does not decolourise/stays orange/decolourises very slowly</p> <p>M3 ultraviolet radiation/light needed</p> <p>M4 produces bromoethane/C₂H₅Br</p> <p>M5 produces hydrogen bromide/HBr</p> <p>ethene</p> <p>M6 an addition reaction</p> <p>M7 decolourises (immediately) / turns colourless</p> <p>M8 produces dibromoethane/C₂H₄Br₂</p>	<p>ALLOW UV</p>	<p>5</p>
			Total 17

Question number	Answer	Notes	Marks
10 (a)	<p>An explanation that links any two pairs</p> <p>Pair 1</p> <p>M1 same volume of water</p> <p>M2 so the same amount of fuel/heat is required</p> <p>Pair 2</p> <p>M1 stir the water</p> <p>M2 so the temperature is uniform throughout the water</p> <p>Pair 3</p> <p>M1 to make sure the spirit burner is the same distance to the copper can</p> <p>M2 so the same amount of heat loss occurs</p>	<p>ALLOW same mass of water</p> <p>IGNORE references to time</p> <p>ALLOW the wick is the same height</p> <p>ALLOW any other acceptable answer</p>	4
(b) (i)	<p>M1 $\Delta T = (30-18) = 12$</p> <p>M2 $Q = 100 \times 4.2 \times 12 (= 5040 / 5000 \text{ (J)})$</p>	<p>correct answer without working scores 2 marks</p> <p>ALLOW ecf if incorrect temperature change</p> <p>e.g. 7560 /7600 or 12600 /13000 scores 1</p>	2
(ii)	<p>M1 (mass of ethanol =) $38.52 - 38.29$ OR 0.23 (g)</p> <p>M2 (amount =) $0.23 \div 46$ OR 0.005(0) (mol)</p> <p>M3 $5040 \div 0.005(0)$ OR 1 008 000 (J/mol)</p> <p>M4 $1\,008\,000 \div 1000$ OR 1008 (kJ/mol)</p> <p>M5 – 1008 (kJ/mol)</p>	<p>correct answer without working scores 5 marks</p> <p>ALLOW ecf throughout</p> <p>ACCEPT 1 000 000</p> <p>ACCEPT 1000</p> <p>ACCEPT – 1000</p>	5
			Total 11

