Mark Scheme (Final)

Summer 2023

Pearson Edexcel International Advanced Subsidiary Level In Chemistry (WCH11)
Paper 01
Unit 1: Structure, Bonding and Introduction to Organic Chemistry

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Summer 2023
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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.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities. Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Section A

Question Number	Answer	Mark
1	**The only correct answer is A** ($MgBr_2$) ***B*** *is incorrect because the fluoride ion is less polarisable than the bromide ion* ***C*** *is incorrect because the sodium ion is less polarising than the magnesium ion* ***D*** *is incorrect because the sodium ion is less polarising than the magnesium ion and the fluoride ion is not as polarisable as the bromide ion*	**(1)** **Computer**

Question Number	Answer	Mark
2	**The only correct answer is B** (Mg^{2+}) ***A*** *is incorrect because the fluoride anion has fewer protons than magnesium* ***C*** *is incorrect because the sodium cation has fewer protons than magnesium* ***D*** *is incorrect because the oxide ion has fewer protons than magnesium*	**(1)** **Computer**

Question Number	Answer	Mark
3	**The only correct answer is C** (Group 5) ***A*** *is incorrect because the jump between* 3^{rd} *and* 4^{th} *IE is not as great as between IE 5 and 6* ***B*** *is incorrect because the jump between* 4^{rd} *and* 5^{th} *IE is not as great as between IE 5 and 6* ***D*** *is incorrect because the jump between* 5^{th} *and* 6^{th} *IE is much greater than between IE 6 and 7*	**(1)** **Computer**

<table>
<tr><td></td><td></td><td></td></tr>
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<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4</td><td>
The only correct answer is D

<table>
<tr><th>1s</th><th>2s</th><th>$2p_x$</th><th>$2p_y$</th><th>$2p_z$</th><th>3s</th></tr>
<tr><td>$\uparrow\downarrow$</td><td>$\uparrow\downarrow$</td><td>$\uparrow\downarrow$</td><td>$\uparrow$</td><td>$\uparrow$</td><td></td></tr>
</table>

A is incorrect because both occupied 2p orbitals are paired and there is one unoccupied 2p orbital

B is incorrect because the occupied 2p orbital has two electrons with the same spin

C is incorrect because one electron has been promoted into the 3s orbital so the atom is not in its ground state
</td><td>(1)

Computer</td></tr>
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<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5</td><td>
The only correct answer is A (atomic radius)

B is incorrect because the electronegativities increase across Period 3

C is incorrect because first ionisation energies generally increase across Period 3

D is incorrect because the melting temperatures increase then decrease across Period 3
</td><td>(1)

Computer</td></tr>
</table>

Question Number	Answer	Mark
6	**The only correct answer is C** (the repulsion between the outer electrons of sulfur is greater than that of phosphorus) ***A*** *is incorrect because the atomic radius of sulfur is less than that of phosphorus* ***B*** *is incorrect because electronegativity is a measure of the attraction of an atom for the bonding electrons in a covalent bond* ***D*** *is incorrect because the screening of the outer electrons of sulfur and phosphorus is the same*	**(1)** **Computer**

Question Number	Answer	Mark
7(a)	**The only correct answer is B** (64) ***A*** *is incorrect because the mass of bromide has been converted into moles* ***C*** *is incorrect because the mass of bromide in mg has been divided by the* A_r *of bromine before conversion to ppm* ***D*** *is incorrect because the mass of bromide ions has been taken as 64 g rather than 64 mg*	**(1)** **Computer**

Question Number	Answer	Mark
7(b)	**The only correct answer is A** (2.4×10^{20}) ***B*** *is incorrect because the mass of solution has not been divided by 2* ***C*** *is incorrect because the mass of the ions has not been divided by the A_r of bromine* ***D*** *is incorrect because the mass of the ions has not been divided by the A_r of bromine and the mass of solution has not been divided by 2*	**(1)** **Computer**

Question Number	Answer	Mark
8	**The only correct answer is B** (0.09 mol aluminium) ***A*** *is incorrect because that is the number of moles of aluminium that has reacted* ***C*** *is incorrect because the reacting ratio of aluminium to acid has been taken as 1:1* ***D*** *is incorrect because the limiting reagent has not been recognised and the reacting ratio has been reversed*	**(1)** **Computer**

