



Mark Scheme (Results)

November 2025

Pearson Edexcel International GCSE in Chemistry
4CH1/2C

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

November 2025

Question Paper Log Number P78767RA

Publication Code 4CH1_2C_2511_MS

All the material in this publication is copyright

© Pearson Education Ltd

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.

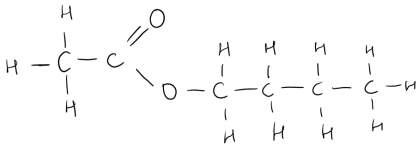
Question number	Answer	Notes	Marks																												
1 (a)	<table border="1"> <thead> <tr> <th>Letter</th><th>titration</th><th>measures different volumes</th><th>evaporates solvent to produce crystals</th></tr> </thead> <tbody> <tr> <td>P</td><td></td><td>✓</td><td></td></tr> <tr> <td>Q</td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>R</td><td>✓</td><td></td><td></td></tr> <tr> <td>S</td><td></td><td></td><td>✓</td></tr> <tr> <td>T</td><td>✓</td><td></td><td></td></tr> <tr> <td>U</td><td></td><td></td><td></td></tr> </tbody> </table>	Letter	titration	measures different volumes	evaporates solvent to produce crystals	P		✓		Q	✓	✓		R	✓			S			✓	T	✓			U				extra ticks in any row lose 1 mark any ticks in row U lose 1 mark	5
Letter	titration	measures different volumes	evaporates solvent to produce crystals																												
P		✓																													
Q	✓	✓																													
R	✓																														
S			✓																												
T	✓																														
U																															
(b)	Q		1																												
(c)	(volumetric) pipette	REJECT dropping pipette	1																												
			Total 7																												

Question number	Answer	Notes	Marks															
2 (a)	<table><tr><th>Halogen</th><th>State at 25 °C</th><th>Colour</th></tr><tr><td>fluorine</td><td>gas</td><td>pale yellow</td></tr><tr><td>chlorine</td><td>gas</td><td>(pale) green</td></tr><tr><td>bromine</td><td>liquid</td><td>brown</td></tr><tr><td>iodine</td><td>solid</td><td>dark grey</td></tr></table>	Halogen	State at 25 °C	Colour	fluorine	gas	pale yellow	chlorine	gas	(pale) green	bromine	liquid	brown	iodine	solid	dark grey	ALLOW light green	3
Halogen	State at 25 °C	Colour																
fluorine	gas	pale yellow																
chlorine	gas	(pale) green																
bromine	liquid	brown																
iodine	solid	dark grey																
(b)	solid		1															
(c)	M1 $42 \times 79 + 58 \times 81$ OR 8016 M2 $8016 \div 100$ OR 80.16 M3 80.2	correct answer without working scores 3 ALLOW M2 ECF M1 ALLOW M3 ECF M2 ECF for M3 if all values in the question are used and the answer given to 3 sig.figs.	3															
(d) (i)	$(0.75 \times 0.75 =) 0.5625$	ALLOW 0.56 /0.563	1															
(ii)	M1 $(0.1875 \times 2=)$ 0.375 M2 but need to x 2 to take into account that either Cl atom could be the ³⁵Cl or ³⁷Cl isotope OWTTE OR M1 Total probability is 1 M2 so remaining probability is 0.375	ALLOW ECF from (i) ALLOW idea that shows two combinations of ³⁵Cl and ³⁷Cl isotopes to form a chlorine molecule with <i>M_r</i> of 72 ALLOW 0.38	2															

(e)	An explanation that links the following 5 points M1 reactivity decreases down the group (from F/Cl to I) M2 displacement reactions happen when more reactive halogen displaces a less reactive halogen M3 from a solution/compound containing its halide (ions) OR ALLOW correct word or balanced chemical equation for M2 and M3 M4 example of colour change in a displacement reaction M5 example of reaction where displacement does not occur	ALLOW fluorine is the most reactive element in Group 7 ORA ALLOW specific halogen displaces a less reactive halogen e.g. Chlorine/Cl is more reactive so it will displace bromine/Br (and iodine/I) ALLOW specific halide (ions) ALLOW ORA for M2 and M3	5 Total 15
-----	--	--	---------------------------------

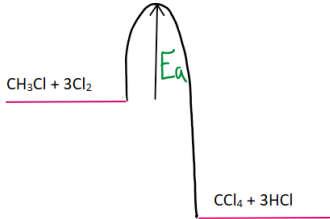
Question number	Answer	Notes	Marks
3 (a) (i)	(hydrated) iron(III) oxide/ferric oxide	ACCEPT Fe_2O_3 REJECT iron oxide/ FeO with incorrect oxidation state	1
(ii)	An explanation that links the following two points: M1 paint acts as a barrier/(protective) layer OWTTE M2 which prevents water/oxygen/air getting to the iron/reacting with iron	REJECT galvanising /coating/covering/sacrificial protection	2
(b)	An explanation that links the following: M1 (high-carbon) steel is an alloy M2 idea of a comparison of malleability between pure iron and (high-carbon) steel M3 (pure) iron can be used in gates/railings/nails/wires/chains/cookware M4 (high-carbon) steel can be used in cutting tools/knives/blades/springs/bearings/hammers/rail tracks/car chassis M5 (high carbon) steel has different-sized atoms /particles (which disrupt the structure/regular arrangement) ORA M6 which means layers (of atoms/metal ions/particles) cannot slide over each other ORA	ALLOW pure iron is more malleable than high-carbon steel ORA ALLOW car (bodies)/ship building/decorative metal works IGNORE cutlery/kitchen utensils ALLOW ideas of load-bearing applications/building reinforcement ALLOW steel has (both iron and carbon) atoms/particles which are of different sizes (and randomly arranged) ALLOW rows or sheets any mention of intermolecular forces/ionic bonds/covalent bonds/bond breaking max 5 marks	6
(c)	M1 (amount of zinc $\Rightarrow$) $16 \div 65$ OR 0.246 (mol) M2 (volume of hydrogen $= 0.246 \times 24 \Rightarrow$) 5.9 (dm^3)	correct answer without working scores 2 ALLOW ECF for incorrect A_r ALLOW answer correctly rounded to 1 sig.fig.	2

