



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/43

Paper 4 Extended Theory

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is a registered trademark.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **7** printed pages.

Question	Answer	Marks
1(a)	mixture	1
1(b)	element	1
1(c)	compound	1
1(d)	mixture	1

Question	Answer	Marks												
2(a)(i)	(two or more) atoms	1												
	combined / joined / sharing electrons (by a covalent bond) / bonded	1												
2(a)(ii)	substance that cannot be split up / broken down / decomposed (into anything simpler) OR (substance) made of atoms with the same atomic number / number of protons / proton number	1												
2(b)(i)	10	1												
2(b)(ii)	22	1												
2(b)(iii)	A AND B	1												
2(b)(iv)	A AND B	1												
2(b)(v)	C AND D	1												
2(c)	<table border="1"> <thead> <tr> <th></th> <th>number of protons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td>Na</td> <td>11</td> <td>11</td> </tr> <tr> <td>S²⁻</td> <td>16</td> <td>18</td> </tr> <tr> <td>Cl₂</td> <td>34</td> <td>34</td> </tr> </tbody> </table>		number of protons	number of electrons	Na	11	11	S ²⁻	16	18	Cl ₂	34	34	3
	number of protons	number of electrons												
Na	11	11												
S ²⁻	16	18												
Cl ₂	34	34												

Question	Answer	Marks
3(a)	hematite	1
3(b)	(coke reacts with oxygen / air) to produce heat / increase temperature / exothermically	1
	coke is reducing agent / produces reducing agent / produces carbon monoxide OR coke reduces Fe ₂ O ₃ / (iron) ore / hematite (producing iron)	1
	Fe ₂ O ₃ + 3CO → 2Fe + 3CO ₂ OR Fe ₂ O ₃ + 3C → 2Fe + 3CO OR 2Fe ₂ O ₃ + 3C → 4Fe + 3CO ₂ M1 species correct M2 balanced	2
	limestone (decomposes to calcium oxide which) reacts with / removes acidic impurities / SiO ₂ / sand / silica / silicon(IV) oxide / silicon dioxide	1
	limestone / calcium oxide / lime is involved in the production of slag / calcium silicate	1
3(c)(i)	positive ions / cations	1
	sea of electrons / mobile electrons / delocalised electrons / moving electrons / flowing electrons	1
	attraction between positive ions and electrons	1
3(c)(ii)	layers / rows / sheets of ions	1
	slide / slip / shift (over each other or past each other)	1
3(c)(iii)	particles have different sizes / radii	1
	layers cannot slide / slip / shift	1
3(d)(i)	Fe + H ₂ SO ₄ → FeSO ₄ + H ₂	1

Question	Answer		Marks	
3(d)(ii)	$\text{Fe}_2\text{O}_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 3\text{H}_2\text{O}$ M1 formula of $\text{Fe}_2(\text{SO}_4)_3$ M2 all formulae correct (no additional species) M3 balanced		3	
3(e)		observation with aqueous iron(II) sulfate	observation with aqueous iron(III) sulfate	4
	aqueous sodium hydroxide		M3 brown precipitate	
	aqueous potassium iodide	M1 no change	M4 brown solution / black solid	
	aqueous acidified potassium manganate(VII)	M2 (pink / purple to) colourless / decolourised		

Question	Answer	Marks
4(a)	fractional distillation	1
4(b)(i)	oxidation	1
4(b)(ii)	acid(ic)	1
4(c)	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$	1
4(d)(i)	no carbon dioxide produced / more efficient	1
4(d)(ii)	storage of hydrogen is difficult / takes more space to store (hydrogen) / high likelihood of (hydrogen) leaks / lack of availability of hydrogen	1
4(e)(i)	$\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$ M1 species correct M2 balanced	2
4(e)(ii)	climate change / greenhouse effect / consequence of climate change	1

Question	Answer	Marks
4(e)(iii)	fermentation	1
4(f)	electrolysis	1

Question	Answer	Marks
5(a)(i)	oxygen / O ₂	1
	sodium nitrite / sodium nitrate(III) / NaNO ₂	1
5(a)(ii)	2Cu(NO ₃) ₂ → 2CuO + O ₂ + 4NO ₂ M1 CuO M2 rest of equation fully correct	2
5(b)(i)	reversible reaction in which the rate of the forward reaction equals the rate of the backward reaction	1
	concentration of all reactants and products becomes constant / does not change	1
5(b)(ii)	forward reaction is endothermic	1
	(increased temperature) causes equilibrium to shift to the right / to shift in the endothermic direction / to form more nitrogen dioxide / to form more product(s)	1
5(b)(iii)	less brown / lighter / paler / colour fades	1
	more molecules / moles / volume on the right ORA OR equilibrium shifts in the direction of fewer molecules / moles / lower volume	1

Question	Answer	Marks
6(a)(i)	compounds containing carbon and hydrogen only	1
6(a)(ii)	alkanes: C_nH_{2n+2}	1
	alkenes: C_nH_{2n}	1
6(a)(iii)	any 2 from: <ul style="list-style-type: none"> • same or similar chemical properties • (consecutive members) differ by CH_2 • same functional group • common (allow similar) methods of preparation • physical properties vary in predictable manner/show trends/gradually change OR example of a physical property variation 	2
6(a)(iv)	$ \begin{array}{ccccccc} & H & & & H & & \\ & & & & & & \\ H & - C & - & C = & C & - & C - H \\ & & & & & & \\ & H & & H & H & & H \end{array} $ <p style="text-align: center;">OR</p> $ \begin{array}{ccccccc} & H & & & & & H \\ & & & & & & / \\ H & - C & - & C = & C & & \\ & & & & & & \backslash \\ & H & & & & & H \\ & & & & & & \\ & & & & & & H - C - H \\ & & & & & & \\ & & & & & & H \end{array} $	1
6(a)(v)	structural isomers	1

Question	Answer	Marks
6(b)(i)	more than enough oxygen to react with all of the hydrocarbon	1
6(b)(ii)	125 (cm ³)	1
6(b)(iii)	1:5:3	1
6(b)(iv)	C ₃ H ₈ If full credit is not awarded, allow 1 mark for C _x H _y (g) + 5O ₂ (g) → 3CO ₂ (g) + 4H ₂ O(l)	2

Question	Answer	Marks
7(a)(i)	diffusion	1
7(a)(ii)	silicon(IV) oxide is a solid, whereas carbon dioxide is a gas	1
7(a)(iii)	photosynthesis	1
	chlorophyll / chloroplasts	1
	M2 sunlight / UV (light)	1
	6CO ₂ + 6H ₂ O → C ₆ H ₁₂ O ₆ + 6O ₂ M1 species correct M2 balanced	2
7(b)(i)	condensation	1
7(b)(ii)	hydrolysis	1
7(b)(ii)	HO-□-OH OR H-O-□-O-H	1