Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/22**

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.

© UCLES 2018

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.

© UCLES 2018

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.

© UCLES 2018

Question	Answer	Marks
1(a)(i)	E	**1**
1(a)(ii)	A	**1**
1(a)(iii)	C	**1**
1(a)(iv)	B	**1**
1(a)(v)	A	**1**
1(b)(i)	atoms with same number of protons but different number of neutrons / atoms with same atomic number but different mass number (1)	**1**
1(b)(ii)	44	**1**

Question	Answer	Marks
2(a)(i)	magnesium loses electrons so is oxidation (1) copper ions gain electrons so is reduction (1)	**2**
2(a)(ii)	$Mg + Cu^{2+} \rightarrow Mg^{2+} + Cu$	**1**
2(b)	workable arrangement with two electrodes dipping in liquid and connected correctly to power supply with two wires and with no big gaps in the wiring (1) pure / copper is negative electrode and impure copper is positive electrode (1) electrolyte is labelled copper ions **OR** (soluble) copper salt **OR** electrolyte (1)	**3**
2(c)	(at first) (light) blue precipitate (1) (dissolves in excess ammonia) to form a dark blue solution / dark blue solution (in excess ammonia) / deep blue solution (in excess ammonia) (1)	**2**

© UCLES 2018

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

Question	Answer	Marks
3(a)	has a carbon-carbon double bond / has a C=C bond	**1**
3(b)	purple (1) (to) colourless (1)	**2**
3(c)(i)	$H^+ + OH^- \rightarrow H_2O$	**1**
3(c)(ii)	moles fumaric acid = 4.00×10^{-4} (1) moles sodium hydroxide = 8.00×10^{-4} (1) 16.0 (cm^3) (1)	**3**

Question	Answer	Marks
4(a)	**Any two from:** • same functional group (1) • same general formula (1) • similar chemical properties / react similarly (1) • trend in physical properties (1) • successive members differ by CH_2 (1)	**2**

© UCLES 2018

Question	Answer	Marks
4(b)	$C_4H_8 + 6O_2 \rightarrow 4CO_2 + 4H_2O$ (2) 1 mark for correct reactants and products if equation not balanced	**2**
4(c)	structure of 2-methylpropene drawn showing all atoms and all bonds	**1**
4(d)(i)	butane	**1**
4(d)(ii)	catalyst / to speed up the reaction / to increase the rate of reaction	**1**
4(d)(iii)	heat / high temperature	**1**
4(e)(i)	mole ratio C = 85.7 / 12 AND mole ratio H = 14.3 / 1 **OR** C = 7.14 AND H = 14.3 (1) empirical formula = CH_2 (1)	**2**
4(e)(ii)	(relative) molecular mass	**1**

Question	Answer	Marks
5(a)	**Any two from:** • number of protons / number of electrons (1) • number of electrons in outer shell (1) • number of (electron) shells (1)	**2**
5(b)	2.8.8	**1**
5(c)(i)	correct dot and cross diagram showing 3 pairs of bonding electrons and two non-bonding electrons (2) If two marks not scored, award one mark for one pair of bonding electrons in each of the three overlap areas	**2**

© UCLES 2018

Question	Answer	Marks
5(c)(ii)	**Any two from:** • ammonia is soluble (in water) (1) • ammonia turns (damp) red litmus blue (1) • ammonia does not decompose (when warmed gently) (1)	**2**
5(c)(iii)	$2PH_3 \rightarrow 2P + 3H_2$	**1**
5(c)(iv)	phosphine diffuses more slowly because it has higher (relative) molecular mass / ammonia diffuses more quickly because it has a lower (relative) molecular mass	**1**
5(c)(v)	acidic because it is a non-metal oxide / acidic because phosphorus is a non-metal	**1**

Question	Answer	Marks
6(a)(i)	2.3 to 6.0 (inclusive)	**1**
6(a)(ii)	liquid (1) –190 °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(b)(i)	increases down the group	**1**
6(b)(ii)	polonium because its melting point is lower than expected / polonium because its melting point is lower than tellurium / the melting point of the element increases down the group except for polonium	**1**
6(c)	oxygen is a (simple) molecule / oxygen has weak forces between molecules / simple covalent (structure) (1) polonium has metallic bonding / polonium has metallic structure (1)	**2**
6(d)(i)	burning fossil fuels (containing sulfur) / volcanoes	**1**

© UCLES 2018

Question	Answer	Marks
6(d)(ii)	sulfur dioxide reacts with oxygen **AND** rain / sulfur dioxide reacts with oxygen to form sulfur trioxide **AND** sulfur trioxide reacts with rain / sulfur dioxide reacts with water to form sulfurous acid **AND** sulfurous acid oxidised by oxygen (2) if two marks not scored 1 mark for: sulfur dioxide reacts with rain / sulfur dioxide reacts with water / sulfur dioxide forms sulfurous acid (in the atmosphere) (1)	**2**

Question	Answer	Marks
7(a)(i)	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ (2) If 2 marks not scored, award one mark for correct formulae (1)	**2**
7(a)(ii)	(sun)light (1) chlorophyll (1)	**2**
7(a)(iii)	glucose can be used to make a fuel / glucose (can be fermented) to make ethanol	**1**
7(b)(i)	condensation	**1**
7(b)(ii)	2 or more units polymerised e.g. —O—□—O—□—O—□— (2) If two marks not scored, award 1 mark for: – O – linking two squares / rectangles but no extension bonds	**2**
7(b)(iii)	hydrolysis	**1**
7(c)(i)	ring around the COO group	**1**

Question	Answer	Marks
8(a)	positive sign in centre of atoms labelled (metal) ions (1) at least one electron drawn between the circles and labelled electron(s) (1)	**2**
8(b)	**2 marks for three properties** **1 mark for one or two properties** • conduct electricity / conduct heat • malleable • ductile • lustrous / shiny	**2**
8(c)	$2Bi + 3Cl_2 \rightarrow 2BiCl_3$	**1**
8(d)	$Bi_2Cl_8^{2-}$	**1**
8(e)(i)	white solid disappears (1) equilibrium moves to the left / more BCl_3 and H_2O (1)	**2**
8(e)(ii)	there are no gaseous reactants or products / there are no gases in the equation	**1**
8(f)	mixture of metal with another element / mixture of metal with another metal / mixture of metal with non-metal	**1**

© UCLES 2018

Question	Answer	Marks
9(a)	rate of reaction increases **AND** one or both of: more particles per unit volume / more particles per cm^3 / particles closer together / more concentrated particles (1) collision frequency increases / more particles collide per second (1)	**2**
9(b)	rate of reaction decreases **AND** one or both of: particles move slower / particles have less kinetic energy (1) fewer particles have activation energy (or above) / collisions are less successful (1)	**2**
9(c)	reactants on the left and products on the right and reactant level above product level and labels on or just above the energy level lines (1) vertical arrow downwards between reactants and products (1)	**2**
9(d)	mol Zn = 0.07(0) (1) (= mol H_2) volume of H_2 = 1.68 (dm^3) (1)	**2**
9(e)	50.6% / 51% (2) If two marks not obtained, award one mark for: (relative formula mass of zinc phosphate) = 385	**2**

© UCLES 2018