



Mark Scheme (Results)

Summer 2019

Pearson Edexcel International GCSE in
Chemistry (4CH1) Paper 2CR

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General Marking Guidance

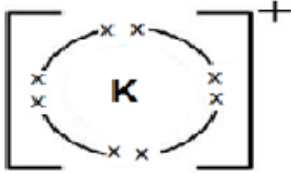
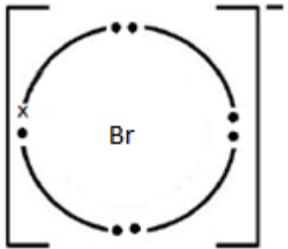
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the true 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)	argon and helium	ALLOW Ar and He	1
(ii)	carbon dioxide	ALLOW CO ₂ If both name and formula given both must be correct	1
(iii)	nitrogen	ALLOW N ₂ IGNORE N	1
(iv)	carbon dioxide	ALLOW CO ₂ If both name and formula given both must be correct	1
(b)	relights a glowing spill/splint		1
			Total 5

Question number	Answer	Notes	Marks
2 (a)	atomic number 5 mass number 11 number of neutrons 6 group in the Periodic table that contains boron 3 period in the Periodic table that contains boron 2 electronic configuration of an atom of boron 2, 3	ACCEPT $1s^2 2s^2 2p^1$	5
(b)	<ul style="list-style-type: none"> • Sum of masses multiplied by percentages • Division by 100 to give final answer <p>M1 $(18.7 \times 10) + (81.3 \times 11)$ OR 1081.3</p> <p>M2 10.8 OR answer from M1 divided by 100</p>	ACCEPT 1080 and 1081 ACCEPT 10.81 and 10.813 Correct answer without working scores 2 11 without working scores 0 11 with correct working scores 1	2
Total 7			

Question number	Answer	Notes	Marks
3 (a) (i)	fractional distillation	ALLOW fractionating /fractionation	1
	(ii) crude oil/it is heated/vapourised	ALLOW boiled IGNORE evaporates	1
	(iii) A description which refers to the following four points M1 B contains larger/longer molecules M2 B has a higher boiling point M3 B has a darker colour M4 B is more viscous/ has greater viscosity	ACCEPT reverse arguments for E ALLOW E is more volatile IGNORE melting point ALLOW arison giving specific colours e.g B is orange and E is pale yellow ALLOW E is more runny MAX 2 marks if no reference to fractions E or B in the answer?	4
	(b) An planation which links the following two points M1 (when sulfur burns) sulfur dioxide /SO ₂ is formed M2 causes acid rain	ALLOW sulfur trioxide/SO ₃ IGNORE sulfur oxides ALLOW a specified harmful effect of acid rain ACCEPT references to causing/ acerbating respiratory problems ALLOW greenhouse gas/ causes global warming/ imate change	2
			Total 8

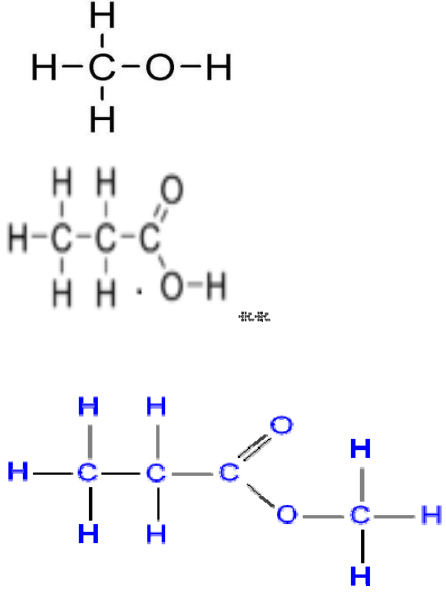
Question number	Answer	Notes	Marks
4 (a)	M1 fluorine - gas M2 astatine - black	ACCEPT very dark grey	2
(b)	An planation linking the following two points M1 bromine / Br ₂ is formed / displaced / produced M2 as chlorine is more reactive (than bromine)	REJECT bromide for bromine ACCEPT bromine/Br ₂ shown as the product in an equation IGNORE state of bromine REJECT bromide/chloride	2

Question number	Answer	Notes	Marks
4 (c)	<p>M1 correct structure of potassium ion</p>  <p>M2 correct structure of bromide ion</p>  <p>M3 charges on both ions correct (with or without square brackets).</p>	<p>ACCEPT any combination of dots and crosses.</p> <p>IGNORE inner shells even if incorrect</p>	3

