Pearson Edexcel

Mark Scheme (Provisional)

Summer 2021

Pearson Edexcel International GCSE

In Chemistry (4CH1) Paper 2C

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Summer 2021
Question Paper Log Number 66057
Publications Code 4CH1_2C_2106_MS

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.

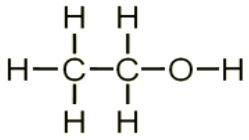
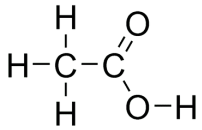
Question number	Answer	Notes	Marks
1 (a) (i)	silicon	**ALLOW** Si	1
(ii)	boron	**ALLOW** B	1
(iii)	magnesium	**ALLOW** Mg	1
(b) (i)	16 / sixteen		1
(ii)	2.8.3 / 2,8,3	**ACCEPT** diagram showing correct electron configuration **ALLOW** correct electron configuration using s and p notation	1
(iii)	does not (easily) gain/lose/share electrons	**ALLOW** full outer shell/energy level **ALLOW** 8 electrons in outer shell/energy level	1
			Total 6

Question number	Answer	Notes	Marks
2 (a) (i)	red-brown (coating on nail)	**ACCEPT** orange-brown / brown **ALLOW** orange **IGNORE** rust colour **IGNORE** red alone	1
(ii)	(hydrated) iron(III) oxide/ferric oxide	**ACCEPT** (hydrated) iron oxide **REJECT** iron oxide with incorrect oxidation state	1
(b)	An explanation that links 4 of the following 5 points tube 1 **M1** air/oxygen is needed for rusting **M2** boiled water does not contain air/oxygen **M3** oil keeps air/oxygen out tube 2 **M4** water/moisture is needed for rusting **M5** drying agent keeps water/moisture out	 **ALLOW** 1 mark for no air/oxygen present as an alternative to **M1** and **M2** **ALLOW** 1 mark for no water/moisture present as an alternative to **M4** and **M5**	4 **Total 6**

Question number	Answer	Notes	Marks
3 (a) (i)	fractionating column/ fractionating tower	**ALLOW** fraction(al) column /fraction(al) tower **IGNORE** fractional distillation	1
(ii)	fuel for ships/fuel for power stations		1
(iii)	**M1** fraction A refinery gases **M2** fraction F bitumen		2
(b) (i)	C_nH_{2n+2}	**ALLOW** x or N in place of n	1
(ii)	An explanation that links the following 3 points **M1** $C_{12}H_{26}$ has larger molecules/longer chain/ORA **M2** $C_{12}H_{26}$ has stronger intermolecular forces/ORA **M3** more energy is needed to separate the molecules/ overcome the forces in $C_{12}H_{26}$ /ORA	 **ACCEPT** forces between molecules for intermolecular forces **ALLOW** intermolecular bonds /bonds between molecules no **M2** or **M3** if implied that covalent bonds break	3
(c) (i)	silica/alumina	**ACCEPT** silicon dioxide /aluminium oxide /SiO_2/Al_2O_3 /aluminosilicates /zeolite	1
(ii)	$C_{12}H_{26} \rightarrow C_9H_{20} + C_3H_6$		1
			Total 10

Question number	Answer	Notes	Marks
4 (a) (i)	all points plotted correctly to the nearest grid line		1
(ii)	point at 50 °C and 17.5 g circled on grid/in table	**ALLOW** ECF from incorrect plotting	1
(iii)	smooth curve of best fit		1
(b)	Any two from **M1** less than 25 cm^3 of water was used **M2** the temperature was less than 50 °C **M3** not enough potassium nitrate was added **M4** the solution was not stirred	**ALLOW** ECF from incorrect plotting and incorrect point circled for **M1** and **M2** only	2

Question number	Answer	Notes	Marks
4 (c)	**M1** curve extended to 75 °C **M2** correct mass read from graph to the nearest grid line	expected answer around 39 to 40 g 0 marks if curve not extended	2
(d)	**M1** mass at 25 °C read from graph to nearest grid line **M2** mass from graph multiplied by 4	expected answer around 44 g **ALLOW** ECF from incorrect plotting	2 **Total 9**

Question number	Answer	Notes	Marks
5 (a)	Any two from: **M1** same general formula **M2** each member differs from the next by CH_2 **M3** same functional group **M4** similar chemical properties/reactions **M5** trend/steady increase in physical properties	 **ALLOW** same chemical properties/reactions **ACCEPT** named physical properties e.g. trend in boiling points	2
(b) (i)	H_2SO_4	If name and formula given, name must be correct.	1
(ii)	**M1** from orange **M2** to green	colours must be in the correct order	2
(iii)	**M1**  **M2** 	Penalise no bond between O and H once only	2

