
CHEMISTRY

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Paper 3 Core Theory

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	A	1
1(a)(ii)	B	1
1(a)(iii)	D	1
1(a)(iv)	B	1
1(a)(v)	C	1
1(b)	substance containing only one type of atom / substance containing atoms (each) with the same number of protons / substance which cannot be broken down further by chemical means	1
1(c)	solid	1
	–15 °C is below the melting point	1

Question	Answer	Marks
2(a)	1.5 (%)	1
2(b)	any 3 from: <ul style="list-style-type: none"> greater percentage of helium (on Neptune) / more helium on Neptune / less helium on Earth greater percentage of hydrogen (on Neptune) / more hydrogen on Neptune / no hydrogen on Earth / (very) little hydrogen on Earth no oxygen on Neptune / little oxygen on Neptune (but Earth has 21% oxygen) greater percentage of methane (on Neptune) / more methane on Neptune / less methane on Earth / more methane on Neptune more argon on Earth / less argon on Neptune no nitrogen on Neptune / little nitrogen on Neptune 	3
2(c)	labels 'C' and 'H' in the correct circles and no non-bonding electrons or extra bonding electrons	1
	one pair of electrons in each overlap area	1

Question	Answer	Marks
2(d)(i)	<u>atoms</u> of the same element with the same <u>number</u> of protons but a different <u>number</u> of neutrons	1
2(d)(ii)	number of protons: 1	1
	number of neutrons: 2	1
2(e)(i)	30 IF full credit is not awarded, allow 1 mark for (C =) 12 and (H =) 1	2
2(e)(ii)	anhydrous / white copper(II) sulfate OR anhydrous / blue cobalt(II) chloride	1
	(anhydrous copper(II) sulfate) turns blue OR (anhydrous cobalt(II) chloride) turns pink	1

Question	Answer	Marks
3(a)(i)	2 (CO ₂)	1
	3 (H ₂ O)	1
3(a)(ii)	correct structure showing all of the atoms and all of the bonds including O–H IF full credit is not awarded, allow 1 mark for structure with OH	2
3(b)(i)	pH 10	1
3(b)(ii)	red / pink	1
	to yellow	1
3(b)(iii)	sodium carbonate + sulfuric acid → sodium sulfate + carbon dioxide + water IF full credit is not awarded, allow 1 mark for either sodium sulfate OR carbon dioxide + water	2

Question	Answer	Marks
3(c)	sulfur dioxide	1
3(d)(i)	P: chromatography paper / filter paper	1
	Q: solvent	1
3(d)(ii)	chromatography	1
3(d)(iii)	X drawn on the baseline	1

Question	Answer	Marks
4(a)	graphite: conducts	1
	potassium: conducts	1
4(b)	low boiling point	1
4(c)	does not conduct when solid but conducts when molten IF full credit is not awarded, allow 1 mark for conducts when molten	2
4(d)	positive electrode (anode): chlorine / Cl_2	1
	negative electrode (cathode): zinc / Zn	1
4(e)	chlorine is more reactive than iodine	1

Question	Answer	Marks
5(a)(i)	2 (C)	1
	2 (Cl_2)	1
5(a)(ii)	carbon gains oxygen / oxidation number of carbon increases / carbon loses electrons	1

Question	Answer	Marks
5(b)	any 2 from: <ul style="list-style-type: none"> • titanium has a high melting / boiling point ORA • titanium has a high density ORA • titanium is hard / strong ORA 	2
5(c)(i)	relative reactivity with water: forms bubbles slowly / slower than sodium	1
	melting point of potassium: any value between 45–90 (°C) inclusive	1
5(c)(ii)	increases down the group / decreases up the group	1
5(d)	basic because it is a metal (oxide)	1

Question	Answer	Marks
6(a)	any 4 from: <ul style="list-style-type: none"> • petroleum vaporised / heated • petroleum enters the fractionating column at the bottom • vapours move up the fractionating column • column is hotter at the bottom / cooler at the top • idea of vapours condensing in different parts of the fractionating column • idea of different fractions having different boiling ranges • fractions (condensing) higher up have lower boiling points ORA 	4
6(b)(i)	breaking down / decomposing / splitting hydrocarbons	1
	into smaller hydrocarbons / into alkanes and alkenes / by heating / using a high temperature	1
6(b)(ii)	hydrogen	1
6(c)	covalent	1
6(d)	polymer	1

Question	Answer	Marks
7(a)	any 3 from: <ul style="list-style-type: none"> • diffusion • molecules move (from place to place) • (molecules move) randomly • molecules collide • molecules spread out / mix up • (bulk) movement of molecules from areas of where they are at higher concentration to where they are at lower concentration 	3
7(b)(i)	$C_4H_6O_2Br_2$	1
7(b)(ii)	carboxylic acid	1
7(c)	average	1
	an element	1
	an atom	1
	12	1
7(d)(i)	increasing the concentration of the <u>acid</u>	1
	increasing the temperature	1
	using <u>magnesium</u> powder / using smaller pieces of <u>magnesium</u>	1
7(d)(ii)	4 (HBr)	1

Question	Answer	Marks
8(a)(i)	reversible reaction	1
8(a)(ii)	speed up the reaction / increase the rate of reaction / speed of reaction faster	1

Question	Answer	Marks
8(b)(i)	decreases as the temperature increases ORA	1
8(b)(ii)	28%	1
8(c)	112 (g)	1
8(d)	clothing / named clothing / fishing lines	1