Question Number	Answer	Mark
9	**The only correct answer is B** (CH_2Cl) ***A*** *is incorrect because atomic numbers have been used to calculate the empirical formula* ***C*** *is incorrect because this is not an empirical formula of the compound* ***D*** *is incorrect because the atomic numbers have been used to calculate the empirical formula and the ratios have not been simplified*	**(1)** **Computer**

Question Number	Answer	Mark
10	**The only correct answer is D** (250 cm^3 of 0.09 mol dm^{-3} $(NH_4)_2SO_4(aq)$) ***A*** *is incorrect because there are 0.09 mol of ions* ***B*** *is incorrect because there are 0.09 mol of ions* ***C*** *is incorrect because there are 0.09 mol of ions*	**(1)** **Computer**

Question Number	Answer	Mark
11	**The only correct answer is D** (yellow blue) ***A*** *is incorrect because both the ions are moving in the wrong direction* ***B*** *is incorrect because only the copper(II) ions have been attracted to an electrode* ***C*** *is incorrect because only the chromate(VI) ions have been attracted to an electrode*	**(1)** **Computer**

Question Number	Answer	Mark
12	**The only correct answer is A** (beryllium ions are smaller than barium ions) ***B*** *is incorrect because the number of electrons does not affect the melting temperature* ***C*** *is incorrect because the beryllium ion has a larger charge density than the barium ion* ***D*** *is incorrect because electronegativity does not affect the melting temperature*	**(1)** **Computer**

Question Number	Answer	Mark
13	**The only correct answer is A (**BF_3) ***B*** *is incorrect because there are four bonding pairs of electrons which repel equally* ***C*** *is incorrect because there are two bonding pairs of electrons which repel less strongly than the two lone pairs* ***D*** *is incorrect because there are three bonding pairs of electrons which repel less strongly than the lone pair*	**(1)** **Computer**

Question Number	Answer	Mark
14	**The only correct answer is C** (SO_2) ***A*** *is incorrect because although the bonds are polar, the dipoles cancel because the molecule is linear* ***B*** *is incorrect because although the bonds are polar, the dipoles cancel because the molecule is octahedral* ***D*** *is incorrect because although the bonds are polar, the dipoles cancel because the molecule is tetrahedral*	**(1)** **Computer**

Question Number	Answer	Mark
15	**The only correct answer is C** ($CH_3\bullet + H\bullet \rightarrow CH_4$) ***A*** *is incorrect because methyl free radicals are present* ***B*** *is incorrect because the chlorine free radical and the methyl free radical are present* ***D*** *is incorrect because chlorine free radicals are present*	**(1)** **Computer**

Question Number	Answer	Mark
16	**The only correct answer is C** (2-methylbut-2-ene) ***A*** *is incorrect because the name is not based on the longest carbon chain* ***B*** *is incorrect because the name is not based on the longest carbon chain* ***D*** *is incorrect because the numbering of the substituent group is incorrect*	**(1)** **Computer**

Question Number	Answer	Mark
17	**The only correct answer is A** (*E*-1-bromo-2-methylbut-1-ene) ***B*** *is incorrect because the highest priority groups are on opposite sides of the double bond* ***C*** *is incorrect because the longest carbon chain has four atoms* ***D*** *is incorrect because the longest carbon chain has four atoms and the highest priority groups are on opposite sides of the double bond*	**(1)** **Computer**

Question Number	Answer	Mark
18(a)	**The only correct answer is D** (14) ***A*** *is incorrect because only the C−C single bonds in the ring have been counted* ***B*** *is incorrect because only the C−C sigma bonds in the ring have been counted* ***C*** *is incorrect because the eight C−H sigma bonds have been counted but only four C−C single bonds have been counted*	**(1)** **Computer**

Question Number	Answer	Mark
18(b)	**The only correct answer is C** (0.960) ***A*** *is incorrect because the molar volume has not been used* ***B*** *is incorrect because only one double bond has been reduced* ***D*** *is incorrect because hydrogen atoms have been used in the calculation rather than hydrogen molecules*	**(1)** **Computer**

