



Mark Scheme (Results)

January 2026

Pearson Edexcel International Advanced Subsidiary Level
In Chemistry
Paper 01A: Structure, Bonding and Introduction to Organic
Chemistry

WCH11/01A

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January 2026

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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.

Section A

Question number	Answer	Mark
1	The only correct answer is B (C_2H_5) <i>A is incorrect because C_4H_{10} is the molecular formula</i> <i>C is incorrect because the empirical formula is the whole number ratio of atoms present</i> <i>D is incorrect because the general formula for an alkane</i>	1

Question number	Answer	Mark
2a	The only correct answer is B (displacement) <i>A is incorrect because it is not an addition reaction</i> <i>C is incorrect because it is not a neutralisation reaction</i> <i>D is incorrect because it is not a substitution reaction</i>	1

Question number	Answer	Mark
2b	The only correct answer is D ($\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$) <i>A is incorrect because Cu^{2+} has not gained an electron</i> <i>B is incorrect because Cu^+ was not a reactant</i> <i>C is incorrect because Zn lost more than one electron</i>	1

Question number	Answer	Mark
3	The only correct answer is D (2,2,4-trimethylhexane) <i>A is incorrect because the 5 3d orbitals have been omitted</i> <i>B is incorrect because the 3p and 3d orbitals have been omitted</i> <i>C is incorrect because the chain should be numbered so that the side chains have the lowest possible number</i>	1

Question number	Answer	Mark
4	The only correct answer is A (carbon) <i>B is incorrect because fluorine has only one unpaired electron in the ground state</i> <i>C is incorrect because lithium has only one unpaired electron in the ground state and it is not a p-block element</i> <i>D is incorrect because titanium it is not a p-block element</i>	1

Question number	Answer	Mark
5	The only correct answer is C (2.7) <i>A is incorrect because 2.7×10^{-6} is mg in kg</i> <i>B is incorrect because 2.7×10^{-3} is g in kg</i> <i>D is incorrect because 2.7×10^3 is kg in g</i>	1

Question number	Answer	Mark
6	The only correct answer is C (3.6×10^{24}) <i>A is incorrect because there are 3 ions in Na_2SO_4, just multiplied by the number of mol.</i> <i>B is incorrect because there are 3 ions in Na_2SO_4, only allowed for 2 ions</i> <i>D is incorrect because there are 3 ions in Na_2SO_4</i>	1

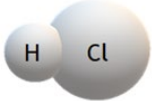
Question number	Answer	Mark
7	The only correct answer is C (300) <i>A is incorrect because this is the volume of carbon dioxide produced</i> <i>B is incorrect because this is the volume of oxygen used up</i> <i>D is incorrect because water is not a gas at room temperature and pressure</i>	1

Question number	Answer	Mark
8	The only correct answer is D (S^{2-}) <i>A is incorrect because Ca^{2+} has the smallest ionic radius</i> <i>B is incorrect because Cl^- has only one more electron than protons</i> <i>C is incorrect because K^+ has one fewer electron than protons</i>	1

Question number	Answer	Mark
9	The only correct answer is D (acidified potassium manganate(VII)) <i>A is incorrect because hydrogen peroxide and propene produce propene oxide</i> <i>B is incorrect because propene combusts in oxygen</i> <i>C is incorrect because propene does not react directly with sodium hydroxide</i>	1

Question number	Answer	Mark
10	The only correct answer is B (4) <i>A is incorrect because 1-chloro propene has geometric isomers</i> <i>C is incorrect because 2-chloro propene does not have geometric isomers</i> <i>D is incorrect because 2-chloro propene does not have geometric isomers</i>	1

Question number	Answer	Mark
11	The only correct answer is B (C_4H_{10}) <i>A is incorrect because HCl is formed in propagation steps</i> <i>C is incorrect because C_2H_5Cl is formed in propagation steps</i> <i>D is incorrect because $C_2H_4Cl_2$ is formed in propagation steps</i>	1

Question number	Answer	Mark
12	The only correct answer is D ) <i>A is incorrect because it is showing a charge separation</i> <i>B is incorrect because it is showing an even charge distribution</i> <i>C is incorrect because it is showing an equal charge distribution</i>	1

Question number	Answer	Mark
13	The only correct answer is A (Li⁺ and I⁻) <i>B is incorrect because the positive ion is larger and the negative ion is smaller than LiI</i> <i>C is incorrect because the positive ion is larger and the negative ion is smaller than LiI</i> <i>D is incorrect because the positive ion is larger and the negative ion is smaller than LiI</i>	1