Question number	Answer	Notes	Marks
4 (d)	<p>An explanation linking the following five points</p> <p>M1 water is covalently bonded / has a simple molecular structure</p> <p>M2 water does not contain any free (moving) charged particles (so does not conduct electricity)</p> <p>M3 sodium chloride has a giant ionic structure / has an ionic lattice structure / is ionically bonded</p> <p>M4 the ions are in fixed positions / cannot move (so does not conduct electricity)</p> <p>M5 in solution/ aqueous sodium chloride the ions are free to flow / move (so the solution does conduct electricity)</p>	<p>ALLOW water is a covalent bond</p> <p>ACCEPT water does not contain any free ions/electrons or delocalised electrons</p> <p>ALLOW sodium chloride is an ionic bond/ contains ions</p> <p>REJECT mention of atoms/ molecules/intermolecular forces in Na for M3 only</p> <p>M4 subsumes M3</p> <p>REJECT electrons being unable to move for M4</p> <p>REJECT reference to electrons conducting electricity in aqueous sodium chloride for M5</p> <p>IGNORE reference to ions carrying charge/current</p>	5
(e)	<p>(i) $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$</p> <p>(ii) electrons are lost (by chloride ions/ Cl^-)</p>	<p>ALLOW $2\text{Cl}^- - 2\text{e}^- \rightarrow \text{Cl}_2$</p> <p>ACCEPT oxidation number of chlorine increases (by 1) / changes from -1 to 0</p> <p>REJECT chlorine loses electrons</p> <p>IGNORE references to gain of oxygen</p>	1 1

(iii)	A hydrogen B is incorrect as oxygen is not formed at the cathode C is incorrect as sodium is not formed when graphite electrodes are used D is incorrect as water is not formed at the cathode		1 Total 15
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Question number	Answer	Notes	Marks
5 (a) (i)	$2\text{CH}_3\text{COOH} + \text{K}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COOK} + \text{CO}_2 + \text{H}_2\text{O}$ M1 $2\text{CH}_3\text{COOK}$ M2 $\text{CO}_2 + \text{H}_2\text{O}$	ALLOW multiples ACCEPT $2\text{CH}_3\text{COO}^-\text{K}^+$ ALLOW $2\text{KCH}_3\text{COO}$ If M1 not awarded any numbers before $\text{CO}_2 + \text{H}_2\text{O}$ can be ignored and M2 can be awarded. For both marks to be awarded the equation must be correctly balanced	2
(ii)	effervescence / fizzing / bubbles	IGNORE carbon dioxide/gas given off/evolved/ formed /produced IGNORE mention of incorrect gas	1
(b) (i)	(acts as a) catalyst	ACCEPT increases the rate of the reaction/speeds up the reaction	1
(ii)	ethanol is flammable / might catch fire / might ignite	ACCEPT ethyl ethanoate /the mixture /it is flammable /might catch fire /might ignite	1
(iii)	(ester has) sweet / fruity / distinctive smell	ALLOW liquid (ester) floats on top of mixture OWTTE	

Question number	Answer	Notes	Marks
5 (c) (i)	 <p> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array}$ $\begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \\ \quad \quad // \\ \text{H}-\text{C}-\text{C}-\text{C} \\ \quad \quad \backslash \\ \text{H} \quad \text{H} \quad \text{O}-\text{H} \end{array}$ $\begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad // \quad \\ \text{H}-\text{C}-\text{C}-\text{C} \quad \text{O}-\text{C}-\text{H} \\ \quad \quad \backslash \quad \\ \text{H} \quad \text{H} \quad \text{O} \quad \text{H} \end{array}$ </p>	<p>Penalise missing bond between O and H once only</p> <p>If incorrect number of carbon atoms in alcohol and or acid allow ECF for structure of ester formed from their alcohol and acid</p> <p>ACCEPT H₂O</p>	3 1
(d)	(ii) water	<p>food flavourings / perfumes</p> <p>ACCEPT any correct use e.g. in cosmetics / making soaps / making detergents /solvents (for paints / varnishes)</p>	1
			Total 11

Question number	Answer	Notes	Marks									
6 (a) (i)	pipette		1									
	(ii) red wine would mask the colour of the indicator / difficult to see colour change (at end point)	ACCEPT indicator and red wine are a similar colour OWTTE	1									
	(iii) to mix the contents (of the flask so that they can react) OWTTE	ACCEPT to ensure the colour change is permanent OWTTE ALLOW to speed up the reaction/ to ensure lete reaction	1									
	(iv) so as not to add more wine than is needed (for lete reaction)/ so as not to overshoot the end point OWTTE	ACCEPT to find the act/precise point of neutralisation IGNORE to obtain an accurate reading	1									
(b)	<table border="1" data-bbox="475 1283 970 1574"> <tbody> <tr> <td data-bbox="475 1283 571 1384">M1</td> <td data-bbox="571 1283 837 1384">final burette reading in cm³</td> <td data-bbox="837 1283 970 1384">22.70</td> </tr> <tr> <td data-bbox="475 1384 571 1485">M2</td> <td data-bbox="571 1384 837 1485">initial burette reading in cm³</td> <td data-bbox="837 1384 970 1485">2.15</td> </tr> <tr> <td data-bbox="475 1485 571 1574">M3</td> <td data-bbox="571 1485 837 1574">volume of wine added in cm³</td> <td data-bbox="837 1485 970 1574">20.55</td> </tr> </tbody> </table>	M1	final burette reading in cm ³	22.70	M2	initial burette reading in cm ³	2.15	M3	volume of wine added in cm ³	20.55	MAX 2 if final and initial burette readings are reversed. MAX 2 if readings not given to 2 decimal places. ALLOW ECF for M3 on correct subtraction of M1 - M2	3
M1	final burette reading in cm ³	22.70										
M2	initial burette reading in cm ³	2.15										
M3	volume of wine added in cm ³	20.55										

