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Mark Scheme

Sample Assessment Material 2018

Pearson Edexcel International
GCSE Chemistry (4CH1) Paper 2C

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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.

Subject specific marking guidance

Symbols, terms used in the mark scheme

- Round brackets ( ): words inside round brackets are to aid understanding of the marking point but are not required to award the point
- Curly brackets { }: indicate the beginning and end of a list of alternatives (separated by obliques), where necessary, to avoid confusion
- Oblique /: words or phrases separated by an oblique are alternatives to each other and either answer should receive full credit.
- ecf: indicates error carried forward which means that a wrong answer given in an early part of a question is used correctly to a later part of a question.

You will not see 'owtte' (or words to that effect). Alternative correct wording should be credited in every answer unless the mark scheme has specified specific.

The Additional Guidance column is used for extra guidance to clarify any points in the mark scheme. It may be used to indicate:

- what will not be accepted for that marking point in which case the phrase 'do not accept' will be alongside the relevant marking point
- it might have examples of possible acceptable answers which will be adjacent to that marking point

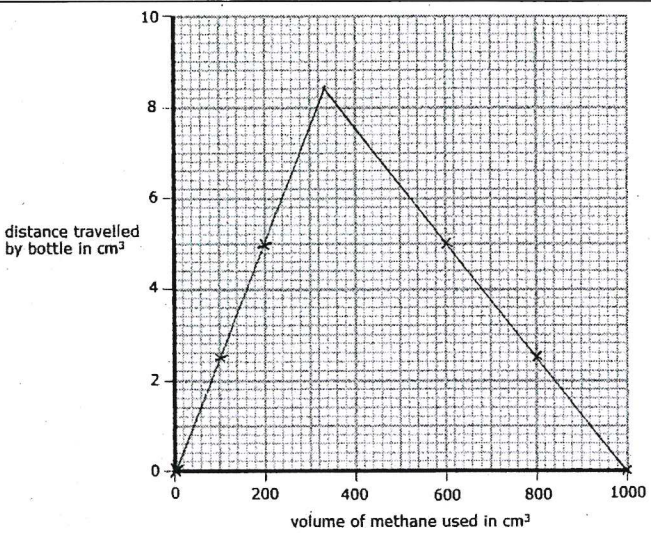
Question number	Answer	Additional Guidance	Marks
1 (a)	**M1** (bromine) brown **M2** (Iodine) purple	**ACCEPT** orange **ALLOW** red **ACCEPT** violet REJECT lilac	2
(b) (i)	diffusion		1
(ii)	$I_2(s) \rightarrow I_2(g)$		1

Total for Question 1 = 4 marks

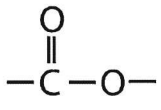
Question number	Answer	Additional guidance	Marks
2 (a)	melt the lead(II) bromide ALLOW "made molten"	**REJECT** any reference to dissolving in water IGNORE "in liquid state" / "liquid form"	1
(b)	**M1** (A) electrons / e^- / e **M2** (B) lead(II) ions / Pb^{2+} **M3** (C) bromide ions / Br^- If (B) & (C) are reversed, can score 1 out of 2	ALLOW lead ions If both name and formula given both must be correct	3
(c) (i)	$Pb^{2+} + 2e^- \rightarrow Pb$		1
(ii)	lead(II) ions are gaining electrons / the reaction involves the gain of electrons		1

ECF on c(i) if electrons are on LHS of the half equation

Total for Question 2 = 6 marks

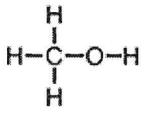
Question number	Answer	Additional guidance	Marks
3 (a) (i)	<table><tr><th>Volume of methane</th><th>Volume of oxygen</th></tr><tr><td>0</td><td>1000</td></tr><tr><td>100</td><td>900</td></tr><tr><td>200</td><td>800</td></tr><tr><td>600</td><td>400</td></tr><tr><td>800</td><td>200</td></tr><tr><td>1000</td><td>0</td></tr></table>		1
(b) (i)		**M1** all six points plotted correctly to the nearest gridline **M2 and M3** both straight lines drawn as best fit to points plotted Award only 1 mark for **M2** and **M3** if lines drawn without the aid of a ruler	3
(ii)	**M1** volume read correctly to nearest gridline from graph drawn **M2** vertical line drawn from point of intersection to horizontal axis	Expected value is 330 cm^3	2
(c)	to obtain a better idea of where the two lines intersect	ACCEPT if some indication that peak/max is between 2 numbers given in question, and saying therefore the repeated experiment improves accuracy	1