Question number	Answer	Mark
14	The only correct answer is C (Ti²⁺) <i>A is incorrect because K⁺ has the electronic structure shown</i> <i>B is incorrect because Ca²⁺ has the electronic structure shown</i> <i>D is incorrect because Sc³⁺ has the electronic structure shown</i>	1

Question number	Answer	Mark
15	The only correct answer is D ($1s^2 2s^2 2p^6$) <i>A is incorrect because this would be for losing three electrons</i> <i>B is incorrect because this would be for the nitrogen atom</i> <i>C is incorrect because this would be for gaining one electron</i>	1

Question number	Answer	Mark
16	The only correct answer is C (aluminium) <i>A is incorrect because there would not be a large jump between the third and fourth ionisations</i> <i>B is incorrect because there would not be a large jump between the third and fourth ionisations</i> <i>D is incorrect because there would not be a large jump between the third and fourth ionisations</i>	1

Question number	Answer	Mark
17	The only correct answer is B (66%) <i>A is incorrect because there has been a miscalculation</i> <i>C is incorrect because only one HCl included</i> <i>D is incorrect because only one NaCl included</i>	1

Question number	Answer	Mark
18	The only correct answer is A ) <i>B is incorrect because hexane is not an oxidising agent</i> <i>C is incorrect because hexane is not corrosive</i> <i>D is incorrect because hexane is not toxic</i>	1

Question number	Answer	Mark
19	The only correct answer is A (OH) <i>B is incorrect because OH^- does not have an unpaired electron</i> <i>C is incorrect because OH_2 does not have an unpaired electron</i> <i>D is incorrect because OH_3^+ does not have an unpaired electron</i>	1

TOTAL FOR SECTION A = 20 MARKS

Section B

Question Number	Answer	Additional Guidance	Mark
20(a)(i)	• X axis with elements and a label and graph covers $\geq \frac{1}{2}$ the grid • Y axis with label and units • all points plotted within $\pm \frac{1}{2}$ a small square	<u>Example of graph</u> Ignore any lines joining points (1) Do not award non-linear scales (1) Comment ignore lines from origin Allow lines or bar graph (1) Allow correct atomic number for elements (3)	(3)

Question Number	Answer	Additional Guidance	Mark
20(a)(ii)	An answer that makes reference to the following points: - silicon has a giant lattice/molecular structure and covalent bonds - many/ strong (covalent) bond between silicon atoms or each silicon atom is bonded to four others - which requires a large amount of energy to break the bonds	Accept macromolecular Allow giant covalent structure for M1 Accept description of covalent bonds Do not award reference to incorrect bonding types M1 and M2 are interdependent Standalone mark Comment if silica is referred to lose M2	(3)

Question Number	Answer	Additional Guidance	Mark
20(b)(i)	A description that makes reference to the following points: - metals contain delocalised electrons - which can move/flow freely (throughout the structure when a potential difference is applied)	Penalise omission of delocalised in i or ii once only (1) Ignore free electrons / charge carriers Do not award atoms contain delocalised electrons (1) M2 dependent on M1 or near miss Eg if they say 'free electrons' for M1 they can gain M2	(2)

Question Number	Answer	Additional Guidance	Mark
20(b)(ii)	A description that makes reference to the following point: sodium has less delocalised electrons (than aluminium per atom/ion)	Accept reverse argument Accept sodium has one delocalised electrons and aluminium has three Do not award incorrect number of electrons	(1)

Question Number	Answer	Additional Guidance	Mark
20(c)(i)	- zero or eight dots electrons on outer shell of aluminium and eight electrons on outer shell of oxygen - two dots and six crosses for three oxygen (ions) and two aluminium (ions) - charge of 3+ on aluminium and charge of 2- on oxide ion	Example of diagram: $2[Al]^{3+} \quad 3[:\overset{\times\times}{O}^{\times\times}]^{2-}$ Ignore missing square brackets Do not award subscripts If no other mark awarded then a correct dot-and-cross diagram for either ion scores (1)	(3)

Question Number	Answer	Additional Guidance	Mark
20(c)(ii)	A description that makes reference to the following point: ions must be mobile / free to move (to allow a current to flow)	Accept reverse argument Allow ions/ Al^{3+} O^{2-} can flow Ignore just free ions Do not award reference to delocalised electrons	(1)

(Total for Question 20 = 13 marks)

Question Number	Answer	Additional Guidance	Mark
21(a)(i)	A description that makes reference to two of the following points: • (some) zinc reacts /disappears (to give a colourless solution) • bubbles / fizzing / effervescence • excess zinc seen at the bottom of the beaker • temperature increases	(1) Allow zinc / solid / powder dissolves or decreases Do not award all of the zinc disappears (1) Ignore just hydrogen gas given off Do not award incorrect gas (1) (1) Ignore heat will be released Apply list principle	(2)

