

Mark Scheme (Results)

Summer 2018

Pearson Edexcel International GCSE
In Chemistry (4CH0) 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 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)	carbon monoxide	**ACCEPT** CO	1
(b)	oxygen	**ACCEPT** O_2 **IGNORE** O	1
(c)	chlorine	**ACCEPT** Cl_2 **IGNORE** Cl	1
(d)	nitrogen	**ACCEPT** N_2 **IGNORE** N	1
(e)	chlorine	**ACCEPT** Cl_2 **IGNORE** Cl	1
(f)	nitrogen **AND** carbon monoxide	In either order **ACCEPT** N_2 AND CO **IGNORE** N	1

Total for Question 1 = 6

Question number	Answer	Notes	Marks
2 (a) (i)	**M1** (it/mass) decreases **M2** (as) carbon dioxide/CO_2/gas escapes out of/leaves (the flask)	 ALLOW carbon dioxide/CO_2/ gas goes into air IGNORE carbon dioxide/CO_2 /gas given off/produced /formed on its own	2
(ii)	<u>all</u> (hydrochloric) acid has reacted	**ACCEPT** the acid is used up **ALLOW** there was not enough acid to react with (all the) marble chips **ALLOW** acid was the limiting factor **IGNORE** marble chips was in excess	1
(iii)	mass (of flask and contents) stays the same/stops decreasing	**ACCEPT** stops bubbling/fizzing/effervescing **IGNORE** no more gas produced/given off	1
(b) (i)	**A** 1 minute (correct answer as the gradient of the curve is steeper than at 4, 6 or 8 minutes) **B** 4 minutes (incorrect - the gradient of the curve is less steep than at 1 minute) **C** 6 minutes (incorrect - the gradient of the curve is less steep than at 1 minute) **D** 8 minutes (incorrect - the gradient of the curve is less steep than at 1 minute)		1
(ii)	**M1** starts from 0,0 and is steeper than original curve **M2** levels off before original curve but at same height		2

Question number	Answer	Notes	Marks
2 (c)	**M1** fewer (acid) particles in same volume **M2** (so) fewer (successful) collisions per second **M3** (so) lower rate of reaction	IGNORE references to wrong type of particles e.g. molecules **ACCEPT** less frequent (successful) collisions **IGNORE** references to less chance of collision Any reference to particles losing energy / moving more slowly can score M1 only	3

Total for Question 2 = 10

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 (a) (i)</td><td>pipette</td><td></td><td>1</td></tr>
<tr><td>(ii)</td><td>to see colour (change) more easily/clearly OWTTE</td><td></td><td>1</td></tr>
<tr><td>(iii)</td><td>M1 (before) pink

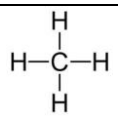
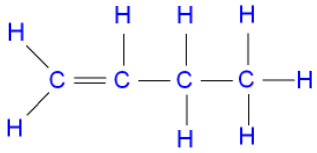
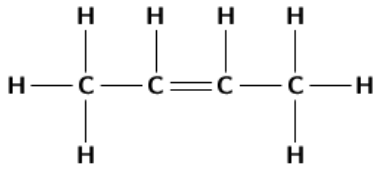
M2 (after) colourless</td><td>ACCEPT magenta
ALLOW red

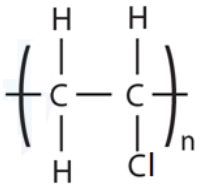
ACCEPT no colour
ALLOW decolourised
REJECT discoloured
IGNORE clear
ALLOW 1 mark for both correct but in reverse order</td><td>2</td></tr>
<tr><td>(iv)</td><td>water does not affect number of moles/amount of NaOH (present) OWTTE</td><td>ALLOW water will not affect the (titration) result/volume of acid needed

REJECT water does not affect the concentration of NaOH
IGNORE water does not affect the pH of NaOH (solution)
IGNORE references to effect on indicator</td><td>1</td></tr>
<tr><td>(b)</td><td><table><tr><td>Burette reading after adding the acid</td><td>(22.80)</td></tr><tr><td>Burette reading before adding the acid</td><td>1.45</td></tr><tr><td>Volume in cm^3 of acid added</td><td>21.35</td></tr></table>
M1 for reading before adding the acid
M2 for volume added</td><td>Mark CQ</td><td>2</td></tr>
</table>

Question number	Answer	Notes	Marks
3 c) (i)	ticks under last three results		1
(ii)	**M1** (21.50 +21.35+21.40) ÷ 3	mark CQ on any combination of ticked results If no results are ticked then M1 can only be awarded if the last three results are averaged If only one result ticked then no marks can be scored in (ii)	2
	M2 21.42	Mark CQ on M1 All answers should be correctly rounded to 2 dp	
3(d)	**M1** *n*[$(H_3PO_4$] = (0.02 x 21.30) ÷ 1000 OR 0.000426 OR 4.26 x 10^{-4}	**ACCEPT** 0.00043 OR 4.3 x 10^{-4}	3
	M2 *n*[NaOH] = 3 x **M1** OR evaluated correctly and quoted to at least two significant figures	If M1 is correct this should be 0.001278 ACCEPT 0.00128 OR 0.0013	
	M3 conc^{n} of NaOH = **M2** x 1000 ÷ 25 evaluated correctly and quoted to at least two significant figures	If M1 and M2 are correct this should be 0.05112 **ACCEPT** 0.052 from 0.0013 **ACCEPT** 0.0512/0.051 from 0.00128 correct answer with no working scores 3 examples of possible answers using incorrect mole ratio 0.01704 scores 2 marks 0.00568 scores 2 marks	

