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**CHEMISTRY**

**0620/33**

Paper 3 Core Theory

**October/November 2017**

MARK SCHEME

Maximum Mark: 80

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**Published**

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This document consists of **6** printed pages.

Question	Answer	Marks
1(a)(i)	<b>B</b>	<b>1</b>
1(a)(ii)	<b>C</b>	<b>1</b>
1(a)(iii)	<b>B</b>	<b>1</b>
1(a)(iv)	<b>D</b>	<b>1</b>
1(a)(v)	<b>C</b>	<b>1</b>
1(b)(i)	burning fossil fuels / volcanoes / high temperature furnaces / burning named fossil fuel	<b>1</b>
1(b)(ii)	breathing difficulties / irritates nose / irritates eyes / irritates throat	<b>1</b>
1(c)	number of protons: 7	<b>1</b>
	number of neutrons: 8	<b>1</b>
	number of electrons: 7	<b>1</b>

Question	Answer	Marks
2(a)	any 3 from: <ul style="list-style-type: none"> <li>• no oxygen on Venus / (very) little oxygen on Venus / Earth has oxygen / Earth has 21% oxygen</li> <li>• greater per cent carbon dioxide on Venus / more carbon dioxide on Venus <b>ORA</b></li> <li>• smaller per cent of nitrogen on Venus / (very) little nitrogen on Venus / less nitrogen on Venus / Earth has 79% nitrogen</li> </ul>	<b>3</b>
2(b)	limewater	<b>1</b>
	turns milky / cloudy / white precipitate	<b>1</b>
2(c)(i)	labels 'O' and 'H' in the correct circles and no extra non-bonding electrons or bonding electrons	<b>1</b>
	one pair of electrons in each overlap area	<b>1</b>

Question	Answer	Marks
2(c)(ii)	solid	1
	–200 °C is lower than melting point	1
2(c)(iii)	it has 8 electrons in its outer shell	1
2(d)(i)	sulfuric acid + magnesium carbonate → magnesium sulfate + carbon dioxide + water IF full credit is not awarded, award 1 mark for either magnesium sulfate <b>OR</b> carbon dioxide + water	2
2(d)(ii)	98 IF full credit is not awarded, award 1 mark for (S =) 32 , (O = 16) and (H =1)	2
2(e)(i)	bleach / treating wood pulp / preservative	1
2(e)(ii)	pH 2	1

Question	Answer	Marks
3(a)	calcium carbonate	1
3(b)(i)	condensation (at mouth of tube)	1
3(b)(ii)	add (aqueous) sodium hydroxide / (aqueous) ammonia	1
	green precipitate	1
3(c)(i)	H <sub>2</sub>	1
3(c)(ii)	filtration / filter	1
3(d)(i)	structure completed correctly with all of the atoms and all of the bonds IF full credit is not awarded, award 1 mark for OH instead of O–H	2
3(d)(ii)	bubbles <b>OR</b> effervesces / magnesium decreases in size <b>OR</b> magnesium disappears	1

Question	Answer	Marks
3(e)	any 3 from: <ul style="list-style-type: none"> <li>• beaker with chromatography paper inside <b>OR</b> chromatography paper with spot on baseline</li> <li>• solvent in bottom of beaker</li> <li>• solvent and chromatography paper correctly labelled</li> <li>• spot (of dye) above level of solvent</li> </ul>	3
3(f)	any 3 from: <ul style="list-style-type: none"> <li>• diffusion</li> <li>• molecules move (from place to place)</li> <li>• (molecules move) randomly</li> <li>• molecules collide</li> <li>• molecules spread out / mix up</li> <li>• (bulk) movement of molecules from areas of where they are at higher concentration to where they are at lower concentration</li> </ul>	3

Question	Answer	Marks
4(a)	electrical conductivity of solid diamond: does not conduct	1
	electrical conductivity of molten sulfur: does not conduct	1
4(b)	low boiling point	1
4(c)	does not conduct when solid but conducts when molten IF full credit is not awarded, award 1 mark for does not conduct when molten	2
4(d)(i)	low density	1
4(d)(ii)	electrolysis	1
4(e)	positive electrode (anode): bromine / Br <sub>2</sub>	1
	negative electrode (cathode): potassium / K	1
4(f)(i)	diamond has a giant structure <b>AND</b> diamond has covalent bonds	1

Question	Answer	Marks
4(f)(ii)	drill (bits) / jewellery	1

Question	Answer	Marks
5(a)	3 (O <sub>2</sub> )	1
	2 (SO <sub>2</sub> )	1
5(b)(i)	lead oxide loses oxygen / oxidation number of lead decreases / lead gains electrons	1
5(b)(ii)	any 2 from: <ul style="list-style-type: none"> <li>• high melting points / high boiling points</li> <li>• high densities</li> <li>• conduct heat <b>OR</b> conduct electricity</li> <li>• shiny / lustrous</li> <li>• sonorous / rings when hit</li> <li>• malleable</li> <li>• ductile</li> </ul>	2
5(c)	air / oxygen	1
	water	1
5(d)(i)	to oxidise impurities / to oxidise named impurities (restricted to phosphorus / sulfur / carbon / silicon)	1
5(d)(ii)	potassium oxide	1
	it is the oxide of a metal / metal oxides are basic	1
5(e)	mixture	1
	of metals / of metal with non-metal / of metals with other elements	1
5(f)(i)	car bodies / bridges / railings	1

Question	Answer	Marks
5(f)(ii)	cutlery / chemical plant	1

Question	Answer	Marks
6(a)	<b>X</b> in bottom compartment of fractionating column	1
	<b>B</b> in bottom right tube or shown to the right of the arrow	1
6(b)	naphtha	1
6(c)(i)	correct structure of ethane showing all of the atoms and all of the bonds	1
6(c)(ii)	3 (H <sub>2</sub> )	1
6(c)(iii)	takes in heat (from surroundings) / absorbs heat / absorbs thermal energy	1
6(d)	any 4 from: <ul style="list-style-type: none"> <li>• idea of breaking down / splitting / decomposing (long-chained) hydrocarbons</li> <li>• example of fraction broken down, e.g. kerosene or fuel oil</li> <li>• shorter / smaller hydrocarbons formed</li> <li>• and alkenes</li> <li>• heat / high temperature</li> <li>• catalysts</li> </ul>	4
6(e)(i)	(boiling point) increases	1
6(e)(ii)	any value between –8 and –80 (°C) inclusive of these values	1
6(e)(iii)	arrangement: irregular / random / no particular arrangement	1
	separation: close together / touching	1