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Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE in Chemistry (4CH0) Paper 1CR

Pearson Edexcel Science Double Award (4SC0) Paper 1CR

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number			Answer	Notes	Marks
1	a	i	steam	Accept gas / vapour	1
		ii	ice	Accept solid	1
		iii	ice	Accept solid	1
	b	i	D (melting)		1
		ii	B (condensing)		1
	c		D (solid to gas)		1
	d	i	exothermic		1
		ii	$H_2O(g) \rightarrow H_2O(l)$	Accept multiples and fractions	1

(Total for Question 1 = 8 marks)

Question number			Answer	Notes	Marks
2	a	i	B (filtration)		1
		ii	C (fractional distillation)		1
	b	i	B (filtration)		1
		ii	D (simple distillation)		1
		iii	A (crystallisation)		1

Question number			Answer	Notes	Marks
2	c	i	place paper in beaker/container/solvent/water solvent level <u>below</u> spots/starting line leave until solvent/water/liquid AND rises/reaches (near) top (of paper) / solvent (front) reaches level shown OR leave until dyes/spots separate (allow to) dry / cover/seal container	Any three for 1 each	3
		ii	insoluble/did not dissolve (in water/solvent)		1
		iii	2		1
		iv	1		1
		v	46 70 0.67	Accept value in range 44.5 - 48.5 Accept value in range 69 - 70 Award 1 for M1 and M2 both correct but recorded in cm Accept value in range 0.63 - 0.7(0) ECF from values recorded (even if >1)	1 1 1

(Total for Question 2 = 14 marks)

Question number			Answer	Notes	Marks
3	a	i	(hydrated) iron(III) oxide / ferric oxide	Accept (hydrated) iron oxide Reject iron with other oxidation states Ignore formulae even if incorrect	1
		ii	no water / moisture	Accept drying agent absorbs water Prevents water from reaching nail reacting with nail Reject no air/oxygen	1
		iii	to keep air/oxygen out (of water)	Accept to keep air/oxygen from dissolving in water/away from nail	1
	b	i	galvanising	Ignore sacrificial protection	1
		ii	zinc more reactive than iron / above iron in reactivity series / better reducing agent than iron / loses electrons more readily zinc reacts/corrodes/oxidises (instead of iron) $Zn \rightarrow Zn^{2+} + 2e$ (occurs) $Fe \rightarrow Fe^{2+} + 2e$ does not occur OR $Fe^{2+} + 2e \rightarrow Fe$ (occurs)	Accept converse statements Reject zinc rusts Accept zinc reacts first/before iron If neither M3 nor M4 given, award 1 mark for $Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$	4

Question number			Answer	Notes	Marks
3	c	i	oxidation loss of electron(s)	Ignore ionisation Accept increase in oxidation number M2 DEP on M1 or near miss No ECF from reduction	1 1
		ii	copper ions are formed (at rod) AND reduced / removed (from solution) / converted to (copper) atoms formed (at nail) concentration/number/amount of copper ions remains constant	Accept Cu^{2+} for copper ions and Cu for copper atoms Reject references to displacement Accept copper sulfate in place of copper ions	1 1

(Total for Question 3 = 12 marks)

Question number			Answer	Notes	Marks
4	a		C (good electrical conductor… and basic oxide)		1
	b	i	effervescence / fizzing / bubbles sodium moves / darts / floats sodium melts / forms a ball sodium becomes smaller / disappears white trail	Accept gas given off /gas evolved / gas formed / gas produced Accept wrongly identified gas Accept equivalents such as shoots/skims Accept dissolves Ignore white precipitate Do not apply list principle Assume that it = sodium Ignore flames/sparks Any two for 1 each	2
		ii	l aq g		1 1
	c		hydrogen/gas/potassium burns / flame / fire / sparks	Accept explodes Ignore references to more vigorous reaction / more fizzing	1
	d		(all have) 1 electron in outer shell	Accept (all have) same number of outer electrons	1