Total for Question 3 = 7 marks

Question number	Answer	Additional guidance	Marks
4 (a)	**C** (CH_3COOH)		1
(b)	**B** (5)		1
(c)	**B** (carbon dioxide)		1
(d)	ethyl ethanoate	**ACCEPT** ethyl acetate	1
(e)	 continuation bond required		1

Total for Question 4 = 5 marks

Question number	Answer	Additional Guidance	Marks
5 (a)			3

Name of alcohol	Molecular formula	Structural formula	Displayed formula
methanol			
ethanol		CH_3CH_2OH	
propanol	C_3H_8O		
butanol			

(b) (i)	phosphoric acid	**ACCEPT** phosphoric(V) acid **ACCEPT** H_3PO_4	1
(ii)	**M1** 300 °C	**ACCEPT** any temperature, or range of temperatures, between 250 and 350 °C	2
	M2 60 – 70 atm	**ACCEPT** any pressure, or range of pressures, between 60 and 70 atm	

Total for Question 5 = 6 marks

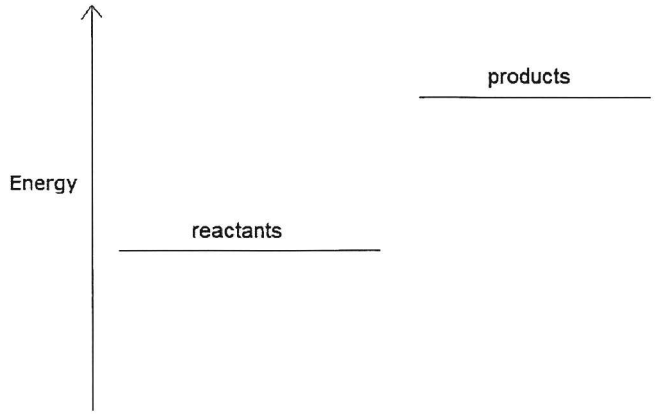
Question number	Answer	Additional guidance	Marks
6 (a)	Copper: electrostatic (force of) attraction between the nuclei (of the atoms) and the delocalised electrons Graphite: electrostatic (force of) attraction between the nuclei (of the atoms) and the bonding/shared pair of electrons	ACCEPT positive ions in place of nuclei **ACCEPT** sea of electrons Penalise omission of electrostatic once only	2
(b)	An explanation that links the following two statements: **M1** delocalised electrons **M2** are free to flow (in an electric field)	 **ACCEPT** sea of electrons **M2** DEP on **M1** **ALLOW** just 'electrons are free to flow' for one mark	2
(c)	An explanation that links the following two statements: **M1** the covalent bonds are strong **M2** so a lot of energy is required to break them	 **ACCEPT** description of covalent bonds **ACCEPT** bonds between the atoms **ACCEPT** intramolecular bonds **M2** DEP on covalent bonds, or equivalent, have to be broken REJECT M1 & M2 if any implication of melting point being related to breaking of intermolecular forces	2

