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CHEMISTRY

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Paper 3 Core Theory

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MARK SCHEME

Maximum Mark: 80

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This document consists of **7** printed pages.

Question	Answer	Marks
1(a)(i)	A	1
1(a)(ii)	C	1
1(a)(iii)	D	1
1(a)(iv)	D	1
1(a)(v)	E	1
1(b)	any 3 from: <ul style="list-style-type: none"> • metals conduct electricity / heat ORA • metals are malleable ORA • metals are ductile ORA • metals are sonorous / ring when hit ORA • metals are shiny / lustrous ORA 	3
1(c)	substance contain two (or more different) <u>elements</u> which are bonded together / which are chemically combined	1

Question	Answer	Marks
2(a)	any 3 from: <ul style="list-style-type: none"> • greater percentage of helium (on Saturn) / less helium on Earth • greater percentage of hydrogen (on Saturn) / little hydrogen on Earth • no oxygen on Saturn / oxygen on Earth / Earth has 1/5 oxygen • lower percentage of other gases (on Saturn) / more of other gases on Earth • greater percentage of argon on Earth / less argon on Saturn • no OR very little nitrogen on Saturn / Earth has about 80% nitrogen / Earth has a lot of nitrogen 	3
2(b)(i)	hydrogen is less dense than helium	1
2(b)(ii)	gas	1
	–250 °C is above the boiling point	1

Question	Answer	Marks
2(c)(i)	(damp) <u>red</u> litmus	1
	turns blue	1
2(c)(ii)	labels 'N' and 'H' in the correct circles	1
	one pair of electrons in each overlap area and no non-bonding electrons or extra bonding electrons added	1
2(d)	51 IF full credit is not awarded, allow 1 mark for (S =) 32, (N =) 14 and (H =) 1	2
2(e)(i)	carbon dioxide / CO ₂	1
2(e)(ii)	global warming / effect of global warming, e.g. melting ice caps / desertification / more extreme weather / death of corals / more risk of flooding	1

Question	Answer	Marks
3(a)(i)	functional group shown as –COOH / –CO ₂ H or displayed formula	1
3(a)(ii)	pH 4	1
3(a)(iii)	neutralisation	1
3(a)(iv)	releases heat / heat given out	1
3(b)	C ₃ H ₈ O ₃	1
3(c)	2 (CO)	1
	3 (H ₂ O)	1

Question	Answer	Marks
3(d)(i)	distillation	1
	water is the distillate / water collects in the condenser / sodium chloride remains in the flask	1
	idea of different boiling points (of water and sodium chloride)	1
3(d)(ii)	boiling <u>point</u> / melting <u>point</u>	1
3(d)(iii)	(aqueous) silver nitrate (acidified with nitric acid)	1
	white precipitate	1

Question	Answer	Marks
4(a)	electrical conductivity of zinc: conducts	1
	solubility in water of sodium chloride: soluble	1
4(b)	low boiling point / does not conduct when solid or molten	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): iodine	1
	negative electrode (cathode): calcium	1
4(e)	number of protons: 15	1
	number of neutrons: 16	1
4(f)	acidic because phosphorus is a non-metal	1
4(g)	goes (directly) from solid to vapour / gas (without liquid state being formed)	1

Question	Answer	Marks
5(a)	nickel(II) oxide loses oxygen / oxidation number of nickel decreases / nickel gains electrons	1
5(b)	reversible reaction	1
5(c)(i)	carbon monoxide is a gas / carbon monoxide escapes from the mixture	1
5(c)(ii)	toxic / poisonous	1
5(d)(i)	any 2 from: <ul style="list-style-type: none"> • nickel has a high melting / boiling point ORA • nickel has a high density ORA • nickel is hard / strong ORA 	2
5(d)(ii)	nickel(II) chloride is coloured ORA / nickel(II) chloride can be a catalyst ORA	1
5(e)(i)	boiling point: any value between 680–750 °C inclusive	1
	relative reactivity of rubidium with water: reacts explosively / bigger flame (than potassium) / forms bubbles extremely rapidly / faster than potassium but slower than caesium / rapidly bursts into flame	1
5(e)(ii)	density increases down the group ORA	1

Question	Answer	Marks
6(a)	any 5 from: <i>from ethene:</i> <ul style="list-style-type: none"> • steam • high temperature • catalyst <i>by fermentation:</i> <ul style="list-style-type: none"> • yeast / zymase / enzymes • absence of oxygen / anaerobic • water / aqueous (suspension) • suitable temperature quoted (10–40 °C) 	5
6(b)(i)	saturated hydrocarbon: no change / aqueous bromine remains orange	1
	unsaturated hydrocarbon: aqueous bromine decolourised	1
6(b)(ii)	a large molecule formed from many monomers	1
6(b)(iii)	clothing / named article of clothing	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

Question	Answer	Marks
7(b)	Cl_2	1
	2 (SCl_2)	1
7(c)	P: freezing	1
	Q: condensing / condensation	1

Question	Answer	Marks
8(a)	89.6 (g)	1
8(b)(i)	220 (cm ³)	1
8(b)(ii)	49 (min)	1
8(b)(iii)	goes faster / increases (rate)	1
8(c)(i)	16%	1
8(c)(ii)	any 2 from: <ul style="list-style-type: none"> • neutralise soil • reduce acidity of soils • so plants grow properly / so plants grow well 	2