Question Number	Answer	Additional Guidance	Mark
21(a)(ii)	An answer that makes reference to the following points: - all species correct - balancing and state symbols	<u>Example of equation</u> (1) $\text{Zn(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g})$ (1) OR $\text{Zn(s)} + 2\text{H}_3\text{O}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g}) + 2\text{H}_2\text{O(l)}$ Comment Near miss of incorrect charge on ion eg H^- or uncanceled spectator ions eg $\text{Zn(s)} + 2\text{H}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g}) + \text{SO}_4^{2-}(\text{aq})$ score M2 only Full equation scores 0	(2)

Question Number	Answer	Additional Guidance	Mark
21(b)(i)	287.5 (g mol⁻¹)	Ignore units even if incorrect	(1)

Question Number	Answer	Additional Guidance	Mark
21(b)(ii)	calculation of moles of sulfuric acid	<u>Example of calculation</u> $n = ((25.0 \div 1000) \times 1.25 =) 0.03125 \text{ (mol)}$ Ignore SF except 1 SF	(1)

Question Number	Answer	Additional Guidance	Mark
21(b)(iii)	- expected mass of hydrated zinc sulfate - evaluation to give yield and answer to 2/3 SF Alternative method by comparing moles - moles of hydrated zinc sulfate - evaluation to give yield and answer to 2/3 SF	(1) $m = (0.03125 \times 287.5 =) 8.9844 \text{ (g)}$ Yield = $((3.75 \div 8.9844) \times 100 =) 41.739 \text{ (\%)}$ (1) Yield = $41.7 / 42 \text{ (\%)}$ (1) $n = 3.75 \div 287.5 = 0.01304$ Yield = $(0.01304 \div 0.03125) \times 100 = 41.739 \text{ (\%)}$ (1) Yield = $41.7 / 42 \text{ (\%)}$ Correct answer with no working scores (2) Use of 8.98 will give an answer of 41.8(%) TE at each stage and from (b)(i) and (b)(ii)	(2)

(Total for Question 21 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
22(a)(i)	- calculation of mean - answer to 3 SF	<u>Example of calculation</u> $\frac{((5.45 \times 54) + (92.1 \times 56) + (2.45 \times 57))}{100}$ RAM = 55.9155 RAM = 55.9 M2 TE on incorrect calculation provided an answer between 50 and 60 Allow units of g mol^{-1} but otherwise penalise units Correct answer with no working scores (2)	(2)

Question Number	Answer	Additional Guidance	Mark						
22(a)(ii)	An answer that makes reference to the following points: (X is) iron / Fe - correct number of subatomic particles	Allow Fe⁺ <table><tr><td>protons</td><td>electrons</td><td>neutrons</td></tr><tr><td>26</td><td>25</td><td>30</td></tr></table>	protons	electrons	neutrons	26	25	30	
protons	electrons	neutrons							
26	25	30							

Question Number	Answer	Additional Guidance	Mark
22(a)(iii)	X^{2+} / Fe^{2+} / $^{56}Fe^{2+}$	Allow TE of incorrect element from (a)(ii) provided charge is 2+	(1)

Question Number	Answer	Additional Guidance	Mark
22(b)	An explanation that makes reference to the following points: - isotopes have the same number of electrons/ electron configuration (1) - chemical properties depend on the number of electrons in the outer shell (1)	Ignore references to the same number of protons Allow valence for outer	(2)

(Total for Question 22 = 7 marks)

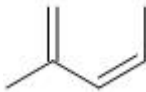
Question Number	Answer	Additional Guidance	Mark
23(a)(i)	- repeat unit of poly(propene) with extension bonds - rest of equation	Example of equation $n \begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{C} - \text{H} \\ & & \\ & & \text{H} \end{array} \longrightarrow \left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{H} - \text{C} - \text{H} \\ & \\ & \text{H} \end{array} \right)_n$ Allow $n \begin{array}{c} \text{H} & \text{H} \\ & \\ \text{C} = & \text{C} \\ & \\ \text{H} & \text{CH}_3 \end{array} \longrightarrow \left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{CH}_3 \end{array} \right)_n$ Comment Allow omission of subscript n on RHS due to error on Question paper Do not award skeletal formulae	(2)