TOTAL FOR SECTION A = 20 MARKS

A	B	C	D
6	4	6	4

Section B

Question Number	Answer	Additional Guidance	Mark
19(a)(i)	An answer that makes reference to the following point: • (vaporised atoms are ionised by) bombarding / striking/ hitting/firing with (high speed / high energy) electron(s)	Allow molecules for atoms Allow electron gun / electron beam / Allow $X + e^{-} \rightarrow X^{+} + 2e^{-}$ Ignore electron current, voltage Ignore incorrect ionisation equation	**(1)** **Expert**

Question Number	Answer	Additional Guidance	Mark
19(a)(ii)	An answer that makes reference to the following point: • (ions are accelerated by) an **electric** field / voltage/ potential difference / (series of negatively) charged plates	Ignore references to link between mass of ion and acceleration/speed Do not award references to (electro)magnetic field Do not award positively charged plates	**(1)** **Graduate**

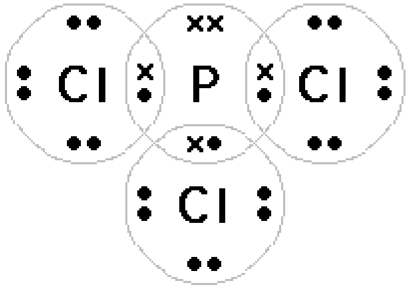
Question Number	Answer	Additional Guidance	Mark
19(a)(iii)	An explanation that makes reference to the following points: • (atoms/isotopes) have the same/identical electronic configurations / isoelectronic **(1)** • (isotopes/atom/ions) have different masses/ different m/z (with same charge) **(1)**	Allow the same number of (outer) electrons Accept heavier isotopes are deflected less / lighter isotopes are deflected more Ignore reference to just neutrons Ignore reference to protons Ignore comments linking deflection to charge	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
19(b)(i)	An explanation that makes reference to the following points: • (weighted) mean / average mass of atom(s) (of an element) **(1)** • divided by/compared to 1/12 (mass) of a ^{12}C (atom) /carbon 12 (atom) **(1)**	Accept $$\frac{\text{(weighted) mean mass of an atom}}{\frac{1}{12}\text{ of the (mass) of a carbon 12 atom}}$$ for both marks Do not award molecules for atoms	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
19(b)(ii)	• calculation of weighted mean / average **(1)** • answer to 4 SF **(1)**	<u>Example of calculation</u> $$\frac{(75.53 \times 35) + (24.47 \times 37)}{100}$$ (26.436 +9.0539 = 35.489) 35.49 Correct answer with no working scores 2 TE on arithmetical errors in M1 provided answer between 35 and 37	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
19(c)(i)	An answer that makes reference to the following points: • 101 $^{31}P^{35}Cl^{35}Cl^{+}$ / $^{31}P^{35}Cl_2{}^{+}$ • 103 $^{31}P^{35}Cl^{37}Cl^{+}$ / $^{31}P^{37}Cl^{35}Cl^{+}$ • 105 $^{31}P^{37}Cl^{37}Cl^{+}$ / $^{31}P^{37}Cl_2{}^{+}$	All three correct scores 2 Two correct scores 1 Allow omission of 31 on P Allow atoms in any order Allow isotope mass after symbol e.g. Cl^{35} Ignore any bonds shown between atoms Penalise omission of / incorrect charge once only Penalise omission of P once only	**(2)** **Graduate**

Question Number	Answer	Additional Guidance	Mark
19(c)(ii)	An explanation that makes reference to the following points: • so the ratios for the three ions are (101) ¾ × ¾ = 9/16 (= 0.5625) (103) ¼ × ¾ × 2 = 6/16 (= 0.375) (105) ¼ × ¼ = 1/16 (= 0.0625)	All three correct scores 2 Two correct scores 1 Allow (101) 3 ×3 = 9 (103) 1× 3 × 2 = 6 (105) 1 ×1 = 1 Allow use of original isotopic percentages i.e. 75.53% for ^{35}Cl etc	**(2)** **Expert**

Question Number	Answer		Additional Guidance	Mark
19(d)(i)	An answer that makes reference to the following points: • 3 shared pairs of electrons • all other electrons correct	 **(1)** **(1)**	Example of diagram  Electrons can be shown as all dots / crosses	**(2)** **Expert**

