



Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Chemistry (4WCH1) Unit 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) (i)	D (D) <i>A is incorrect as this is Groups 1 and 2</i> <i>B is incorrect as this is not in Groups 1 and 2</i> <i>C is incorrect as these all have higher melting points</i>		1
(ii)	A (A) <i>B is incorrect as these do not have two electrons in the outer shell</i> <i>C is incorrect as these do not have two electrons in the outer shell</i> <i>D is incorrect as these do not have two electrons in the outer shell</i>		1
(iii)	A (A) <i>B is incorrect as this is not in Group 1</i> <i>C is incorrect as these do not fit all the properties of Z</i> <i>D is incorrect as these are all non-metals</i>		1
(b)	(neon) has a full / complete <u>outer</u> shell (of electrons)	ALLOW maximum number of electrons in the <u>valence</u> shell / <u>outer</u> shell contains 8 electrons / full <u>outer</u> energy level	1
(c) (i)	sodium / rubidium / caesium / francium	ALLOW symbol (ignore case)	1
(ii)	M1 the metals / they are all in group 1 / same group M2 all the metals have one electron on their outer shell / they all have the same number of electrons in their outer shell M3 all the metals must lose (the electron on the outer shell)	ALLOW reverse argument throughout REJECT same electronic configuration ALLOW one valence electron / highest energy level for equivalents to outer shell IGNORE formation of a 1 ⁺ ion	3
			Total 8

Question number	Answer	Notes	Marks
3 (a)	An explanation that links the following two points M1 ink would dissolve in the solvent/pencil would not dissolve in the solvent 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	ALLOW ink is soluble/pencil is insoluble ALLOW unable to calculate R_f value	2
(b)	An explanation that links the following two points M1 X and Z M2 as they both have a dye that travelled the furthest up the paper	M2 dep on M1	2
(c)	An explanation that links the following three points M1 (W contains only one dye) produces only one spot M2 V is insoluble/not soluble M3 (V may contain more than one dye) as it has not moved (from the start line)/not separated		3
(d)	M1 measurement to spot W = 2.8 cm/ 28 mm or 2.9cm/ 29mm M2 measurement to solvent front = 8.5 cm/ 85 mm M3 (R_f value =) $\frac{2.8}{8.5}$ OR $\frac{2.9}{8.5}$ more than 2 sig figs M4 0.33/0.34	ALLOW within range of 2.8-2.9 cm ALLOW ecf on incorrect measurements in M1 and M2 ALLOW ecf corrected to 2 sig figs	4
			Total 11

Question number	Answer	Notes	Marks
4 (a)	<u>Method 1</u> A suitable method to include the following: M1 measure a specific volume of HCl into the test tube (using a measuring cylinder) / use same volume of HCl / same amount of HCl M2 use the same concentration of HCl M3 measure the starting temperature of the HCl M4 use a balance to measure the mass (of the metal) M5 add a specific mass of metal to the test tube / use same mass of metal / same amount of metal M6 measure the maximum / final temperature in the test tube M7 calculate / find / compare the temperature change M8 magnesium should have the highest temperature change, iron the lowest temperature change <u>Method 2 - only to be used if thermometer not used</u> A suitable method to include the following: M1 measure a specific volume of HCl into the test tube (using a measuring cylinder) / use same volume of HCl / same amount of HCl M2 use the same concentration of HCl M3 use a balance to measure the mass (of the metal) M4 add a specific mass of metal to the test tube / use same mass of metal / same amount of metal M5 observe fizzing / bubbles (in the test tube) M6 measure the height of the bubbles M7 magnesium should have the most bubbles / fizzing, iron the lowest bubbles / fizzing	ALLOW any sensible volume eg 5cm³ ALLOW any sensible mass eg 2g / 1 spatula ALLOW correct order of reactivity ALLOW any sensible volume eg 5cm³ ALLOW any sensible mass eg 2g / 1 spatula ALLOW correct order of reactivity	6
(b)	$\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ M1 for correct formulae M2 for correct balancing for correct formulae	M2 is dependent on M1	2

		ALLOW correct multiples	
(c)	magnesium (C) <i>A is incorrect as copper is a transition metal</i> <i>B is incorrect as iron is a transition metal</i> <i>D is incorrect as zinc is a transition metal</i>		1
			Total 9

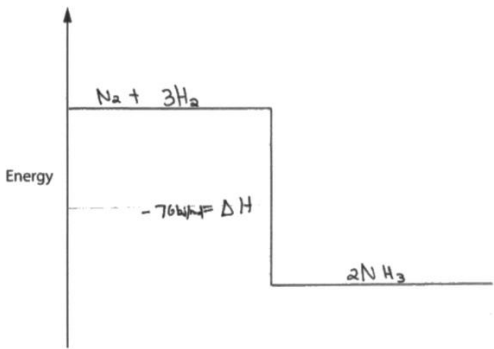
	Answer	Notes	Marks
5 (a)	M1 butane contains hydrogen/H and carbon/C (atoms) M2 only M3 and contains only single bonds	REJECT hydrogen and carbon molecules for M1 M2 dep on hydrogen and carbon ACCEPT does not contain double bonds/multiple bonds	3
(b) (i)	$2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow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

