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Mark Scheme (Results)
Summer 2010

IGCSE

IGCSE Science (Double Award) (4437) Paper 2F

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IGCSE SCIENCE DOUBLE AWARD 4437/2F – SUMMER 2010

SECTION A

Question			Mark	Acceptable answers	Notes	Total
1	**a**		M1	neutron		**1**
			M2	proton		**1**
			M3	electron		**1**
	b		M1	nucleus		**1**
	c		M1	12		**1**
	d		M1	5		**1**
	e		M1	2.3		**1**

Question			Mark	Acceptable answers	Notes	Total
2	**a**	**i**	M1	air / atmosphere	re any reference to method	**1**
		ii	M1	natural gas / North Sea gas / hydrocarbons / named fraction / water / steam	Ignore methane	**1**
	b	**i**	M3	iron / Fe	Ignore reference to oxide(s) / oxidation states II and III	**1**
		ii	M1	350 - 500		**1**
			M2	100 - 350		**1**
		iii	M1	cross in box 3		**1**
			M2	cross in box 4		**1**
			M3	cross in box 5		**1**

Question			Mark	Acceptable answers	Notes	Total
3	**a**		M1	limewater / aqueous calcium hydroxide / $Ca(OH)_2(aq)$	Accept (aq) / solution / dissolved in water as equivalent to aqueous	**1**
			M2	milky / cloudy /chalky / white precipitate / white solid	Ignore bubbles	**1**
	b		M1	copper(II) carbonate → copper(II) oxide + carbon dioxide	Both (II) needed Reject any other substances Ignore heat	**1**
	c		M1	green	Ignore qualifiers such as light / dark	**1**
			M2	black	Reject all other colours	**1**

Question			Mark	Acceptable answers	Notes	Total
4	**a**		M1	cross in box 1		**1**
			M2	cross in box 4		**1**
	b		M1	filter or filtration / centrifuge and decant	Accept description of process Reject any wrong method	**1**
	c		M1	wash (with water) / add water and filter	Accept description of process	**1**
			M2	dry / heat / warm / evaporate / leave in warm place / spread onto filter paper / place in (warm) oven	Accept description of process Ignore wrong consequence (eg heat to remove sodium nitrate)	**1**
					If M1 and M2 in wrong order, award1/2 Reject any wrong method in both M1 and M2	

Question			Mark	Acceptable answers	Notes	Total
5	**a**		M1	covalent		**1**
	b		M1	low		**1**
			M2	weak	If high given for M1, then accept strong	**1**
			M3	molecules		**1**
					Mark b independently except that if high given for M1, then accept strong for M2	
	c		M1	shared pairs of electrons between O and both H atoms	Electrons can be shown as dots / crosses / e / any combination of these	**1**
			M2	two electrons in O inner shell AND four more electrons in O outer shell AND no extra electrons in H	Accept these electrons paired or unpaired	**1**
					M2 dependent on M1	
	d	**i**	M1	blue	Ignore qualifiers such as light / dark Reject all other colours	**1**
			M2	white / grey / pale(r) blue	Accept all combinations of these Reject all other colours	**1**
		ii	M1	anhydrous copper(II) sulphate	(II) not needed	**1**
		iii	M1	becomes blue / heat produced / temperature rises / forms hydrated copper(II) sulphate / goes back to original colour	If different colour given in di(M1), accept this colour here	**1**

Question			Mark	Acceptable answers	Notes	Total
6	**a**	**i**	M1	propene / propylene	Accept prop-1-ene	**1**
		ii	M1	yellow / orange / brown	Accept any combination of these colours Reject red	**1**
			M2	(goes) colourless / decolourised	Ignore clear Ignore discoloured	**1**
					Do not award mark for single colour if not clear whether start or finish	
	b	**i**	M1	(contains) hydrogen and carbon / H and C (atoms)	Reject molecules / ions	**1**
			M2	only	Accept other words with equivalent meaning, such as purely / solely / entirely Award M2 only if correct elements mentioned in M1	**1**
		ii	M1	only single bonds / no double bonds / no multiple bonds		**1**
		iii	M1	double bond between two carbon atoms		**1**
			M2	each carbon bonded to two hydrogen atoms	M2 dependent on M1	**1**
	c		M1	cross in box 1		**1**
			M2	cross in box 5		**1**

SECTION A TOTAL: 45 MARKS

SECTION B

Question			Mark	Acceptable answers	Notes	Total
7	**a**	**i**	M1	bubbles / fizzing / effervescence / metal disappears floats / moves	Ignore metal dissolves / gas produced	**1**
		ii	M1	flame / explosion		**1**
	b	**i**	M1	lithium hydroxide		**1**
		ii	M1	KOH		**1**
	c		M1	hydrogen / H_2	Ignore H	**1**
			M2	(squeaky) pop with burning splint /burns with a (squeaky) pop	Accept other words such as explosion / lighted spill or taper Reject glowing splint Ignore references to air/splint extinguished No CONSEQ from wrong gas	**1**
	d	**i**	M1	blue / purple	Ignore qualifiers such as light / dark / bright	**1**
			M2	OH^- / hydroxide	Ignore hydroxyl	**1**
		ii	M1	lilac / purple	Ignore qualifiers such as light / dark Reject all other colours	**1**

Question			Mark	Acceptable answers	Notes	Total
8	**a**	**i**	M1	fractional distillation / fractionation		**1**
		ii	M1	crude oil heated	M1 given even if describe laboratory process. Only M1 possible if describe lab process or mention cracking/breaking bonds	**1**
			M2	(vapour) passed into column/tower	If crude oil heated **in** fractionating column, then give only 1 mark for M1 and M2	**1**
			M3	fractions collected at different heights		**1**
			M4	correct reference to boiling point / molecular size / temperature gradient/hot at bottom cooler at top	Do not award if specified temperature gradient is wrong way round	**1**
	b	**i**	M1	bitumen		**1**
		ii	M1	gasoline		**1**
	c		M1	oxygen	Ignore air	**1**
			M2	carbon dioxide	Accept answers in either order	**1**
			M3	water	Accept steam in place of water	**1**
					All marks in c are independent	
					Ignore heat	
	d	**i**	M1	C_nH_{2n+2}	Accept other letters/symbols such as x Accept $C_nH_{2(n+1)}$	**1**

Question			Mark	Acceptable answers	Notes	Total
9	**a**		M1	2.8.2	Accept other punctuation marks (or none) in place of full stops	**1**
			M2	2.8.7		**1**
	b		M1	electron transfer	All marks can be scored from suitably annotated diagrams	**1**
			M2	from magnesium/Mg to chlorine/Cl		**1**
			M3	Mg loses two electrons and (each) Cl gains one electron	Award 0/3 if any reference to sharing electrons Ignore covalent	**1**
	c				M3 dependent on M2	**1**
			M1	magnesium / Mg		**1**
	d		M2	loss of electrons / increase in oxidation state	Ignore number of electrons M2 independent of M1	**1**
			M1	+ and − ions / oppositely charged ions / Mg^{2+} and Cl^{-}	Need idea of + and - charge	**1**
			M2	strong (electrostatic) attractions (within lattice)	accept strong (ionic) bonds reject covalent bonds / molecular attraction	**1**
			M3	lot of energy needed to overcome attractions / break bonds / separate ions	Do not accept "loosening bonds" Ignore "hard to break"	
					any mention of "intermolecular" or "intramolecular" loses M1 and M2 So "strong intermolecular forces need lots of energy to overcome" scores M3	

SECTION B TOTAL: 30 MARKS

PAPER TOTAL: 100 MARKS

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