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CHEMISTRY **0620/31**

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: • 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**

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Question	Answer	Marks
2(d)(i)	atoms of the same element with the same number of protons but a different number 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_2O)	**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**

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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**

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Question	Answer	Marks
5(b)	any 2 from: • 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: • 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**

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Question	Answer	Marks
7(a)	any 3 from: • 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 acid	**1**
	increasing the temperature	**1**
	using magnesium powder / using smaller pieces of magnesium	**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**

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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**

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