Question number	Answer	Notes	Marks
6 (c) (i) ip	Ticks in boxes 1, 3 and 4		1
(ii) ip	<ul style="list-style-type: none"> • setting out of calculation • answer <p>M1 $\frac{20.40 + 20.35 + 20.45}{3}$</p> <p>M2 20.40</p>	<p>20.40 without working scores 2</p> <p>20.4 with or without working scores 1</p> <p>If no results ticked then only use of 2 or 3 concordant titres can score both marks in (ii)</p> <p>If only one result ticked then M2 can be scored for averaging two or more titre values correctly</p> <p>M1 CQ on results ticked</p> <p>M2 CQ on correct calculation from M1</p> <p>Answer to M2 must be correct to 2dp</p>	2

<p>(d) (i)</p>	<ul style="list-style-type: none"> • setting out of calculation • final answer <p>M1 $\frac{25.0 \times 0.05(00)}{1000}$</p> <p>M2 0.00125</p>	<p>If no division by 1000 giving an answer of 1.25 award 1 mark</p> <p>Correct answer without working scores 2</p>	<p>2</p>
<p>(ii)</p>	<p>0.00125 OR answer to (i)</p>		<p>1</p>
<p>(iii)</p>	<ul style="list-style-type: none"> • setting out of calculation • final answer <p>M1 $\frac{0.00125 \times 1000}{19.50}$ OR $\frac{\text{answer to (ii)} \times 1000}{19.5}$</p> <p>M2 0.0641 OR answer to M1</p>	<p>ACCEPT any number of sig fig cept 1</p> <p>Correct answer without working scores 2</p> <p><u>answer to (ii)</u> 19.5 correctly evaluated to 2 or more sig figs. scores 1</p> <p>Do not penalise not multiplying by 1000 in (iii) if they have not divided by 1000 in (i)</p>	<p>2</p> <p>Total 15</p>

Question number	Answer	Notes	Marks
7 (a)	reversible reaction	<p>IGNORE references to equilibrium</p> <p>ALLOW the reaction goes both ways</p> <p>ALLOW the reaction can go forwards and backwards</p>	1
(b) (i)	<p>M1 yield increases</p> <p>M2 (equilibrium shifts to the right as the forward) reaction is endothermic</p>	<p>ACCEPT more hydrogen produced</p> <p>IGNORE references to Le Chatelier e.g. an increase in temperature favours the forward reaction</p> <p>M2 dep on M1 correct or missing</p>	2
(ii)	<p>M1 yield decreases</p> <p>M2 (equilibrium shifts to the left as) fewer moles/molecules (of gas) on lhs / more moles/molecules (of gas) on rhs OWTTE</p>	<p>ACCEPT less hydrogen produced</p> <p>ALLOW parti es</p> <p>REJECT atoms</p> <p>IGNORE references to Le Chatelier e.g. an increase in pressure favours the side with fewer moles</p> <p>M2 dep on M1 correct or missing</p>	2

Question number	Answer	Notes	Marks
7 (c)	<ul style="list-style-type: none"> • calculate the amount, in moles, of methane • use the equation to calculate the amount of hydrogen • multiply amount by 24 to find the volume of hydrogen • final answer in standard form <p>M1 $\frac{10,000,000}{16}$ OR 625,000</p> <p>M2 625,000 x 3 OR 1,875,000</p> <p>M3 1,875,000 x 24 OR 45,000,000 (dm³)</p> <p>M4 4.5 x 10⁷ (dm³)</p>	<p>Mark consequentially for M2, M3 and M4.</p> <p>45,000,000 without working scores 3</p> <p>Correct answer in standard form without working scores 4</p> <p>Common answers 4.5 x 10⁴ (3) 45,000 (2) 4.5 x 10¹ (3) 45 (2) 1.5 x 10⁷ (3) 15,000,000 (2)</p> <p>NOTE even if working is incorrect e.g. division by 24 instead of multiplication M4 can still be awarded for correct conversion to standard form</p>	4
			Total 9

TOTAL MARKS 70