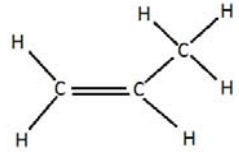
(Total for Question 4 = 7 marks)

Question number			Answer	Notes	Marks
5	a		bromine: (red-)brown fluorine: gas AND astatine: solid	Accept red Reject orange / yellow	1 1
5	b	i	Mg^{2+} Cl^-	Accept H^+ / H_3O^+ Ignore OH^- Award 1 for both ions correct but in wrong order	1 1
		ii	hydrogen / H_2 burns with a pop / squeak OR use burning/lit splint/flame to see if pop/squeak	Ignore H Must be reference to test and result Reference to splint/match with no indication of flame is not enough Reject reference to glowing splint Ignore flame extinguished 'Squeaky pop test' alone is not sufficient No ECF from wrong gas M2 DEP on M1 correct or missing	1 1
		iii	white precipitate silver chloride to prevent other precipitates forming	Accept white solid / ppt / ppte / suspension Accept AgCl Accept to react with carbonate (ions) Accept to react with hydroxide (ions) Accept carbonates/hydroxides (also) form (white) precipitates	1 1 1

Question number			Answer	Notes	Marks
5	b	iv	hydrogen chloride/HCl does not dissociate / does not form/produce ions OR hydrochloric acid is not formed (in methylbenzene) /HCl is not an acid (in methylbenzene) / no H^+ ions (present/formed) OR only dissociates/forms H^+ ions in water	Accept hydrogen chloride covalent bonds do not break Ignore there is no water Ignore there are no ions (unspecifiied) Ignore all references to not reacting with methylbenzene	1

(Total for Question 5 = 10 marks)

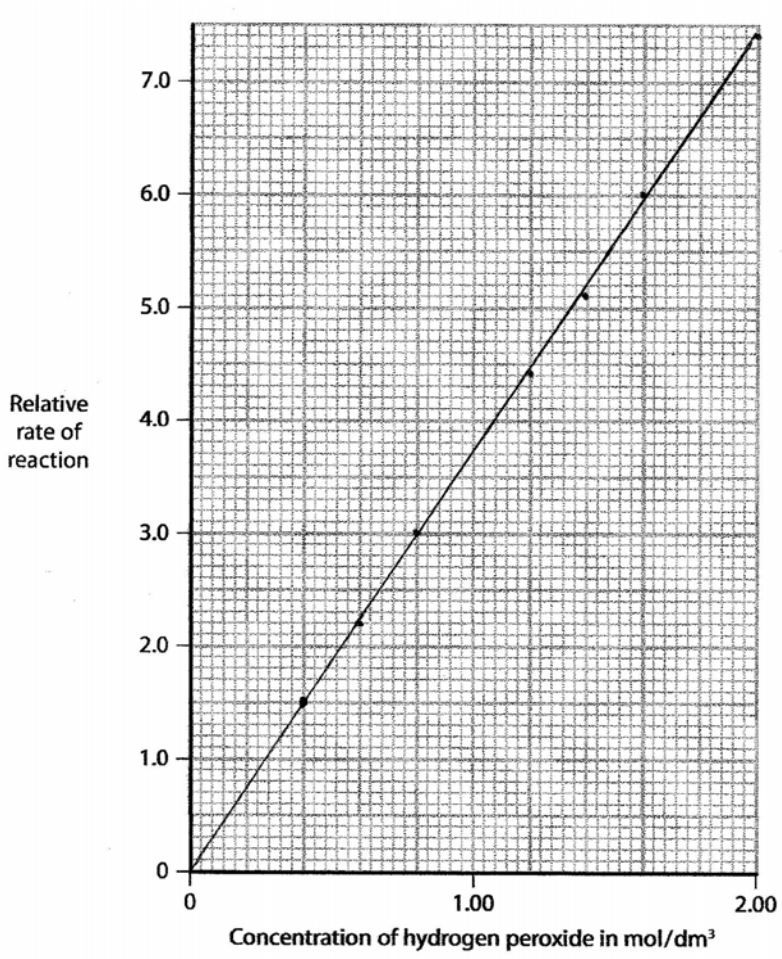
Question number			Answer	Notes	Marks
6	a	i	heated	Accept boiled / evaporated / vaporised Reject burn Ignore melts	1
		ii	(compounds containing) hydrogen and carbon only	Accept substances/molecules containing … Reject atoms/elements //mixture containing … Reject hydrogen and carbon molecules/ions Accept alternatives such as solely M2 needs a reference to hydrogen and carbon	1 1
		iii	(hydrocarbons/molecules in) D have: higher boiling point larger/bigger/heavier/longer molecules more viscous/thicker/less runny	Ignore melting point If no reference to D or F, then 0/3 Accept converse statements for F	1 1 1
6	b	i	silica / alumina (catalyst) 600 – 700 °C	Accept aluminosilicate / Al_2O_3 / SiO_2 / zeolite /broken ceramic/porous pot Accept any value or range within this range Units required Accept equivalent values in K	1 1
		ii	(alkene has) double bond (between C atoms) OR alkane has only single bonds / no double bonds / no multiple bonds	Assume it = alkenes Accept multiple bonds Reject triple bonds Reject references to ionic bonding Ignore references to intermolecular forces	1

