



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/32

Paper 3 Theory (Core)

March 2017

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **5** printed pages.

Question	Answer	Marks
1(a)(i)	oxygen / O ₂	1
1(a)(ii)	lithium / Li	1
1(a)(iii)	aluminium / Al	1
1(a)(iv)	argon / Ar	1
1(a)(v)	nickel / Ni	1
1(a)(vi)	lithium / Li	1
1(b)	number of electrons for Ni = 28	1
	number of electrons for O ²⁻ = 10	1
	number of neutrons Ni = 34 AND O ²⁻ = 10	1
	number of protons for O ²⁻ = 8	1

Question	Answer	Marks
2(a)(i)	A placed either on the left hand lower tube (or on the one on the right directly opposite this)	1
	W placed on both or either of the tubes at the top	1
2(a)(ii)	the slag is above the molten iron / the iron is below the molten slag	1
2(b)(i)	breakdown of a substance / breakdown of a compound	1
	using heat / using high temperature	1
2(b)(ii)	CO ₂	1
2(b)(iii)	calcium oxide reacts with silicon(IV) oxide / sand	1
	to form calcium silicate / slag	1
2(c)	apparatus correctly set up with two rods dipping into a liquid	1
	completed circuit with cell / power pack	1
	electrode(s) AND electrolyte correctly labelled	1
2(d)(i)	graphite / platinum / (pure) iron	1
2(d)(ii)	conducts electricity / inert	1
2(e)(i)	Fe(CO) ₅ / FeC ₅ O ₅	1
2(e)(ii)	carbon monoxide is poisonous / toxic	1

Question	Answer	Marks
2(f)(i)	water	1
	oxygen / air	1
2(f)(ii)	the lower the pH, the greater the rate / it is faster at a lower pH	1
	the higher the temperature, the greater the rate / it is faster at a higher temperature	1

Question	Answer	Marks
3(a)	nitrogen	1
3(b)(i)	substance containing carbon and hydrogen	1
	only / and no other element	1
3(b)(ii)	oxygen on left	1
	water on right	1
3(b)(iii)	it is a greenhouse gas / causes climate change / global warming	1
	ice caps melt (or rise in sea levels) / <u>increased</u> flooding / desertification / increased death of corals	1
3(b)(iv)	incomplete combustion (of hydrocarbon)	1
3(b)(v)	correct molar mass = 114 8 · 12/96 (in final column) scores [1]	2
3(c)(i)	increases as the number of carbon atoms increases	1
3(c)(ii)	pentane / C ₅ H ₁₂	1
	20 °C is in between its melting and boiling points / boiling point is above 20 °C and melting point is below 20 °C	1
3(c)(iii)	correct structure of methane showing all four C–H bonds	1

Question	Answer	Marks
4(a)	reversible (reaction)	1
4(b)	increase plant growth / provide more nitrogen for making protein / helps plant grow faster	1
4(c)	<u>ammonium</u> nitrate	1
4(d)(i)	neutralises (the acid) / lowers the acidity / raises pH	1
4(d)(ii)	plants cannot grow (well) under acidic conditions	1

Question	Answer	Marks
5(a)	ring around –OH	1
5(b)	10	1
5(c)(i)	double C=C bond	1
5(c)(ii)	(aqueous) bromine / bromine water	1
	turns colourless	1
5(d)	(E), D, A, B, C one consecutive pair reversed scores [1]	2
5(e)	any 3 from: diffusion molecules in (constant) movement / molecules collide movement of molecules is random / in every direction molecules spread out molecules (spread) from higher concentration to lower concentration	3
5(f)(i)	on the baseline / on the starting line	1
5(f)(ii)	Q	1
5(f)(iii)	Q	1

Question	Answer	Marks
6(a)	hydrogen	1
6(b)	electron	1
6(c)	bonding pair correctly shown	1
	3 non-bonding pairs on right hand chlorine atom	1
6(d)	litmus (paper) / Universal Indicator paper	1
	bleached / goes colourless	1
6(e)	2 on left AND NaCl on right NaCl on right scores [1]	2
6(f)(i)	1.8 g	1
6(f)(ii)	315 g	1

Question	Answer	Marks
7(a)	physical properties [max 3], e.g.: conduct electricity (or heat) shiny malleable ductile sonorous chemical properties [max 2], e.g.: react with acids react with oxygen correct word equation (general or specific) [max 1]	5
7(b)	nickel, zinc, magnesium, calcium one consecutive pair reversed / all reversed scores [1]	2
7(c)(i)	<u>atoms</u> with the same number of protons and different numbers of neutrons	1
7(c)(ii)	energy (production) / nuclear power	1