Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/32**

Paper 3 Core Theory **October/November 2016**

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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

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

© UCLES 2016

Question	Answer	Mark
1(a)(i)	K / potassium	**1**
1(a)(ii)	Cu / copper	**1**
1(a)(iii)	C / carbon	**1**
1(a)(iv)	He / helium	**1**
1(a)(v)	Fe / iron	**1**
1(b)	*number of protons:* 47 and 47 *number of electrons:* 47 and 47 *number of neutrons:* 60 and 62	**1** **1** **1**

Question	Answer	Mark
2(a)(i)	any 2 from: • more Cl^- in **A ORA** • more HCO_3^- in **A ORA** • more Ca^{2+} in **A ORA** • more Na^+ in **B ORA** • more K^+ in **B ORA** • more SiO_3^{2-} in **B ORA** • more Mg^{2+} in **B ORA**	**2**
2(a)(ii)	Ca^{2+}	**1**

© UCLES 2016

Question	Answer	Mark
2(a)(iii)	1.5 mg = [2] $\frac{100}{1000} \times (15) =$ [1] **OR** $0.1 \times (15) =$ [1]	**2**
2(b)	*test:* add (nitric acid and) silver nitrate *result:* white precipitate	**1** **1**
2(c)	the random movement of particles in a suspension	**1**
2(d)	silicon is a non-metal / silicon is on the right-hand side of the Periodic Table	**1**
2(e)(i)	decreases (as temperature increases)	**1**
2(e)(ii)	11.5 (mg / dm^3)	**1**
2(e)(iii)	increases because chemical reaction(s) are faster at higher temperatures / reactions with iron are faster at higher temperatures / reactions with metals are faster at higher temperatures **OR** decreases because less oxygen is dissolved at higher temperatures	**1**
2(f)	filtration treatment with chlorine / chlorination	**1** **1**
2(g)(i)	any suitable source, e.g. car (exhausts) / lightning / furnaces /	**1**
2(g)(ii)	breathing difficulties / irritation to nose (**OR** lungs **OR** eyes **OR** throat or skin)	**1**

© UCLES 2016

Question	Answer	Mark
3(a)	water (water) is losing oxygen	**1** **1**
3(b)(i)	rock from which metal is extracted / rock containing (high proportion of) a metal (compound)	**1**
3(b)(ii)	to burn the coke / to form carbon monoxide	**1**
3(b)(iii)	calcium silicate	**1**
3(b)(iv)	**S** on or in 2nd pipe from the bottom on the right / just outside this pipe	**1**
3(c)	*impurities named* (max = [1]) • e.g. carbon / sulfur / phosphorous / silicon *removal of impurities* (max = [1]) • oxygen blown into iron / oxygen blast • calcium oxide added / lime added • sulfur oxidised to sulfur dioxide • sulfur dioxide escapes as gas • carbon oxidised to carbon dioxide • carbon dioxide escapes as a gas • phosphorous oxidised to phosphorous oxide • silicon oxidised to silicon dioxide • slag formed / calcium silicate formed • slag floats on surface of steel *relevant word equation* (max = [1]) • e.g. sulfur + oxygen → sulfur dioxide • carbon + oxygen → carbon dioxide *one other relevant piece of information about impurities / reaction* (max = [1])	**4**

© UCLES 2016

Question	Answer	Mark
4(a)	the sample is impure	**1**
4(b)	any 3 from: • diffusion • particles move / motion of particles • (movement is) random / in any direction / in all directions • particles spread out / particles mix • particles move from high to low concentration	**3**
4(c)	red	**1**
4(d)(i)	(metal) salt water	**1** **1**
4(d)(ii)	filtration / filter	**1**
4(d)(iii)	**E**, **B**, **C**, **A**, **D**	**2**

© UCLES 2016

Question	Answer	Mark
5(a)(i)	CaO CO_2	**1** **1**
5(a)(ii)	(thermal) decomposition	**1**
5(a)(iii)	100 = [2] A_r = 40 (Ca), 12 (C),16 (O) = [1]	**2**
5(b)	any 2 from: • compound has a fixed composition / mixture has not got a fixed composition • (components of) compound cannot separated (by physical means) / (components of) mixture can be separated (by physical means) • compound has different properties from the elements it has been made from / substances in a mixture have the same properties as those used to make the mixture	**2**
5(c)	concrete is weaker / steel is stronger	**1**
5(d)	oxygen / air water	**1** **1**

© UCLES 2016

Question	Answer	Mark
6(a)(i)	*hydrocarbon*: (compounds which) contain carbon and hydrogen only *fraction*: • molecules with certain number(s) of carbon atoms / molecules with (limited) range of carbon atoms **OR** • (limited) range of boiling points **OR** • molecules of certain sizes / (limited) range of sizes	**1** **1**
6(a)(ii)	*naphtha:* making chemicals / making alkenes *kerosene:* fuel for planes / fuel for heating / making alkenes	**1** **1**
6(b)	*comment on alkenes* (max = [1]) • alkenes have C=C / are unsaturated *reference to homologous series* (max = [3]) • family of similar carbon compounds / similar organic compounds • (same) functional group • similar chemical properties • trend in physical properties • (same) general formula / C_nH_{2n} • differ by CH_2	**4**
6(c)(i)	(yes) there is general trend from propene to hexane / (yes) the numbers go up in both columns	**1**
6(c)(ii)	any value between 35 (°C)–85 (°C) inclusive	**1**

© UCLES 2016

Question	Answer	Mark
6(c)(iii)	liquid –60 °C is between the melting and boiling point / the melting point is lower than –60 °C but the boiling point is higher (than –60 °C)	**1** **1**
6(d)	correct structure of ethane showing all of the atoms and all of the bonds	**1**
6(e)	C_4H_8 C_8H_{18}	**1** **1**

Question	Answer	Mark
7(a)	air would react with sodium / argon is unreactive / argon makes the atmosphere inert / sodium does not react with argon	**1**
7(b)	**D–E**	**1**
7(c)(i)	any 2 from: • gas spreads everywhere / liquid spreads over a surface • gas has no fixed volume / liquid has fixed volume • gas has no surface / liquid has (definite) surface • gas can be compressed / liquid cannot be compressed	**2**
7(c)(ii)	*arrangement:* no (fixed) arrangement / random / irregular *motion:* slow / sliding over each other / slipping over each other	**1** **1**

© UCLES 2016

Question	Answer	Mark
7(d)(i)	any 2 from: • high melting point / high boiling point • high density • catalytic activity • has several oxidation states • forms coloured compounds • hard / strong	**2**
7(d)(ii)	Nb_2Cl_{10}	**1**
7(d)(iii)	any 2 from: • does not conduct electricity / heat • has a low melting point / has a low boiling point • insoluble in water / soluble in organic solvent	**2**

© UCLES 2016