Question number			Answer	Notes	Marks
6	b	iii	C_2H_4	Accept structural and displayed formula Penalise incorrectly shown formulae eg eg C2H4 / C_2h_4 / C_2 + H_4	1
	c	i	propene	Accept propylene / prop-1-ene Reject incorrect spellings	1
		ii	general empirical 	Accept methyl group in any position Ignore shape and bond angles	1 1 1
		iii	CH_3 H CH_3 H | | | | —C—C—C—C— | | | | H H H H	M1 for <u>two</u> carbon atoms both with 2 H atoms M2 for <u>two</u> carbon atoms both with 1 H atom and 1 CH_3 group No M2 if methyl groups on 1st + 2nd, or 3rd + 4th carbons in chain Do not penalise bonds to H of CH_3 Max 1 if chain extended correctly 0/2 if any double bonds shown Ignore brackets and $_n$	2

(Total for Question 6 = 15 marks)

Question number			Answer	Notes	Marks
7	a		weigh (solid) before and after mass unchanged	 M1 and M2 are independent	1 1
	b	i	(total) volume / temperature mass / amount OR state of subdivision / particle size / surface area	Ignore amount	1 1
		ii	ref to hydrogen peroxide / solution / liquid / water / reactant / spray AND ref to stopping escaping / spitting (out) / leaving / OWTTE	 Reject idea of evaporation	 1
	c	i	oxygen/O_2/gas escapes/given off	Ignore O Reject reference to wrong gas	1
		ii	rate OR reaction slowing (down)	Accept loss of mass per unit time	1
		iii	8 (minutes)		1

Question number			Answer	Notes	Marks
7	d	i	T		1
		ii	0.8(0)		1
			loss in mass is double/twice that for 0.4(0)/S OR S loses 0.4g and T loses 0.8 g	Accept 150 - 149.6 = 0.4 and 150 - 149.2 = 0.8 but not just 150 - 149.2 = 0.8 M2 DEP on M1	1

Question number			Answer	Notes	Marks
7	e			M1 + M2 for all 7 points plotted to nearest gridline Deduct 1 mark for each error M3 for straight line of best fit Must be drawn with ruler Need not be drawn to origin but must reach origin if extrapolated	3

Question number			Answer	Notes	Marks
7	f		more particles/molecules (in a given volume) collide more frequently / more collisions per unit time/per second/per minute	 Ignore greater chance of collision Max 1 if reference to greater energy / moving faster	1 1

(Total for Question 7 = 16 marks)