Question number	Answer	Notes	Marks
6 (a)	M1 Mr of $N_2 = 28$ M2 $n = 70 \div 28$ M3 2.5	Answer of 2.5 scores 3 marks with or without working ALLOW ECF from M1	3
(b)	M1 $14 + (1 \times 3)$ M2 17	Answer of 17 scores 2 marks with or without working ALLOW 15 or 10 for 1 mark	2
(c) (i)	M1 conversion tonnes to kg $5.10 \times 1000 = 5100$ M2 $5100 \div 17 = 300$ M3 $(300 \div 2) \times 3 = 450$ M4 $450 \times 2 = 900$ M5 9.0×10^2 (kg)	Answer of 9.0×10^2 scores 5 marks with or without working Conversion from tonnes to kg can take place at any point ALLOW ECF throughout	5
(ii)	M1 $(3.65 \div 5.10) \times 100$ M2 71.56862745 M3 71.6	Answer of 71.6 scores 3 marks with or without working ACCEPT any evaluation to 1 decimal place for 1 mark	3
			Total 13

Question number			Answer	Notes	Marks
7	(a)	(i)	All points plotted correctly = 1 mark	ALLOW tolerance of ½ a square	1
		(ii)	Point at 80°C, 30g correctly circled	ALLOW circled point at 100°C, 34g if curve is drawn to match	1
		(iii)	Smooth curve of best fit		1
		(iv)	Range of 16.5 to 18	ALLOW ECF for incorrect plotting	1
	(b)		A description that links the following points M1 (water molecules) gain (kinetic/thermal) energy M2 (water molecules) move <u>faster</u> / <u>more</u> quickly M3 (water) molecules move apart / are more spaced out / intermolecular forces of attraction weaken M4 the water molecules escape to form a gas / overcome intermolecular forces of attraction	ALLOW particles REJECT the use of atoms for M3 and M4 ACCEPT evaporates / turns into water vapour	4
	(c)	(i)	M1 same number of protons M2 different number of neutrons	IGNORE electrons throughout REJECT compounds for both marks ALLOW same atomic number ALLOW different mass number(s)	2
		(ii)	M1 $\frac{(12.0 \times 136) + (16.0 \times 137) + (72.0 \times 138)}{100}$	ALLOW 137.6 with or without	2

	M2 137.6	working for 2 marks REJECT 137 ACCEPT 138 No ECF	
			Total 12

Question number	Answer	Notes	Marks
8 (a)	(Steel is) strong/malleable	IGNORE good conductor	1
(b)	Any 4 from: M1 both are good conductors of electricity M2 aluminium has a lower mass (per 100 m) M3 aluminium cables / wires are easier to support M4 fewer pylons are needed (for aluminium cables) M5 aluminium cables are cheaper	ALLOW reverse arguments for copper throughout ALLOW aluminium has a lower density	4
(c)	Use and property must be linked in pairs e.g.: M1 copper use = water pipes M2 property = low reactivity M3 aluminium use = aircraft bodies M4 properties = low density / malleable / strong	ALLOW any sensible use and a linked property for 2 marks REJECT any answers related to overhead / electric cables for copper and aluminium	4
			Total 9

Question number	Answer	Notes	Marks
9 (a)	M1 bonds broken = $944 + (3 \times 436)$ OR 2252 M2 bonds made = (6×388) OR 2328 M3 $\Delta H = -76$ (kJ/mol)	ALLOW ECF throughout –76 with no working scores 3 marks (+)76 with no working scores 2 marks	3
(b)	An explanation that links together the following two points: M1 more energy is given out / released when the bonds are made M2 than is taken in when the bonds are broken	If state/imply that energy required to make bonds OR If state/imply that energy released when bonds are broken scores 0/2	2
(c)	Diagram including the following: M1 horizontal lines showing energy levels labelled $N_2 + 3H_2$ / reactants and $2NH_3$ / products M2 level of $2NH_3$ / products below level of $N_2 + 3H_2$ / reactants 	IGNORE label on x-axis IGNORE direction of arrow between reactants and products	2
(d)	M1 $(4.6 \times 24\,000) \div 1000$ M2 110.4	Answer of 110.4 OR 110 gets 2 marks with or without working ALLOW POT (power of ten) error for 1 mark If no other marks awarded, give 1 mark for correct unit conversion of $24000 \div 1000$	2
			Total = 9