Question Number	Answer	Additional Guidance	Mark
23(a)(ii)	An answer that makes reference to the following points: - no small molecule is made making poly(propene)/only one product is made or a small molecule/ water/ H₂O or two (different) products are made for PLA - poly(propene) is an addition polymer/ is formed by additional polymerisation	Allow making poly(propene) has a higher atom economy (1) Allow PLA is a condensation polymer/ is formed by condensation polymerisation (1) Allow polypropene is formed by breaking the carbon-carbon double bond or PLA is formed by breaking the O-H	(2)

Question Number	Answer	Additional Guidance	Mark
23(a)(iii)	A description that makes reference to the following point: bacteria / microbes / microorganisms	Allow decomposers / enzymes Ignore break down on its own Ignore breaks down biologically	(1)

Question Number	Answer	Additional Guidance	Mark
23(a)(iv)	An answer that makes reference to two of the following points: • takes less time to break down • does not require/ reduces the need for incineration • reduces pollution / litter / harm to wildlife • helps reduce use of crude oil or renewable (resource) • breaks down into non-harmful products/ fertilizer	(1) Allow degrades faster (1) Ignore just toxic gases or greenhouse gases (1) Do not award no pollution (1) Allow sustainable (1) Ignore broken down by microbes	(2)

Question Number	Answer	Additional Guidance	Mark
23(b)(i)	A description that makes reference to the following point: • one of the carbon atoms of the double bond(s) does not have two different substituents/ atoms/ groups or one of the carbon atoms of the double bond(s) has the same substituents/ atoms/ groups	Allow one carbon of the C=C is bonded to two hydrogen (atoms)	(1)

Question Number	Answer	Additional Guidance	Mark
23(b)(ii)	skeletal formula	 Ignore bond lengths and angles	(1)

Question Number	Answer	Additional Guidance	Mark
23(b)(iii)	A description that makes reference to the following point: (carbon-carbon double bonds) lack free rotation / have restricted rotation	Allow double bonds do not rotate Ignore reference to sigma and pi bonds	(1)

(Total for Question 23 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
24(a)	An answer that makes reference to two of the following points: - chemically stable / inert - non-toxic / non-irritant - immiscible with water - hypoallergenic	(1) Allow unreactive / long shelf-life/ durable/ stable (1) Allow not harmful / not corrosive / non-hazardous Ignore safe (1) Allow hydrophobic / insoluble Ignore oily (1) Ignore references to flammability	(2)

Question Number	Answer	Additional guidance	Mark
24(b)	$C_{30}H_{62}$	Allow $H_{62}C_{30}$	(1)

Question Number	Answer	Additional guidance	Mark
24(c)(i)	Nickel	Accept palladium or platinum Accept Ni or Pd or Pt	(1)

Question Number	Answer	Additional guidance	Mark
24(c)(ii)	$8 \times 10^{-6} \text{ (g)}$	<u>Example of calculation:</u> $\text{mass} = ((40 \times 0.2) \div 10^6 =) 8 \times 10^{-6} \text{ (g)}$ Allow $8 \bullet 10^{-6} \text{ (g)}$ Allow $8 \times 10^{-9} \text{ kg}$ Ignore 0.000008 (g) Correct answer with no working scores (1)	(1)

Question Number	Answer	Additional Guidance	Mark
24(c)(iii)	(Method 1) • conversion of temperature to K • rearrangement of ideal gas equation • evaluation to give moles of hydrogen • evaluation of mole ratio and number of C=C bonds in squalene (Method 2) • conversion of temperature to K • rearrangement of ideal gas equation • evaluation to give moles of hydrogen • evaluation of mole ratio and number of C=C bonds in squalene	<u>Example of calculation</u> (1) $T = (200 + 273 =) 473 \text{ (K)}$ (1) $n = pV \div RT = (4.0 \times 10^5 \times 400) \div (8.31 \times 473)$ (1) $n = 40706 \text{ (mol)}$ Ratio 40706:6800 = 6:1 (1) 6 $T = (200 + 273 =) 473 \text{ (K)}$ $V = nRT \div p = (6800 \times 8.31 \times 473) \div 4.0 \times 10^5$ $n = 66.821 \text{ (mol)}$ Ratio 400:66.821 = 5.986 6 Correct answer with no working scores (4) TE throughout	(4)