Question number			Answer	Notes	Marks
8	a	i	air natural gas / water / hydrocarbons / alkanes	Accept atmosphere Accept steam /methane	1 1
		ii	iron / Fe any value in range 150 – 250	Ignore references to promoters such as iron oxide Reject iron with an oxidation state If range stated, must be within 150 - 250 Reject values in other units	1 1
		iii	C (hydrogen and nitrogen)		1
		iv	C (a liquid)		1
	b	i	2 (1) (1) 2	Accept multiples and fractions	1
		ii	all five bonds shown as dot and cross rest of diagram correct	Accept all dots and all crosses Accept any combination of dots and crosses M2 DEP on M1	1 1

Question number			Answer	Notes	Marks
8	c	i	ΔH is negative OR enthalpy changes / energy changes / heat changes / values are negative		1
		ii	does not react with oxygen /no oxygen (in equation)	Accept no combustion / does not burn Accept decomposition	1
	d	i	C N H $\frac{26.1}{12}$ $\frac{60.9}{14}$ $\frac{13.0}{1}$	0/3 for use of any atomic numbers / division wrong way round / multiplication If division by 28(N) or 2(H), then no M1, but M2 and M3 can score by ECF: 28 and 2 gives CNH_3 28 and 1 gives CNH_6 14 and 2 gives CN_2H_3 If any transcription error (eg 21.6 in place of 26.1), then no M1, but M2 and M3 can score by ECF	1
			ratio is 2.18 : 4.35 : 13.0 / 1 : 2 : 6		1
			CN_2H_6	Accept elements in any order Use of M and H symbols means M3 cannot be awarded	1
		ii	CN_2H_6		1

(Total for Question 8 = 15 marks)

Question number			Answer	Notes	Marks
9	a	i	gains oxygen	Accept increase in oxidation number/state Ignore reference to loss of electrons	1
		ii	$SO_2 + H_2O \rightarrow H_2SO_3$	Accept $2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$ OR $2SO_2 + O_2 \rightarrow 2SO_3$ AND $SO_3 + H_2O \rightarrow H_2SO_4$	1
	b	i	covalent	Accept sharing electrons Reject sharing 1 electron Reject references to ions Ignore intermolecular forces Ignore simple Reject giant	1
		ii	intermolecular forces (of attraction) / forces (of attraction) between molecules	Accept intermolecular bonds	1
			weak / need little (thermal/heat) energy to overcome	Accept easily overcome M2 DEP on M1 at least partially correct If only answer is weak bonds, then 0/2 If any reference to breaking covalent /ionic / metallic bonds, then 0/2	1
		iii	Mo_2O_6		1

Question number			Answer	Notes	Marks
9	c	i	(giant structure of) positive ions	Accept cations but not just ions Reject references to negative ions and molecules	1
			(surrounded by) delocalised electrons	Accept sea of electrons Mark independently	1
		ii	(delocalised / sea of) electrons	Ignore free electrons Ignore references to carrying charge/current	1
			move / flow (through structure) / are mobile (when voltage/potential difference applied)	M2 DEP on M1 No penalty for references to molybdenum atoms or ions / nuclei / protons, but any mention of these moving = 0/2	1
		iii	layers/sheets/planes/rows AND (positive) ions/atoms/particles	If any reference to molecules/protons/electrons/nuclei, then 0/2	1
			slide (over each other)	Allow slip/flow/shift/move/OWTTE in place of slide M2 DEP on mention of either layers etc OR ions etc	1

(Total for Question 9 = 12 marks)

Question number			Answer	Notes	Marks
10	a	i	water	Accept steam	1
		ii	risk of explosion / to burn excess hydrogen safely	OWTTE Ignore hydrogen is flammable	1
	b		heat the solid again reweigh to check mass remains constant	Ignore burning Ignore repeat and find mean heat to constant mass = 2	1 1
	c	i	0.8		1
		ii	0.8 ÷ 16 0.05	CQ on (i) No ECF for division by 8 or 32 M2 subsumes M1	1 1
		iii	0.05 / answer to ii		1
		iv	2.8 ÷ 0.05 56	CQ on (iii) M2 subsumes M1 0/2 if any mass other than 2.8 used	1 1

(Total for Question 10 = 10 marks)