Question Number	Answer		Additional Guidance	Mark
19(d)(ii)	An explanation that makes reference to the following points: • drawn or stated (trigonal) pyramidal shape • minimum repulsion between electron pairs • lone pairs repel more than bonded pairs / lp-bp repulsion is greater than bp-bp repulsion	 **(1)** **(1)** **(1)**	 Ignore reference to bond angle even if incorrect Allow maximum separation between electron pairs Do not award lp-lp repulsion is greater than bp-lp/bp-bp repulsion TE on incorrect dot-and-cross diagram from (d)(i) for M1 and M2 only	**(3)** **Expert**

(Total for Question 19 = 17 marks)

Question Number	Answer	Additional Guidance	Mark
20(a)(i)	An answer that makes reference to the following point: • $BaCO_3 + 2H^+ \rightarrow Ba^{2+} + CO_2 + H_2O$	 Ignore state symbols even if incorrect	**(1)** **Expert**

Question Number	Answer	Additional Guidance	Mark
20(a)(ii)	• calculation of M_r of barium chloride and total M_r of reactants / products **(1)** • $\frac{M_r \text{ barium chloride}}{\text{total } M_r \text{ of reactants / products}} \times 100$ **(1)**	<u>Example of calculation</u> 137.3 + 71 (= 208.3) **and** 208.3 + 44 +18 (= 270.3) (208.3 ÷ 270.3) × 100 = 77.063% Ignore SF except 1 SF Correct answer with no working scores 2 No TE on atom economy of incorrect product Allow TE on incorrect A_r/ Mr/ transcription error	**(2)** **Expert**

Question Number	Answer		Additional Guidance	Mark
20(a)(iii)	An explanation that makes reference to the following points: • barium ion has a greater charge than caesium ion / Ba has 2+ and Cs has 1+ charge • barium ion is smaller than the caesium ion • the (electrostatic) attraction/force(s) between the ions is greater in barium chloride • so more energy is required to break the (ionic) bonding / higher (negative) lattice energy	**(1)** **(1)** **(1)** **(1)**	Ignore references to polarisation Allow barium ion has a greater charge density than the caesium ion Ignore references to atomic radius Allow ionic bonding is stronger in barium chloride Allow just bonding if ions are mentioned previously. Allow barium ions form stronger bonds with chlorine Ignore references to attraction of nucleus and electrons Ignore references to electronegativity Ignore number of bonds Do not award references to intermolecular forces M4 dependent on M3	**(4)** **Expert**

Question Number	Answer	Additional Guidance	Mark
20(a)(iv)	An explanation that makes reference to the following points: • the difference in electronegativity between barium and chlorine is greater than that between beryllium and chlorine/ (electronegativity difference) in $BaCl_2$ is 2.1 and in $BeCl_2$ is 1.5 **(1)** • the Ba−Cl bond will have more ionic / less covalent character than the Be−Cl bond **(1)**	Allow reverse argument throughout Ignore barium is less polarising than beryllium Allow barium chloride is more ionic/less covalent /more polar than beryllium chloride Allow the Ba-Cl bond is more polar than the Be-Cl bond Allow Be-Cl bonds are polar covalent Ignore just "barium chloride is ionic, beryllium chloride is covalent"	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
20(b)	• calculation of M_r $BaSO_4$ **(1)** • calculation of amount of $BaSO_4$ **(1)** • calculation of mass of Group 1 metal **(1)** • calculation of A_r of Group 1 metal **and** identification of metal **(1)**	Example of calculation 137.3 + 32.1 + 64 (= 233.4) 10.72 ÷ 233.4 = 0.045930 (mol) 7.98 – (0.045930 × 96.1) = 7.98 – 4.4138 = 3.5662 / 3.57 (g) $\frac{3.5662 \div 0.045930}{2}$ = (38.822) = 38.8/39 **and** potassium / K **Alternative Scheme for M3 and M4** M_r M_2SO_4 = 7.98 ÷ 0.04593 = 173.7 (1) $\frac{173.7 - 96.1}{2}$ = 38.8 / 39 **and** potassium / K **Alternative scheme** 96.1 ÷ 233.4 × 10.72 = 4.414 g SO_4^{2-} scores M1, M2 7.98 −4.414 = 3.5662/3.57 scores M3 Then M4 as above Ignore SF except 1 SF TE throughout	**(4)** **Expert**