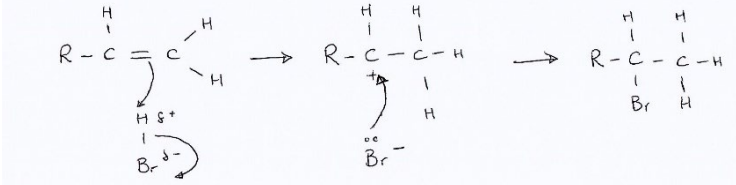
Question Number	Answer	Additional guidance	Mark
24(c)(iv)	$\text{C}_{30}\text{H}_{50} + 6\text{H}_2 \rightarrow \text{C}_{30}\text{H}_{62}$	TE on (b) provided $\text{C}_n\text{H}_{2n+2}$ and (c)(iii) provided less than 10 H_2 Ignore state symbols	(1)

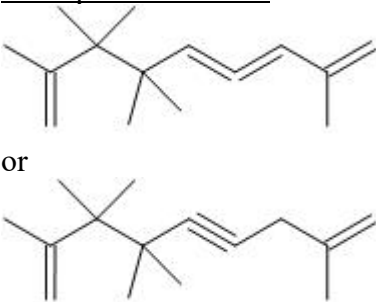
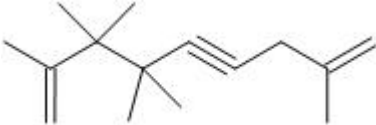
Question Number	Answer	Additional guidance	Mark
24(d)(i)	(fractional) distillation	Ignore solvent extraction/ fractionating column/ fractionating on its own Do not award simple or steam distillation	(1)

Question Number	Answer	Additional Guidance	Mark
24(d)(ii)	- calculation of mass of squalene in 2.6 million dm^3 or calculation of volume of squalene per shark (1) - calculation of number of sharks required (1)	<u>Example of calculation</u> $m = (2.6 \times 10^9 \times 0.86 =) 2.236 \times 10^9 \text{ (g)}$ $V = (290 \div 0.86 =) 337.21 \text{ (cm}^3\text{)}$ $N = (2.236 \times 10^9 \div 290 =) 7710345/ 7.7103 \times 10^6$ or $N = (2.6 \times 10^9 \div 337.21 =) 7710345/ 7.7103 \times 10^6$ Correct answer with no working scores (2) TE throughout Ignore SF except 1 SF	(2)

Question Number	Answer	Additional Guidance	Mark
24(d)(iii)	(Method 1) • calculation of mass of corn starch required (divide by 22.6×100) • calculation of required land area in hectares (multiply by 0.093) • conversion of land area from hectares to km^2 (multiply by 0.01) (Method 2) • conversion of land area from hectares to km^2 (multiply by 0.01) • calculation of required land area in km^2 to produce 3500 tonnes of corn starch (multiply by 3500) • calculation of required land area in km^2 to produce 3500 tonnes of squalene (divide by 22.6×100)	<u>Example of calculation</u> (1) $m = ((3500 \div 22.6) \times 100 =) 1.5487 \times 10^4$ (tonnes) (1) Land area = $(1.5487 \times 10^4 \times 0.093 =) 1.4403 \times 10^3$ (hectares) (1) Land area = $(1.4403 \times 10^3 \times 0.01 =) 14.403$ (km^2) (1) $(0.093 \times 0.01 =) 9.3 \times 10^{-4}$ (km^2) (1) Land area = $(9.3 \times 10^{-4} \times 3500 =) 3.255$ (km^2) (1) Land area = $((3.255 \div 22.6) \times 100 =) 14.403$ (km^2) Correct answer with no working scores (3) TE throughout Ignore SF except 1 SF	(3)

Question Number	Answer	Additional guidance	Mark
24(e)(i)	An answer that makes reference to the following point: highest priority groups are on different sides (of C=C)	Allow atoms or groups with the highest atomic number Ignore mass and size	(1)

Question Number	Answer	Additional Guidance	Mark
24(e)(ii)	- dipole on H-Br bond - arrow from C=C to H of HBr - curly arrow from bond in HBr to Br or just beyond - structure of carbocation with charge - lone pair on Br ion - curly arrow from Br lone pair - structure of product All 7 points scores (4) 5-6 scores (3) 3-4 scores (2) 1-2 scores (1)	<u>Example of diagram</u>  Penalise use of fish hooks (single headed arrow) only once If no lone pair on Br ion allow the curly arrow from anywhere on the Br ion If Br₂ lose bullet points 2 and 7 so max 3	(4)

Question Number	Answer	Additional guidance	Mark
24(e)(iii)	An answer that makes reference to the following point: suitable structure	(1) <u>Example of structure</u>  or  Allow cyclical compound containing two rings or a ring and an extra double bond Do not award any structure with pentavalent carbons	(1)

(Total for Question 24 = 22 marks)

TOTAL FOR SECTION B = 60 MARKS

TOTAL FOR PAPER = 80 MARKS