

Mark Scheme (Results)

January 2015

Pearson Edexcel International GCSE in
Chemistry (4CHO) Paper 1C

Pearson Edexcel Certificate in
Chemistry (KCH0) Paper 1C

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January 2015

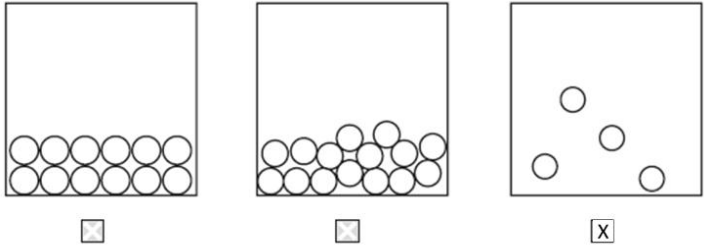
Publications Code UG040479

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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			1
	b	i A (an electron)		1
		ii B (a neutron)		1
		iii B (electrons and protons)		1
	c	isotopes atomic numbers mass numbers		3
				Total 7 marks

Question number	Answer	Notes	Marks																													
2 a i	tick for P = chromatography tick for Q = fractional distillation tick for R = filtration tick for S = simple distillation <table border="1"> <thead> <tr> <th rowspan="2">Separation</th> <th colspan="4">Method of separation</th> </tr> <tr> <th>Chromatography</th> <th>Simple distillation</th> <th>Filtration</th> <th>Fractional distillation</th> </tr> </thead> <tbody> <tr> <td>P red ink from a mixture of coloured inks</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Q ethanol from a mixture of ethanol and water</td> <td></td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>R sand from a mixture of sand and water</td> <td></td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>S water from copper(II) sulfate solution</td> <td></td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> </tbody> </table>	Separation	Method of separation				Chromatography	Simple distillation	Filtration	Fractional distillation	P red ink from a mixture of coloured inks	✓				Q ethanol from a mixture of ethanol and water				✓	R sand from a mixture of sand and water			✓		S water from copper(II) sulfate solution		✓				1 1 1 1
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ii	R	Accept (sand from a mixture of) sand and water	1																													
b	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin: 2px;">B</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">E</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">A</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">C</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">D</div> </div>	M1 for B in first box AND D in last box M2 for A in box 3 AND C in box 4 M2 dependent on M1 correct	1 1																													
Total 7 marks																																

Question number	Answer	Notes	Marks
3 a	burns with a pop/squeak OR use burning/lit splint/flame to see if pop/squeak	Must be reference to test and result Reference to splint/match with no indication of flame is not enough Ignore flame extinguished Reject reference to glowing splint Squeaky pop test on its own is not enough	1
b i	anhydrous/white copper sulfate turns blue OR anhydrous/blue cobalt chloride turns pink	Ignore colourless Accept correct formula Incorrect formula (eg CuSO) counts as near miss Accept correct formula Incorrect formula (eg CoCl) counts as near miss M2 DEP on M1 or near miss	2
ii	measure boiling point / freezing point	Accept boil it / freeze it Ignore heat	2
	100 (°C) / 0 (°C)	Value must match property Ignore units	
		Answers such as boils/distills at 100 °C / freezes at 0 °C score M2 only	

Question number	Answer	Notes	Marks
3 b iii	<p>cross by carbon dioxide from the air reacts to cause the cloudiness cross by the cloudiness is caused by the formation of a white precipitate</p> <ul style="list-style-type: none"><input type="checkbox"/> carbon dioxide forms when the hydrogen burns<input checked="" type="checkbox"/> carbon dioxide from the air reacts to cause the cloudiness<input type="checkbox"/> the cloudiness is caused by the formation of calcium hydroxide<input checked="" type="checkbox"/> the cloudiness is caused by the formation of a white precipitate<input type="checkbox"/> the reaction in the limewater is an example of oxidation	<p>If 3 boxes crossed then max 1 If 4 or more boxes crossed then 0</p>	2
Total 7 marks			

Question number	Answer	Notes	Marks
4 a i	reactants labelled wrong way round / OWTTE	Accept manganese(IV) oxide is the solid OR hydrogen peroxide is the liquid Ignore just manganese(IV) oxide/hydrogen peroxide is wrongly labelled	1
ii	bung / cork	Accept stopper Ignore plug	1
iii	to prevent oxygen/gas from escaping OR (without a bung), oxygen/gas would escape/could not be collected	Do not penalise wrong gas, such as hydrogen	1
b	use a (gas) syringe	Accept collect in gas jar by displacement of air in place of syringe	1
c	2 2 (1)	Accept multiples and fractions	1