Total for Question 6 = 6 marks

Question number	Answer	Additional guidance	Marks
7 (a)	**M1** Fe: 25.0 ÷ 56; Cr: 46.4 ÷ 52; O: 28.6 ÷ 16 **OR** 0.446 : 0.892 : 1.79 (mol) **M2** 0.446 ÷ 0.446 : 0.892 ÷ 0.446 : 1.79 ÷ 0.446 **M3** 1 : 2 : 4		3
(b) (i)	$FeCr_2O_4$ + **2** KOH + **1½** O_2 → FeO + $K_2Cr_2O_7$ + H_2O	**ACCEPT** multiples	1
(ii)	$K_2Cr_2O_7$ + 2 C → Cr_2O_3 + K_2CO_3 + CO	**ACCEPT** multiples	1
(iii)	An explanation that links the following two points: **M1** chromium **M2** because it has lost oxygen	**ACCEPT** the chromium **ion** has gained (3) electrons **ACCEPT** its oxidation number has decreased (from +3 to 0)	2
(iv)	An explanation that links the following two points: **M1** aluminium is more reactive (than chromium) **M2** because it displaces chromium from its oxide	ACCEPT a clear description of displacement which mentions both metals	2
(c) (i)	(from) orange (to) green	**ACCEPT** blue as final colour	1
(ii)	ethanoic acid	**ACCEPT** acetic acid	1

Total for Question 7 = 11 marks

Question number	Answer	Additional guidance	Marks
8 (a)	**M1** 21.0 – 4.1 = 16.9 **M2** Q = 35 × 4.18 × 16.9 **M3** 2472 (J)	 **ACCEPT** 2500	3
(b)	**M1** n[citric acid] = 0.035 × 1.00 **OR** 0.035 (mol) **M2** $\Delta H = \frac{Q}{n}$ **OR** $\frac{(2.472)}{0.035}$ **M3** ΔH = + 70.6 (kJ/mol)	If no answer given in (a) give full credit for use of 2500 Positive sign must be included Mark **M2** and **M3** CQ on **M1** **ACCEPT** any number of sig figs except 1 Correct answer with no working scores 3	3

(c)		**M1** Energy axis drawn and labelled REJECT "energy change" as axis label **M2** energy level of products above reactants **M3** reactants and products labelled **ACCEPT** names for reactants and products	3
(d)	An explanation that links the following two points: **M1** a burette has a greater resolution / has finer graduations / has been calibrated more accurately/precisely **M2** therefore the volume of acid measured is likely to be more accurate/more precise		2

Total for Question 8 = 11 marks

Question number	Answer	Additional guidance	Marks
9 (a)	**M1** place the sodium hydroxide in a burette and note the initial reading **M2** use a pipette to place known volume/25.0 cm^3 of sulfuric acid into the conical flask and add a few drops of phenolphthalein **M3** add the sodium hydroxide until the phenolphthalein turns pink on the addition of one drop **M4** note final the reading of the alkali and then calculate the volume of alkali added **M5** repeat the titration to obtain concordant results	• If reverse acid & alkali but get all related details consistently correct can score 1 for M1 & M2. • If no explicit reference to noting initial AND final reading, can score 1 of M1 & M4 if clear reference to calculation of change in volume • If acid/alkali reversed, for M3 colour change needs to be consistent with student's work • ALLOW clear reference to 2 readings being <= 0.2 cm^3 apart	5
(b) (i)	**M1** $n[NaOH] = 0.02385 \times 0.400$ **M2** = 0.00954 (mol)	ALLOW any rounding ≥ 2 sig. fig i.e. NOT 0.01	2
(ii)	**M1** $n[H_2SO_4] = ½ \times 0.00954$ **OR** 0.00477 (mol) **M2** conc. H_2SO_4 = $0.00477 \times (1000 \div 25.0)$ **M3** = 0.191 (mol/dm^3)	**ACCEPT** 0.01908 and 0.19	3

(c)	**M1**	heat/boil the solution until crystals form in a sample of solution that has been removed and cooled	**ACCEPT** heat/boil until crystals start to form (on the surface) **ACCEPT** heat/boil to evaporate some the water	4
	M2	leave the solution to cool so that crystals form		
	M3	filter to obtain the crystals		
	M4	dry the crystals between sheets of filter paper	**ACCEPT** any suitable method of drying, e.g. place in a **warm** oven	

ACCEPT: until hot saturated solution forms

Note required words

IGNORE "wash"

Total for Question 9 = 14 marks

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