Question number	Answer	Notes	Marks
5 (c) (i)	A discussion which refers to any six of the following points: Advantages of fermentation/disadvantages of hydration **M1** sugar cane can be re-grown/is renewable **M2** crude oil is finite/cannot be replaced/is non-renewable **M3** fermentation uses lower temperatures so energy costs are lower/ hydration uses higher temperatures, so energy costs are higher **M4** fermentation uses lower pressure so energy costs are lower/ hydration uses higher pressure, so energy costs are higher **M5** yeast is a natural substance and not harmful/ phosphoric acid is corrosive Advantages of hydration/disadvantages of fermentation **M6** hydration is a faster process/ fermentation is a slower process **M7** hydration gives pure ethanol/ fermentation gives impure ethanol **M8** growing sugar cane takes up land which could be used for growing food/rearing livestock **M9** hydration is a continuous process/fermentation is a batch process		6
(ii)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	**ALLOW** $2C_2H_6O$ for ethanol **ALLOW** multiples and fractions	1
			Total 14

Question number	Answer	Notes	Marks
6 (a) (i)	(squeaky) pop with lighted splint		1
(ii)	**M1** (damp) litmus paper/ universal indicator **M2** bleached	 **ACCEPT** turns white OR decolourised **ACCEPT** (damp) blue litmus turns red and is bleached scores **M1** and **M2**	2
(b) (i)	chloride ions/Cl^- lose electrons /electrons are lost	**ALLOW** oxidation state of chlorine increases /changes from -1 to 0 **REJECT** chlorine loses electrons **REJECT** reference to gain of oxygen	1
(ii)	$2H^+ + 2e^{(-)} \rightarrow H_2$		1
(iii)	chlorine is toxic/poisonous		1
(iv)	(some) chlorine dissolves (in the solution)	**ALLOW** chlorine dissolves in water	1

Question number	Answer	Notes	Marks
6 (c) (i)	An explanation that links two of the following points **M1** in solid sodium chloride the ions are not free to move/are in fixed positions **M2** in molten sodium chloride the ions are mobile **M3** ions/charged particles need to move for current (to flow) / to conduct electricity	No **marks** if reference to mobile electrons	2
(ii)	• calculate the amount, in moles, of NaCl • determine the amount, in moles, of Cl_2 • calculate the volume of Cl_2 • give the final answer in standard form Example calculation **M1** $\frac{23\,400\,000}{58.5}$ **OR** 400 000 **M2** $\frac{400\,000}{2}$ **OR** 200 000 **M3** 200 000 x 24 **OR** 4 800 000 (dm^3) **M4** 4.8 x 10^6 (dm^3)	**OR** $\frac{\text{answer to } \mathbf{M1}}{2}$ **OR** answer to **M2** x 24 **OR** answer to **M3** in standard form correct answer in standard form without working scores 4 4 800 000 without working scores 3 9.6 x 10^6 and 1.92 x 10^7 score 3 9 600 000 and 19 200 000 score 2 **M4** can be awarded for an answer in standard form as long as some working is shown	4 **Total 13**

Question number	Answer	Notes	Marks
7 (a)	**M1** X conical flask **M2** Y pipette **M3** Z burette		3
(b)	**B** colourless A is not correct as the colour of phenolphthalein in phosphoric acid is not blue C is not correct as phenolphthalein is pink in alkali not in acid D is not correct as the colour of phenolphthalein in phosphoric acid is not red		1

Question number	Answer	Notes	Marks
7 (c) (i)	ticks in boxes 1, 2 and 4		1
(ii)	**M1** $\frac{30.35 + 30.25 + 30.30}{3}$		
)	**M2** 30.30	30.30 without working scores 2 30.3 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	
(d) (i)	**M1** $\frac{30.40 \times 0.525}{1000}$	If no division by 1000 giving an answer of 15.96 award 1 mark	2
	M2 0.01596 (mol)	correct answer without working scores 2	
(ii)	(0.01596 ÷ 3) = 0.00532 (mol)	**OR** answer to (i) ÷ 3	1
(iii)	**M1** $\frac{0.00532 \times 1000}{25.0}$	**OR** $\frac{\text{answer to (ii)} \times 1000}{25.0}$	2
	M2 0.2128 (mol/dm^3)	**OR** answer to **M1** evaluated correctly correct answer without working scores 2 **ACCEPT** answers to any number of sig figs except 1 throughout (d) If no division by 1000 in (i) and no multiplication by 1000 in (iii) do not penalise twice	
			Total 12