Question number	Answer	Notes	Marks
4 d	(a substance that) increases rate of reaction / speeds up reaction / decreases time of reaction is (chemically) unchanged (at the end) OR mass does not change	Ignore change/decrease in rate Ignore references to element / compound Accept is not used up / does not change Accept reference to lowering activation energy Ignore reference to alternative route Ignore references to yield Ignore reference to not reacting or taking part in reaction Ignore refs to being physically unchanged Ignore references to starting reaction Reject reference to providing/increasing energy for M2 Reject reference to incorrect statement such as removes impurities for M2	1 1
e	(approximately) vertical line between hydrogen peroxide and top of curve AND labelled activation energy / E_a	ignore arrowheads on vertical line	1
	curve starting from hydrogen peroxide line and ending at water + oxygen line AND peak below peak of original curve	Accept near misses, such to and from words Accept curve leaving or joining original curve Do not penalise more than one peak	1
Total 9 marks			

Question number	Answer	Notes	Marks
5 a	i	4	1
	ii	B (hydrated)	1
b	i	aluminium hydroxide AND sodium sulfate	1
	ii	smothers/blankets the fuel/fire / sinks onto to fuel/fire (therefore) prevents oxygen/air from reaching the fuel/fire	1 1
c	i	Al(OH) ₃ has (s) / is solid /is insoluble / its ions not free / its ions not released H ₂ SO ₄ has (aq) / is a solution AND (H ⁺) ions are released	1 1
	ii	B (5.5)	1
Total 8 marks			

Question number	Answer	Notes	Marks
6 a	C (diffusion)		1
b	ammonia (moves more quickly) AND it travels further /white solid is close(r) to the HCl end / further from the NH ₃ end	Ignore reference to solution Ignore reverse argument for HCl Ignore references to reacting more quickly	1
c i	sodium hydroxide / NaOH ammonia / NH ₃ blue	Accept other suitable alkalis Reject ammonium Reject all other colours M3 DEP on M2 or near miss	1 1 1
ii	to remove carbonate (ions)/sulfite (ions)	Accept to prevent other ions interfering / to prevent other precipitates from forming Ignore to make sure other reactions do not occur	1
iii	silver nitrate / AgNO ₃ silver chloride / AgCl	If both name and formula given, both must be correct	1 1
Total 8 marks			

Question number	Answer	Notes	Marks
7 a	fractional distillation/fractionating column/tower (crude oil) heated/vaporised / boiled cooler at top/hotter at bottom/idea of temperature gradient fractions condense /separate at different heights/levels fractions have different boiling points/ranges	Reference to fractional / fractionating needed Ignore references to fracking Accept components / hydrocarbons / compounds / gases Accept separate at different temperatures Ignore references to melting point Any four for 1 mark each If any reference to cracking, MAX 2 M1 - M4 can be scored from suitably labelled diagram	4

Question number	Answer	Notes	Marks
7 b i	C_nH_{2n+2}	Do not penalise inappropriate spaces or failure to show 2 and n as subscripts	1
ii	<p>same/similar chemical properties/reactions/behaviour/characteristics</p> <p>gradation / gradual change / trend / increase / decrease of physical properties</p> <p>same functional group (neighbouring) members differ by CH_2</p>	<p>Ignore specific examples such as react with oxygen</p> <p>Ignore similar (type of) reactivity</p> <p>Do not penalise reference to trends</p> <p>Accept reference to specific property, eg boiling point</p> <p>Reject same / similar physical properties</p> <p>Ignore variable physical properties</p> <p>Ignore reference to specific group</p> <p>Any two for 1 each</p> <p>Accept two answers on one answer line</p> <p>Ignore any reference to properties not specified as physical or chemical</p>	2
c	(1) 5 3 4	Accept multiples and fractions	1
d i	carbon monoxide / CO		1
ii	reduces capacity of blood to carry oxygen / OWTTE	<p>Accept correct explanation involving haemoglobin</p> <p>Ignore references to carbon monoxide reacting with blood / red blood cells</p>	1
iii	nitrogen/ N_2 AND oxygen/ O_2	<p>Accept in either order</p> <p>Ignore N and O</p>	1

