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Paper 3 Theory (Core)

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MARK SCHEME

Maximum Mark: 80

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Question	Answer	Marks
1(a)(i)	E	1
1(a)(ii)	C	1
1(a)(iii)	C	1
1(a)(iv)	D	1
1(a)(v)	A	1
1(b)	number of electrons in Ca^{2+} = 18	1
	number of neutrons in Mg = 14	1
	number of protons in Mg = 12 AND number of protons in Ca^{2+} = 20	1

Question	Answer	Marks
2(a)(i)	8 (mg)	1
2(a)(ii)	hydrogencarbonate / HCO_3^-	1
2(a)(iii)	nitrate	1
2(a)(iv)	12.5 (mg)	1
2(b)	(damp) red litmus paper	1
	turns blue	1
2(c)	CaBr_2	1
2(d)(i)	negative electrode: calcium / Ca	1
	positive electrode: bromine / Br_2	1
2(d)(ii)	platinum / Pt	1

Question	Answer	Marks
3(a)	any 5 of: P has ionic bonding / ionic P particles are regularly arranged / lattice / in rows / uniformly arranged P particles (only) vibrating / not moving from place to place Q has covalent bonding Q has irregular arrangement of particles / random arrangement Q particles moving slowly / moving randomly / sliding over each other R no bonding (between atoms) / weak bonding between atoms / weak attractive forces between atoms R has irregular arrangement of particles / random arrangement R particles moving randomly / moving rapidly / freely moving / randomly (moving) / irregular (movement)	5
3(b)	volume increases	1
	particles get further apart	1
3(c)	C / boils (at 1330 °C)	1
	D / dissolves (readily in water)	1
	the change can be reversed by altering the conditions	1
3(d)	pencil (leads) / lubricant	1
	layers move OR slide over each other	1

Question	Answer	Marks
4(a)(i)	hematite / any other ore of iron	1
4(a)(ii)	from the reaction of carbon dioxide	1
	with carbon / coke	1
	OR	
	reaction of carbon / coke	1
	with insufficient oxygen for complete combustion / idea of oxygen not in excess or not limiting	1
4(a)(iii)	2 (Fe)	1
	3 (CO ₂)	1
4(a)(iv)	iron(III) oxide loses oxygen / iron(III) oxide loses oxygen	1
4(a)(v)	160 IF full credit is not awarded, allow 1 mark for (Fe =) 56 and (O =16)	2
4(b)(i)	hydrogen / H ₂	1
4(b)(ii)	gas syringe connected to flask OR this described in words	1
	closed apparatus / workable apparatus OR this described in words	1
	timer / stop-watch OR this described in words	1
4(c)	(aqueous) sodium hydroxide / aqueous ammonia	1
	green precipitate	1
4(d)	any 2 advantages from: saves energy / saves mining of ore / saves other finite resources / saves transport costs of bringing ore to factory / reduces dust pollution / exhaust gas pollution	2

Question	Answer	Marks
5(a)	circle drawn around the COOH group	1
5(b)	C ₂ H ₄ O ₃	1
5(c)	grind up the (sugar) cane / crush the plant	1
	with a solvent	1
	filter (off the solution)	1
5(d)	addition of oxygen / loss of electrons / increase in oxidation number	1
5(e)(i)	decreases with an increasing number of carbon atoms ORA	1
5(e)(ii)	any value between 118 and 164 (°C) (exclusive of these values)	1
5(e)(iii)	solid	1
	–10 (°C) is below the melting point / melting point is higher than –10 (°C)	1

Question	Answer	Marks
6(a)(i)	J	
	it is (very) strong / it is the strongest	1
	it is cheap	1
6(a)(ii)	M because it is the hardest	1
6(a)(iii)	K because its density is the lowest	1
6(b)(i)	line at a steeper gradient than W	1
	ends up at same mass loss	1
6(b)(ii)	Y	1
6(b)(iii)	1.05 days	1
6(b)(iv)	increasing temperature increases rate	1
	increasing concentration increases rate	1
6(c)	pH 12	1

Question	Answer	Marks
7(a)	pair of electrons in overlap area between O atom and both H atoms	1
7(b)	electrical conductivity	1
	melting point/boiling point	1
7(c)	iron < magnesium < cerium < lithium IF full credit is not awarded, allow 1 mark for either a correct sequence apart from a consecutive pair reversed OR for the whole sequence reversed	2
7(d)(i)	water	1
	air / oxygen	1
7(d)(ii)	any 2 methods from: greasing / covering with plastic / galvanising / painting / (electro)plating	2
7(e)	evaporate to crystallisation point / leave in a warm place until crystals form	1
	filter off crystals / pick out crystals AND dry on filter paper / heat in drying oven	1
7(f)	4 (CO ₂)	1
	4(H ₂ O)	1