(Total for Question 20 = 13 marks)

Question Number	Answer	Additional Guidance	Mark
21(a)	An explanation that makes reference to the following points: • graphite has a giant covalent structure / many (strong) covalent bonds within the layers/ **each** carbon atom is covalently bonded to 3 other carbon atoms **(1)** • (which gives it) a high melting temperature /requires a lot of energy to break/melt **(1)** • it has delocalised electron(s) (between the layers) **and** which allows it to conduct electricity / carry charge/ can move when a potential difference is applied **(1)**	Ignore references to intermolecular forces, shape Allow free electrons Do not award conduction by ions	**(3)** **Expert**

Question Number	Answer	Additional Guidance	Mark
21(b)(i)	• calculation of moles of aluminium in 1 kg **(1)** • deduction of aluminium to oxygen/ CO_2 ratio **(1)** • amount of CO_2 produced **(1)** • volume CO_2 produced **(1)**	<u>Example of calculation</u> 1000 ÷ 27 = 37.037 (mol) 2 : 1.5 or 4 : 3 37.037 × ¾ = 27.778 (mol) 27.778 × 24 = 667 (dm^3) Correct answer with some working scores 4 If units given, they must be correct Ignore SF except 1 SF	**(4)** **Expert**

Question Number	Answer	Additional Guidance	Mark
21b(ii)	An explanation that makes reference to the following points:: • less mining (of bauxite/ore/aluminium)/ less transport of raw materials **(1)** • the electrolysis of aluminium oxide is reduced / less new aluminium produced **(1)** • recycling involves melting the metal which uses less energy (than electrolysis) **(1)**	Ignore references to alternative storage e.g. plastics Allow less raw materials used Accept reduces need for electrolysis/ extraction Accept less fossil fuels burned to produce energy for electrolysis Ignore less need to produce cans Ignore space is saved /landfill Ignore references to reduction in carbon dioxide produced Ignore references to incineration Do not award no heat/energy is needed (for recycling)	**(3)** **Expert**

(Total for Question 21 = 10 marks)

Question Number	Answer		Additional Guidance	Mark
22(a)(i)	An answer that makes reference to the following points: • a compound containing hydrogen and carbon only • which only has single bond(s) / has no multiple bonds	 **(1)** **(1)**	 Allow general formula containing C and H only Does not contain C=C/no double bonds/all carbon atoms have the maximum number of hydrogens	**(2)** **Expert**

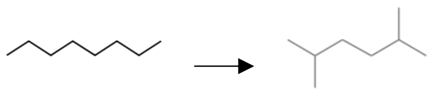
Question Number	Answer		Additional Guidance	Mark
22(a)(ii)	An explanation that makes reference to the following points: • the vapour condenses at different levels / temperatures • the higher the boiling temperature the lower the level at which it condenses	 **(1)** **(1)**	 Allow different boiling temperatures/ points Ignore evaporate Do not award melting temperatures Allow reference to the temperature gradient (high temperature at the bottom of the column, low temperature at the top) Allow the higher the volatility, the higher the level at which it condenses Ignore references to size, density, viscosity	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
22(b)	• calculation of amount of butane **(1)** • convert T from ˚C to K **and** kPa to Pa **(1)** • correct rearrangement of the ideal gas equation and substitution of values **(1)** • conversion of m^3 to cm^3 **(1)** • volume / dose in cm^3 to 2/3 SF **(1)**	<u>Example of calculation</u> $1.55 \div 58 = 0.026724$ / 2.6724×10^{-2} (mol) $25 + 273 = 298$ (K) **and** $100 \times 1000 = 100\,000$ / 1×10^5 (Pa) $V = \frac{nRT}{P} = \frac{0.026724 \times 8.31 \times 298}{1 \times 10^5} = 6.6179 \times 10^{-4}$ (m^3) $6.6179 \times 10^{-4} \times 10^6 = 661.79$ (cm^3) $661.79 \div 120 = 5.5149 = 5.51$ (cm^3) Answer to 2/3 SF Penalise incorrect units in final answer only M4 conversion to cm^3 and M5 calculation of volume of single dose can be credited at any stage Allow TE throughout	**(5)** **Expert**