Question number	Answer	Notes	Marks
7 e	<pre> H H H H H H - C - C - C - C - C - H H H H H H H H H H H - C - C - C - C - H H H H H - C - H H </pre>	<p>Penalise missing H atoms once only provided all bonds are correctly shown</p> <p>Penalise missing bonds in both structures</p>	<p>1</p> <p>1</p>

Question number	Answer	Notes	Marks
8 a	hydrogen / H ₂	Ignore H	1
b	<u>only</u> single bonds (between carbon atoms) /single bond(s) between carbon atoms	ignore between C and H Accept no double bond(s) / no multiple bond(s) Ignore answers that refer to numbers of hydrogens	1
c i	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	Accept Br atoms in any position provided one on each carbon	1
ii	C (the product of the reaction is colourless)		1
d	$\begin{array}{cccc} \text{H} & \text{CH}_3 & \text{H} & \text{H} \\ & & & \\ \cdots-\text{C}-\text{C}-\text{C}-\text{C}-\cdots \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{CH}_3 \end{array}$	M1 for 4 × C AND 6 × H and 2 × CH ₃ M2 for extension bonds and two CH ₃ groups on alternate carbon atoms (can be both above or both below carbon chain) M2 DEP on M1 Do not penalise bonds to H of CH ₃ Ignore brackets and subscripted n If any double bond shown, then 0/2	2
e	$\begin{array}{c} \text{F} \quad \quad \text{F} \\ \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \\ \text{F} \quad \quad \text{F} \end{array}$	Reject any extension bonds Ignore bond angles Do not penalise more than one correct structure	1

Question number	Answer	Notes	Marks
8 f i	(polymer) breaks down / decomposes / decays by bacteria / microbes / microorganisms	Do not penalise compound / object / molecule / substance in place of polymer Reject element in place of polymer Ignore rots / degrades / digests / disintegrate If reference to <u>not</u> breaking down etc, only M2 can be awarded Ignore naturally / enzymes	1 1
ii	inert / unreactive / OWTTE	Ignore do not react with named chemical Ignore references to bond strengths / bond breaking	1
Total 10 marks			

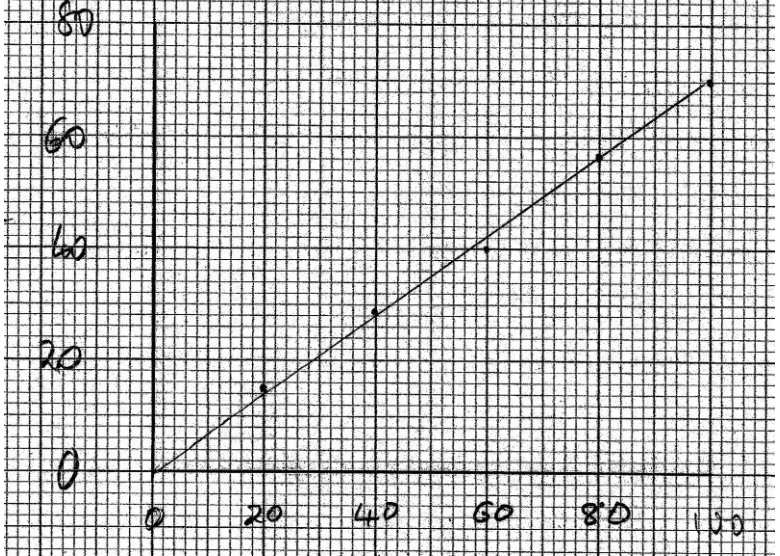
Question number	Answer	Notes	Marks
9 a	C (lithium reacts with water to form an alkali)		1
b	A (have the same number of outer shell electrons)		1
c	(similar) bubbles / fizzing / effervescence OR moves / darts / floats OR gets smaller / disappears potassium shows a flame / sparks / explodes OR potassium melts / forms ball	Accept gas given off /evolved/formed/produced Accept hydrogen <u>gas</u> Ignore identity of gas Accept dissolves Accept reverse arguments for lithium	1 1
d	K ₂ O KCl	Accept K ₂ O ₂ and KO ₂ Reject KO If formula shown as <u>product</u> of an equation, ignore reactants and balancing Ignore coefficients	1 1
e	s l aq g		1
f	85 AND 87 calculated (even if not identified) (85 × 0.72) + (87 × 0.28) = 85.6	Accept 37+48 and 37+50 Correct final answer = 2 marks 85.5 or 85.56 = 1 mark No ECF from incorrect mass numbers Ignore units	1 1
Total 9 marks			

