Mark Scheme (Results)

Summer 2019

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

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General Marking Guidance

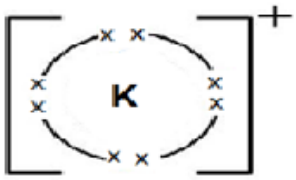
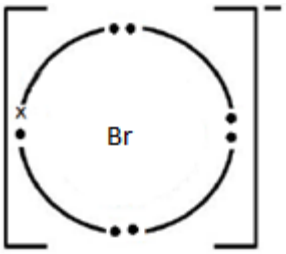
- All candidates must receive the same treatment. Examiners must mark the first candidate in actly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the e 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)	• Sum of masses multiplied by percentages • Division by 100 to give final answer **M1** (18.7 x 10) + (81.3 x 11) **OR** 1081.3 **M2** 10.8 **OR** answer from **M1** divided by 100	**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 larg**er**/long**er** molecules **M2** B has a high**er** boiling point **M3** B has a dark**er** colour **M4** B is **more** viscous/ has great**er** 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

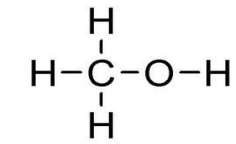
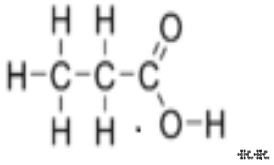
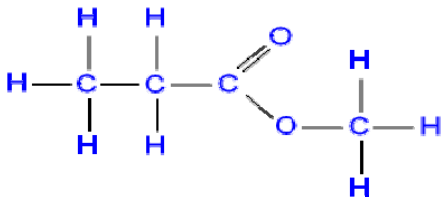
Question number	Answer	Notes	Marks
4 (a)	**M1** fluorine - gas **M2** astatine - black	 **ACCEPT** very dark grey	2
(b)	An planation linking the following two points **M1** bromine / Br_2 is formed / displaced / produced **M2** as chlorine is more reactive (than bromine)	 **REJECT** bromide for bromine **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)	**M1** correct structure of potassium ion  **M2** correct structure of bromide ion  **M3** charges on both ions correct (with or without square brackets).	**ACCEPT** any combination of dots and crosses. **IGNORE** inner shells even if incorrect	3

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

Question number			Answer	Notes	Marks
5	(a)	(i)	$2CH_3COOH + K_2CO_3 \rightarrow 2CH_3COOK + CO_2 + H_2O$ **M1** $2CH_3COOK$ **M2** $CO_2 + H_2O$	**ALLOW** multiples **ACCEPT** $2CH_3COO^-K^+$ **ALLOW** $2KCH_3COO$ If **M1** not awarded any numbers before $CO_2 + H_2O$ 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)	  	Penalise missing bond between O and H once only If incorrect number of carbon atoms in alcohol and or acid allow ECF for structure of ester formed from their alcohol and acid	3
(ii)	water	**ACCEPT** H_2O	1
(d)	food flavourings / perfumes	**ACCEPT** any correct use e.g. in cosmetics / making soaps / making detergents /solvents (for paints / varnishes)	1 **Total 11**

<table>
<tr><th colspan="2">Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>6 (a)</td><td>(i)</td><td>pipette</td><td></td><td>1</td></tr>
<tr><td></td><td>(ii)</td><td>red wine would mask the colour of the indicator / difficult to see colour change (at end point)</td><td>ACCEPT indicator and red wine are a similar colour OWTTE</td><td>1</td></tr>
<tr><td></td><td>(iii)</td><td>to mix the contents (of the flask so that they can react) OWTTE</td><td>ACCEPT to ensure the colour change is permanent OWTTE

ALLOW to speed up the reaction/ to ensure lete reaction</td><td>1</td></tr>
<tr><td></td><td>(iv)</td><td>so as not to add more wine than is needed (for lete reaction)/ so as not to overshoot the end point OWTTE</td><td>ACCEPT to find the act/precise point of neutralisation

IGNORE to obtain an accurate reading</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td><table><tr><td>M1</td><td>final burette reading in cm^3</td><td>22.70</td></tr><tr><td>M2</td><td>initial burette reading in cm^3</td><td>2.15</td></tr><tr><td>M3</td><td>volume of wine added in cm^3</td><td>20.55</td></tr></table></td><td>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</td><td>3</td></tr>
</table>

Question number	Answer	Notes	Marks
6 (c) (i) ip	Ticks in boxes 1, 3 and 4		1
(ii) ip	• setting out of calculation • answer **M1** $\frac{20.40 + 20.35 + 20.45}{3}$ **M2** 20.40	20.40 without working scores 2 20.4 with or without working scores 1 If no results ticked then only use of 2 or 3 concordant titres can score both marks in (ii) If only one result ticked then **M2** can be scored for averaging two or more titre values correctly **M1** CQ on results ticked **M2** CQ on correct calculation from M1 Answer to **M2** must be correct to 2dp	2

(d)	(i)	• setting out of calculation • final answer **M1** $\frac{25.0 \times 0.05(00)}{1000}$ **M2** 0.00125	If no division by 1000 giving an answer of 1.25 award 1 mark Correct answer without working scores 2	2
	(ii)	0.00125 **OR** answer to (i)		1
	(iii)	• setting out of calculation • final answer **M1** $\frac{0.00125 \times 1000}{19.50}$ **OR** $\frac{\text{answer to (ii)} \times 1000}{19.5}$ **M2** 0.0641 **OR** answer to **M1**	**ACCEPT** any number of sig fig cept 1 Correct answer without working scores 2 $\frac{\text{answer to (ii)}}{19.5}$ correctly evaluated to 2 or more sig figs. scores 1 Do not penalise not multiplying by 1000 in (iii) if they have not divided by 1000 in (i)	2 **Total 15**

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

Question number	Answer	Notes	Marks
7 (c)	• 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 **M1** $\frac{10{,}000{,}000}{16}$ **OR** 625,000 **M2** 625,000 x 3 **OR** 1,875,000 **M3** 1,875,000 x 24 **OR** 45,000,000 (dm^3) **M4** 4.5 x 10^7 (dm^3)	Mark consequentially for **M2, M3** and **M4.** 45,000,000 without working scores 3 Correct answer in standard form without working scores 4 Common answers 4.5 x 10^4 (3) 45,000 (2) 4.5 x 10^1 (3) 45 (2) 1.5 x 10^7 (3) 15,000,000 (2) **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	4 **Total 9**

TOTAL MARKS 70

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