(d)	(i)	Zn^{2+} /Zinc ions gain electrons	ALLOW Zn cations REJECT Zn/Zinc gains electrons	1
	(ii)	$4\text{OH}^- \rightarrow (1)\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$	ALLOW multiples or fractions IGNORE state symbols even if incorrect	1
	(iii)	An explanation that links the following two points: M1 concentration of hydroxide ions/ OH^- decreases M2 so universal indicator turns red	ALLOW H^+ /hydrogen ions are formed IGNORE solution is acidic/ H_2SO_4 /acid is formed ALLOW orange IGNORE yellow REJECT pink	2
				Total 15

Question number	Answer	Notes	Marks
4 (a) (i)	ethene		1
(ii)	M1 Pressure: 60 - 70 atm/atmosphere(s) (inclusive) M2 Catalyst: Phosphoric acid	ACCEPT any pressure between 60 and 70 inclusive ACCEPT any correct alternative unit and quantity ALLOW sulfuric acid /H ₂ SO ₄	2
(b) (i)	anaerobic/no O ₂ /absence of air	IGNORE respiration	1
(ii)	M1 enzymes become inactive below 30°C M2 yeast cells/enzymes denature above 40°C	ACCEPT ideas of rate of reaction/fermentation being too slow below 30°C If M1 and M2 not scored, (yeast contains) enzymes need an optimum temperature scores 1 mark	2
(c) (i)	 M1 for ester link M2 for the rest of the molecule with all bonds shown	M2 dep on M1	2
(ii)	M1 carboxylic acid ethanoic acid M2 alcohol butanol	ACCEPT acetic acid ACCEPT butan-1-ol/ 1-butanol	2

Question number	Answer	Notes	Marks
4 (d) (i)	condensation (polymerisation)		1
(ii)	$\begin{array}{c} \text{O} \qquad \qquad \text{O} \\ \parallel \qquad \qquad \parallel \\ \text{---C---CH}_2\text{---CH}_2\text{---C---O---CH}_2\text{CH}_2\text{CH}_2\text{---O---} \end{array}$ M1 ester link M2 rest of the molecule correct with or without extension bonds	ACCEPT $\begin{array}{c} \text{O} \qquad \qquad \text{O} \\ \parallel \qquad \qquad \parallel \\ \text{---O---C---CH}_2\text{---CH}_2\text{---C---O---CH}_2\text{CH}_2\text{CH}_2\text{---} \end{array}$ ALLOW ---COO--- M2 dep M1 ALLOW C_2H_4 / C_3H_6 IGNORE brackets and n	2
(iii)	water/ H_2O		1
			Total 14

Question number	Answer	Notes	Marks
5 (a)	M1 anhydrous/white copper(II) sulfate/copper sulfate/CuSO_4 M2 turns (from white to) blue	ALLOW anhydrous/blue cobalt(II) chloride/cobalt chloride OR cobalt(II) chloride paper ALLOW turns (from blue to) pink M2 dep M1 IGNORE water boils at 100°C	2
(b) (i)	M1 starts at the origin and is steeper than the original curve M2 levels off at 50 cm^3		2
(ii)	M1 starts at the origin and is shallower than the original curve M2 levels off at 50 cm^3	ECF for M2 from 5(b)(i)	2
(c)	A description that refers to five of the following seven points: M1 add the same mass of the potassium iodide to the conical flask M2 add the same volume of hydrogen peroxide M3 keep the temperature constant M4 start/set the timer M5 record the volume of gas produced in a given time OR record the time for certain volume of gas to be evolved M6 plot the results of the graph and calculate OR compare gradient (steepness) for each catalyst M7 the more effective catalyst gives the fastest rate of reaction OWTTE	ALLOW same surface area of catalyst	5
			Total 11

Question number	Answer	Notes	Marks
6 (a)	M1 two horizontal lines in correct positions M2 horizontal lines labelled correctly with formulae of reactants and products M3 vertical line in correct position and labelled E_a 	ALLOW product line directly below reactants line IGNORE incorrect letter cases and subscripts/superscripts ALLOW ECF from M1 REJECT downwards pointing arrow/double-headed arrow /no arrowhead	3
(b)	M1 $\sum$ bond energies on LHS = $(3 \times 414) + (1 \times \text{C-Cl}) + (3 \times 242)$ OR $(1 \times \text{C-Cl}) + 1968$ (kJ/mol) M2 $\sum$ bond energies on RHS = $(4 \times \text{C-Cl}) + (3 \times 431)$ OR $(4 \times \text{C-Cl}) + 1293$ (kJ/mol) M3 $(1 \times \text{C-Cl} + 1968) - (4 \times \text{C-Cl} + 1293) = -339$ M4 $(3 \times \text{C-Cl} = 339 + 675)$ OR 1014 M5 $(\text{C-Cl} = 1014 \div 3 =) 338$ (kJ/mol)	correct answer without working scores 5 ALLOW ECF calculation of Bonds broken - Bonds Made = -339 ALLOW ECF throughout	5
			Total 8