Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/21**

Paper 2 Theory **October/November 2018**

MARK SCHEME

Maximum Mark: 75

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 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)(i)	C	**1**
1(a)(ii)	D	**1**
1(a)(iii)	B	**1**
1(a)(iv)	A	**1**
1(a)(v)	D	**1**
1(b)(i)	20	**1**
1(b)(ii)	molecule containing two atoms	**1**

Question	Answer	Marks
2(a)(i)	zinc loses electrons which is oxidation (1) nickel ions gain electrons which is reduction (1)	**2**
2(a)(ii)	$Zn + Ni^{2+} \rightarrow Zn^{2+} + Ni$	**1**
2(b)	workable arrangement with two electrodes dipping in liquid connected to power supply with two wires and no obvious gaps in the wiring (1) nickel or the fork is negative electrode **and** silver is positive electrode (1) electrolyte is labelled silver ions **OR** soluble silver salt **OR** electrolyte (1)	**3**
2(c)	(at first) white precipitate (1) dissolves (in excess ammonia) / soluble in excess (ammonia) / colourless solution (in excess ammonia) (1)	**2**

Question	Answer	Marks
2(d)	zinc is more reactive than iron (1) zinc corrodes instead of iron / zinc oxidises instead of iron (1)	**2**

Question	Answer	Marks
3(a)	alcohol / hydroxyl	**1**
3(b)	colourless (1) to brown (1)	**2**
3(c)	acid which is only partially ionised (in water) to form H^+ ions / acid which is partially dissociated (in water) to form H^+ ions	**1**
3(d)	moles succinic acid = 1.25×10^{-3} (1) moles sodium hydroxide = 2.50×10^{-3} (1) 125 (cm^3) (1)	**3**

Question	Answer	Marks
4(a)(i)	C_nH_{2n+2}	**1**
4(a)(ii)	**Any one from:** same functional group (1) similar chemical properties / react similarly (1) trend in physical properties (1) successive members differ by CH_2 (1)	**1**
4(b)	all the carbon-carbon bonds are single bonds	**1**
4(c)	$C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$ correct formulae for reactants and products (1) balanced equation – dependent on formulae (1)	**2**

Question	Answer	Marks
4(d)	any branched chain isomer of pentane drawn	**1**
4(e)(i)	substitution	**1**
4(e)(ii)	light / uv	**1**
4(f)(i)	mole ratio C = 90 / 12 **AND** mole ratio H = 10 / 1 **OR** C = 7.5 **AND** H = 10 (1) empirical formula = C_3H_4 (1)	**2**
4(f)(ii)	(relative) molecular mass	**1**

Question	Answer	Marks
5(a)	**Any one from:** number of electrons gives the atomic number (1) number of electrons in outer shell gives the group number (1) number of shells (containing electrons) gives the period number (1)	**2**
5(b)	2,8	**1**
5(c)(i)	$4Al + 3O_2 \rightarrow 2Al_2O_3$	**1**
5(c)(ii)	amphoteric (oxide)	**1**
5(d)(i)	2 pairs of bonding electrons in overlap area (1) only 2 lone pairs on each oxygen atom (1)	**2**
5(d(ii)	oxygen diffuses slower because it has higher (relative) molecular mass / nitrogen diffuses quicker because it has a lower (relative) molecular mass	**1**

Question	Answer	Marks
5 (d)(iii)	**Any 4 = 2 marks, any 2 or 3 = 1 mark:** • water does not react with sodium hydroxide • water is neutral • water is a liquid at room temperature • water is not a reducing agent • water does not burn in air	**2**

Question	Answer	Marks
6(a)(i)	liquid (1) –200 °C is between the boiling and melting points / this temperature is higher than the melting point but lower than the boiling point (1)	**2**
6(a)(ii)	values between 50 °C and 600 °C (inclusive)	**1**
6(b)	nitrogen is a (simple) molecule / nitrogen is a simple covalent (molecule) / weak forces between molecules (1) bismuth has metallic bonding / bismuth has a metallic structure (1)	**2**
6(c)	$2Sb + 3Cl_2 \rightarrow 2SbCl_3$	**1**
6(d)(i)	78%	**1**
6(d)(ii)	nitrogen oxides are converted to nitrogen (1) (nitrogen oxides are removed) by reaction with carbon monoxide (1)	**2**
6(d)(iii)	lightning	**1**

Question	Answer	Marks
7(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ correct formulae for reactants and products (1) balanced equation – dependent on formulae (1)	**2**
7(b)(i)	rise in sea levels / melting of polar ice caps / desertification / more extreme weather patterns (1)	**1**
7(b)(ii)	photosynthesis absorbs carbon dioxide AND respiration releases carbon dioxide (1) the amount of carbon dioxide absorbed is roughly equal to the amount of carbon dioxide released (1)	**2**
7(c)(i)	H_2O (1)	**1**
7(c)(ii)	(dilute) sulfuric acid (1) heat / reflux (1)	**2**
7(d)(i)	ring around the CONH group (1)	**1**
7(d)(ii)	$NH_2CH(CH_3)CO_2H$ (1)	**1**

Question	Answer	Marks
8(a)	delocalised electrons move (throughout the metal structure) / sea of electrons move (from place to place) (1)	**1**
8(b)	**Any two from:** chromium has a high(er) melting point or boiling point / sodium has low(er) melting point or boiling point (1) chromium dense / sodium not very dense (1) chromium is hard / sodium is soft (1) chromium less malleable / sodium very malleable(1)	**2**

Question	Answer	Marks
8(c)	**Any two from:** chromium particles different size to iron particles (1) regular arrangement of layers (of particles) in iron disrupted (1) layers of iron (particles) can slide (more easily) / layers of alloy cannot slide (so easily) (1)	**2**
8(d)	$2Cr + 3H_2O \rightarrow Cr_2O_3 + 3H_2$	**1**
8(e)	$Cr_2O_{12}^{2-}$	**1**
8(f)(i)	goes yellow (1) OH^- ions react with H^+ ions / equilibrium shifts to the left / more CrO_4^{2-} formed / less $Cr_2O_7^{2-}$ / less H^+ (1)	**2**
8(f)(ii)	there are no gaseous reactants or products / there are no gases in the equation	**1**

Question	Answer	Marks
9(a)	rate of reaction decreases (no mark) fewer particles per unit volume / fewer particles per cm^3 / particles further apart / less concentrated particles (1) collision frequency decreases / fewer particles collide per second (1)	**2**
9(b)	rate of reaction decreases (no mark) pieces have smaller surface area exposed / powder has larger surface area exposed / more particles (on surface) exposed to acid (1)	**1**

Question	Answer	Marks
9(c)	reactants next to the left line and products next to the right line and reactant level above product level (1) arrow downwards between reactants and products (1)	**2**
9(d)	mol Ce = 0.09 (1) mol H_2 = 0.135 (1) volume of H_2 = 3.24 (dm^3) (1)	**3**
9(e)	relative formula mass = 460 (1) percentage = 60.9% / 61% (1)	**2**