Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/33**

Paper 3 Theory (Core) **May/June 2018**

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.

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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.

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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.

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Question	Answer	Marks
1(a)(i)	hydrogen chloride / HC*l*	**1**
1(a)(ii)	helium / He	**1**
1(a)(iii)	nitrogen / N_2	**1**
1(a)(iv)	methane / CH_4	**1**
1(a)(v)	nitrogen / N_2	**1**
1(b)(i)	One mark each for any 2 of: • helium • hydrogen • nitrogen	**1**
1(b)(ii)	(substance) containing only one type of atom / (substance) which cannot be broken down chemically into any other substance	**1**
1(c)	bonding pair of electrons between H and C*l*	**1**
	6 non-bonding electrons on the C*l* and none on the H	**1**

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Question	Answer	Marks
2(a)(i)	12(%)	**1**
2(a)(ii)	One mark each for any 3 of: • more nitrogen in petrol engine / ORA for diesel • more carbon dioxide in petrol engine / ORA for diesel • more water vapour in petrol engine / ORA for diesel • more carbon monoxide in petrol engine / ORA for diesel • less oxides of nitrogen in petrol engine / ORA for diesel • more hydrocarbons in petrol engine / ORA for diesel • less sulfur dioxide in petrol engine / ORA for diesel • less / no oxygen in petrol engine / ORA for diesel	**3**
2(a)(iii)	breathing difficulties / irritates eyes / irritates nose / irritates throat / irritates lungs / (potentiates) asthma	**1**
2(b)	distillation	**1**
	kerosene	**1**
	boiling	**1**
2(c)	3 (CO_2)	**1**
	4 (H_2O)	**1**

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Question	Answer	Marks
3(a)	One mark each for any 3 of: • (cobalt / chloride) particles go from close together to spread out / (cobalt / chloride) particles go into solution / (cobalt / chloride) particles go into the water • diffusion • random movement of particles / particles move anywhere (in the liquid) / particles move in all directions • spreading out of particles / intermingling of particles / mixing of particles / particles collide / particles bounce off each other / particles go all over • (bulk) movement of particles from higher to lower concentration / movement of particles **down** concentration gradient	**3**
3(b)(i)	reversible reaction	**1**
3(b)(ii)	blue	**1**
	to pink	**1**
3(c)	$Co_2C_8O_8$	**1**
3(d)	cobalt<zinc<magnesium<barium **IF** 2 marks not scored: 1 mark if all reversed / one consecutive pair reversed	**2**

Question	Answer	Marks
3(e)	3 of the following correct = 2 marks 1 or 2 of the following correct = 1 mark • Co has high melting point / boiling point ORA for lithium • Co has high density ORA for lithium • Co has catalytic activity ORA for lithium • Co forms coloured compounds ORA for lithium • Co compounds have variable oxidation states / form ions with different charges ORA • iron is hard / lithium is soft(er) / iron is strong / lithium is weak • one suitable difference in chemical properties e.g. cobalt is less reactive ORA / lithium reacts with cold water • cobalt is magnetic / ORA for lithium	**2**
3(f)	6 (CoO)	**1**
3(g)	Co_3O_4 loses oxygen / it loses oxygen / oxygen is removed from the cobalt oxide / the cobalt oxide loses oxygen	**1**

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Question	Answer	Marks
4(a)(i)	C=C double bond	**1**
4(a)(ii)	orange / red-brown / brown	**1**
	to colourless	**1**
4(a)(iii)	liquid	**1**
	–120ºC is in between the melting point and boiling point / –120ºC is higher than the melting point **AND** lower than the boiling point	**1**
4(b)(i)	correct structure of ethanol showing all atoms and all bonds	**1**
4(b)(ii)	sugar	**1**
	30ºC	**1**
	enzymes	**1**
	distillation	**1**
4(b)(iii)	any suitable use e.g. solvent / to make **named** chemical	**1**
4(b)(iv)	energy level of reactants above energy level of products / the arrow is going downwards / energy (level) goes down / product has less energy than reactants	**1**
4(b)(v)	carbon monoxide	**1**
	carbon	**1**

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Question	Answer	Marks
5(a)	anode	**1**
5(b)	negative electrode: lead	**1**
	positive electrode: bromine	**1**
5(c)	add (sufficient) water and stir (to dissolve) / add the mixture to water	**1**
	filter off the lead bromide / filter to obtain solution sodium bromide	**1**
	evaporate (some of the) water from the solution / warm solution to crystallisation point then leave (to crystallise)	**1**
5(d)	bromine	**1**
	chlorine is more reactive than bromine	**1**
5(e)	cream	**1**
5(f)	electron	**1**

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Question	Answer	Marks
6(a)	One mark each for any 5 of: • protons in the nucleus / centre (of the atom) • neutrons in the nucleus / centre of the atom • electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus • 8 protons • 8 electrons • 9 neutrons	**5**
6(b)	2nd box down ticked	**1**
	4th box down ticked	**1**
6(c)	number of protons plus neutrons in an atom	**1**

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Question	Answer	Marks
7(a)(i)	relative hardness of potassium: between 1 and 3 (exclusive of these two values)	**1**
	melting point of rubidium: less than 63 ºC but not lower than 20 ºC	**1**
7(a)(ii)	slow bubbling / fewer bubbles than sodium	**1**
7(b)	2,8,1	**1**
7(c)(i)	Group I hydroxide is alkaline / sodium hydroxide is an alkali	**1**
7(c)(ii)	add (red) litmus **OR** add universal / full range indicator	**1**
	turns blue **OR** turns blue / purple	**1**
7(d)	38 **IF** two marks not scored: 1 mark for (B =) 11, (Na =) 23, (H =) 1	**2**

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Question	Answer	Marks
8(a)	measuring cylinder	**1**
8(b)	measure the volume of gas given off / measure volume of carbon dioxide produced **OR** measure time taken	**1**
	over a given time(s) **OR** to produce given volume(s) of gas	**1**
8(c)	decreases rate / decreases it / makes it slower	**1**
8(d)	small pieces **AND** large pieces **AND** powder	**1**
8(e)	calcium chloride	**1**
	carbon dioxide **AND** water	**1**

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