Question Number	Answer	Additional Guidance	Mark
22(c)(i)	An answer that makes reference to the following points: • balanced symbol equation **(1)** • correct state symbols **(1)**	 $C_8H_{18}(l) + 12\frac{1}{2}O_2(g) \rightarrow 8CO_2(g) + 9H_2O(l)/(g)$ M2 depends on correct species Allow multiples	**(2)** **Graduate**

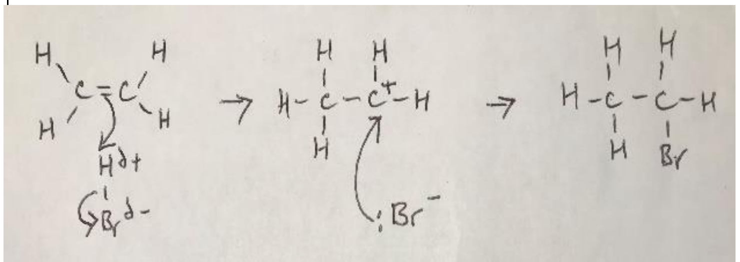
Question Number	Answer	Additional Guidance	Mark
22(c)(ii)	An answer that makes reference to the following points: • fossil fuels are non-renewable/ will run out/ are finite / biofuels are renewable **(1)** • fossil fuels contribute to global warming / biofuels release the carbon dioxide absorbed while growing **(1)**	Do not award biodegradable Allow fossil fuels contribute to climate change Allow biofuels (don't release net carbon dioxide so) are carbon neutral/ net zero Allow biofuels have a lower carbon footprint Ignore references to acid rain / NOx / Do not award references to hydrogen	**(2)** **Expert**

Question Number	Answer	Additional Guidance	Mark
22(c)(iii)	An answer that makes reference to the following point: • (catalytic) reforming/reformation	Allow isomerisation Do not award catalytic conversion	**(1)** **Clerical**

Question Number	Answer	Additional Guidance	Mark
22(c)(iv)	An answer that makes reference to the following point: • 	Allow structural methyl groups shown on branches and ignore vertical connectivity Ignore bond angles Ignore molecular / structural / displayed formulae Ignore state symbols even if incorrect Ignore references to reaction conditions/ catalysts	**(1)** **Graduate**

Question Number	Answer	Additional Guidance	Mark
22(d)(i)	An answer that makes reference to the following point: • to prevent combustion/ oxidation / explosion (of the mixture) or oxygen reacts with hydrocarbons/ ethene /hydrogen	Allow hydrocarbons are flammable/ can catch fire Allow to prevent formation of CO_2/ CO /C/ alcohols/diols/aldehydes Ignore references to side reactions/ (unwanted) products/ incorrect / toxic products Do not award (oxygen) reacts with steam	**(1)** **Expert**

Question Number	Answer	Additional Guidance	Mark
22(d)(ii)	An answer that makes reference to one of the following points: • **making** polymers / poly(ethene) / polythene / polyethylene/ plastics • ripening / maturing fruit e.g. bananas • **making** ethanol / ethane-1,2-diol / antifreeze/ haloethane /	Ignore to make alcohol Ignore polymerisation Ignore references to fuels Do not award making bioethanol	**(1)** **Expert**

Question Number	Answer	Additional Guidance	Mark
22(e)	An answer that makes reference to the following points: • dipole on HBr • curly arrow from C=C bond to H $^{(\delta+)}$ • curly arrow from H−Br bond to Br or just beyond • correct intermediate • lone pair on Br^{-} • curly arrow from lone pair (if shown) on Br^{-} to C+	 Do not award partial charge on C=C Do not award partial charge on Br Penalise incorrect or missing charge on Br once only If lp shown and M5 scored, arrow must come from lp Penalise half arrows once only  All 6 points scores 3 4 or 5 points scores 2 2 or 3 points scores 1	**(3)** **Expert**

(Total for Question 22 = 20 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 80 MARKS

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