Total for Question 3 = 13

Question number	Answer	Notes	Marks
4 (a) (i)	T / $C_2H_4Br_2$	**ACCEPT** displayed formulae	1
(ii)	P / CH_4	**ACCEPT** displayed formulae	1
(b)(i)		**IGNORE** bond angles	1
(ii)	**M1**  **M2** 	**IGNORE** bond angles **ALLOW** in either order **ALLOW** cis– and trans– isomers for 2 marks	2

Question number	Answer	Notes	Marks
4 (c) (i)	(bromine changes colour from red-brown to) colourless/decolourised	If initial colour given must be red-brown /orange/brown/yellow or any combination of orange/brown/yellow e.g. orange-brown **REJECT** discoloured **IGNORE** clear	1
(ii)	**M1** (react with) bromine/Br_2	**IGNORE** (aq) **IGNORE** Br	2
	M2 UV radiation/light	**IGNORE** heat **IGNORE** pressure mark(s) can be scored if reactants are shown in an equation/word equation (even if equation is incomplete or not fully correct)	
(d) (i)	addition (polymers)		1
(ii)			2
	M1 three Hs, one Cl and single bond between two Cs	**ALLOW** Cl in any of the four positions	
	M2 extension bonds and n	**ACCEPT** n anywhere after brackets but not before Extension bonds do not need to go out of brackets M2 DEP M1	

Question number	Answer	Notes	Marks
4 (e) (i)	condensation (polymerisation)		1
(ii)	Any one from:		
	M1 in condensation polymerisation (small) molecule also formed	**ACCEPT** water/H_2O/HCl also formed **ALLOW** two products formed **ALLOW** another compound/product/by-product formed	1
	M2 addition polymerisation involves identical/same monomers/starting molecules		
	M3 condensation polymerisation involves two/ different monomers/starting molecules		
	M4 addition polymerisation produces only one product	**ALLOW** in addition polymerisation (carbon to carbon) double bonds become single	
	M5 addition polymerisation involves the breaking of (carbon to carbon) double bonds		
	M6 condensation polymerisation forms ester/amide links		

Total for Question 4 = 13

Question number	Answer	Notes	Marks
5 (a) (i)	electrolysis	**ACCEPT** decomposition	1
(ii)	zinc reacts with (sulfuric) acid	**ACCEPT** zinc is not inert (electrode) **ALLOW** zinc reacts with electrolyte/solution **ALLOW** zinc dissolves in the acid **ALLOW** zinc reacts with oxygen **IGNORE** zinc is (too/very) reactive **IGNORE** references to cost	1
(b) (i)	glowing splint/spill relights/rekindles/catches fire	**REJECT** lighted splint/spill	1
(ii)	$2H^+ + 2e^- \rightarrow H_2$	**ALLOW** $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$	1
(c)	**M1** 4 faraday give 1 mol O_2 **M2** 0.010 faraday gives 0.0025 mol O_2 **M3** (so) volume of O_2 = (0.0025 x 24000) = 60 (cm^3)	M2 subsumes M1 Mark CQ correct answer with no working scores 3 240/960/120 (cm^3) score 2 marks	3
(d)	very low concentration of hydroxide/OH^- ions present in (sulfuric) acid	**ALLOW** (there are) no/few hydroxide/OH- ions in (sulfuric) acid	1

Total for Question 5 = 8

Question number	Answer	Notes	Marks
6 (a) (i)	**M1** volume of water **M2** temperature of water before and after burning	**ALLOW** mass of water **ALLOW** temperature change	2
(ii)	**M1** *n*[heptanol] = 0.75 ÷ Mr **OR** evaluated correctly and quoted to at least two significant figures **M2** 19 ÷ **M1** **M3** evaluated correctly and quoted to at least two significant figures **OR** **M1** (0.75g produces 19kJ) so 1g produces 19 ÷ 0.75 = 25.33… (kJ) **M2** so 114g produces 114 x 25.33… **M3** evaluated correctly and quoted to at least two significant figures	calculator answer from 114 is 0.0065789473684 (mol) calculator answer from 116 is 0.0064655172 calculator answer from 114 is 2888 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig calculator answer from 116 is 2938.66 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig **IGNORE** sign in final answer from 114 calculator the answer is 2888 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig **IGNORE** sign in final answer correct answer with no working scores 3	3

Question number	Answer	Notes	Marks
6 (b) (i)	**M1** Σ(bonds broken) = [(2 × 436) + 498] **OR** 1370 (kJ) **M2** Σ(bonds formed) = 4 × 464 **OR** 1856 (kJ) **M3** Δ*H* = – 486 (kJ) **OR** if M1 and/or M2 incorrect: **M3** numerical difference between M1 and M2 If M2 greater than M1 answer must be negative If M2 less than M1 answer must be positive	**IGNORE** sign **IGNORE** sign negative sign is required -486 with or without working scores 3 (+)486 with or without working scores 2 unless a clear statement is made that reaction is exothermic then sign can be negative	3

Question number	Answer	Notes	Marks
6 (b) (ii)	**M1** for $2H_2 + O_2$ and $2H_2O$ in correct positions **M2** ΔH correctly placed and labelled	**ALLOW** hydrogen and oxygen and water **ALLOW** reactants and products Mark CQ on sign in (i) **ACCEPT** ΔH label on vertical line/double arrow/arrow pointing from reactants level to product level **REJECT** arrow pointing from products level to reactants level **IGNORE** activation energy attempts	2

Total for Question 6 = 10

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