Question number	Answer	Notes	Marks
10 b i	B (the products are both elements)		1
	ii electrons on wrong side / should be on right /should be $- 2e^-$ $2Br$ should be Br_2	Accept + in front of electrons (should be $-$) Accept product is shown as a bromine atom / should be shown as a bromine molecule Equation correctly rewritten scores both marks	1 1
	iii ions stop moving / ions not free to move OR electrons stop moving (through wires)	Ignore liquid becomes solid / no free ions Accept electric current in place of electrons Reject implication that electrons stop flowing through liquid	1
Total 9 marks			

Question number	Answer	Notes	Marks
11 a i	pipette		1
ii	pink	Ignore purple	1
	colourless	Accept red Ignore clear Ignore white Award 1 mark for both colours correct in wrong order	1
b	(after) 23.15 (before) 1.40 (added) 21.75	CQ on before and after readings Award 1 mark for both readings correct but in wrong order All values must be to 2 dp Penalise answers to other than 2 dp once only	1 1 1
c i	ticks in columns 3 and 4		1
ii	$\frac{21.10 + 21.20}{2}$	CQ on any combination of ticked results If no results ticked, award M1 if only columns 3 and 4 averaged If only 1 result ticked, then no marks can be awarded in (c)	1
	21.15	CQ on results averaged - see separate table Answer should be to 2 dp, except that trailing zero not needed Correct final answer without working scores 2	1

Question number	Answer	Notes	Marks
11 d i	$0.300 \times \frac{200}{1000}$		1
	0.06(00) (mol)	Correct final answer scores 2 marks	1
clip		60 scores 1 mark in di	
ii	di \div 2 / 0.03(00) (mol)	No marks for answers such as 0.6 / 6 / 600	1
clip			
iii	$M_r = 98$ 2.94 (g)	Award 1 mark for 98 anywhere in iii	1
		ECF from incorrect M_r	1
		Moles CQ on ii	
		Must be 2 or more sig figs	
Total 14 marks			

Question number	Answer	Notes	Marks
12 a	mass / amount	Accept weight	1
	surface area / size / volume	Ignore number of marble chips Ignore length / width / height / thickness / shape / type Ignore temperature / purity / density	1
b	gas/carbon dioxide escapes / OWTTE	Ignore references to solid dissolving Ignore references to acid spray / vapour Do not penalise incorrectly named gas (eg hydrogen)	1
c	prevents loss of acid (spray)/liquid	Ignore references to evaporation / water vapour / spilling of liquid Reject references to stopping gases/marble chips escaping	1
d i	210 (s) some indication of mark on curve OR vertical line from 50% / horizontal line from 210 s	Mark M1 and M2 independently	1
	ii B (the loss of mass was greater than 1.0g)		1
e	1 ÷ 210	Accept any time value in range 200 - 210 Accept answer in range 0.004- 0.005 Accept any number of sig fig	1
	evaluation of M1 / 0.00476		1

Question number	Answer	Notes	Marks
12 f	 <p data-bbox="280 863 875 951">all five points plotted to nearest gridline straight line of best fit</p>	<p data-bbox="1077 847 1682 911">Deduct 1 mark for each error up to max 2</p> <p data-bbox="1077 919 1659 1023">Line need not be extrapolated to origin If line not extrapolated, it should go to the origin if extrapolated</p> <p data-bbox="1077 1031 1480 1054">Must be drawn with a ruler</p> <p data-bbox="1077 1062 1559 1094">CQ on candidate's plotted points</p>	<p data-bbox="1760 863 1783 887">2</p> <p data-bbox="1760 919 1783 943">1</p>

Question number	Answer	Notes	Marks
12 g	<p>more particles (in a given volume)</p> <p>more collisions (between particles) / OWTTE</p> <p>per unit time / OWTTE</p>	<p>Accept ions Reject atoms / molecules Accept quantitative answer such as twice as many particles when concentration doubles</p> <p>more frequent collisions scores M2 and M3 Ignore greater chance/likelihood of collisions Accept reverse argument if clear that decreasing concentration is being considered MAX 1 if any reference to particles moving faster / having more energy</p>	<p>1</p> <p>1</p> <p>1</p>
Total 15 marks			

