Mark Scheme

Sample Assessment Material 2018

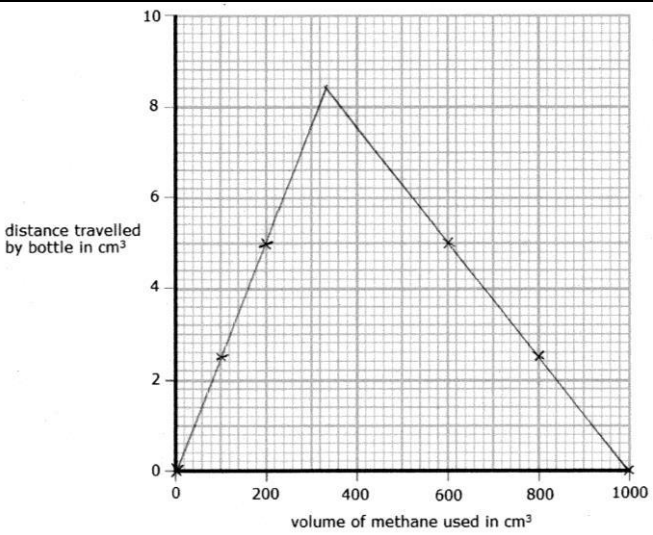
Pearson Edexcel International
GCSE Chemistry (4CH1) Paper 2C

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

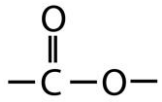
Total for Question 1 = 4 marks

Question number	Answer	Additional guidance	Marks
2 (a)	melt the lead(II) bromide	**REJECT** any reference to dissolving in water	1
(b)	**M1** (A) electrons / e^- / e **M2** (B) lead(II) ions / Pb^{2+} **M3** (C) bromide ions / Br^-	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

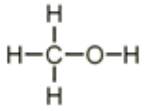
Total for Question 2 = 6 marks

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		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)			1

Total for Question 4 = 5 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional Guidance</th><th>Marks</th></tr>
<tr><td>5 (a)</td><td>
<table>
<tr><th>Name of alcohol</th><th>Molecular formula</th><th>Structural formula</th><th>Displayed formula</th></tr>
<tr><td>methanol</td><td></td><td></td><td>  </td></tr>
<tr><td>ethanol</td><td></td><td>CH_3CH_2OH</td><td></td></tr>
<tr><td>propanol</td><td>C_3H_8O</td><td></td><td></td></tr>
<tr><td>butanol</td><td></td><td></td><td></td></tr>
</table>
</td><td></td><td>3</td></tr>
<tr><td>(b) (i)</td><td>phosphoric acid</td><td>ACCEPT phosphoric(V) acid
ACCEPT H_3PO_4</td><td>1</td></tr>
<tr><td>(ii)</td><td>M1 300 °C

M2 60 – 70 atm</td><td>ACCEPT any temperature, or range of temperatures, between 250 and 350 °C

ACCEPT any pressure, or range of pressures, between 60 and 70 atm</td><td>2</td></tr>
</table>

Total for Question 5 = 6 marks

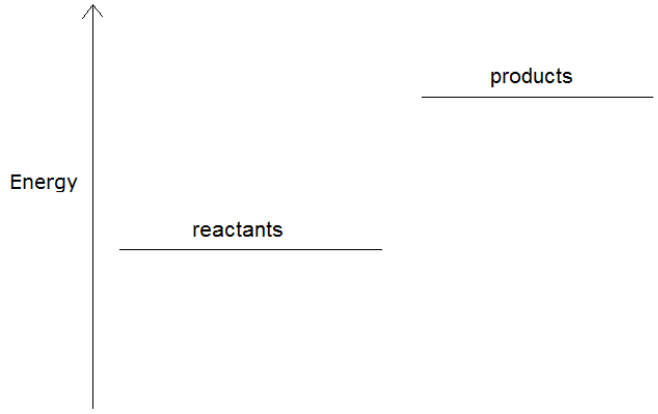
Question number	Answer	Additional guidance	Marks
6 (a)	Copper: electrostatic (force of) attraction between the nuclei (of the atoms) and the delocalised electrons Graphite: electrostatic (force of) attraction between the nuclei (of the atoms) and the bonding/shared pair of electrons	**ACCEPT** sea of 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	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		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 **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		5
(b) (i)	**M1** n[NaOH] = 0.02385 × 0.400 **M2** = 0.00954 (mol)		2
(ii)	**M1** $n[H_2SO_4]$ = ½ × 0.00954 **OR** 0.00477 (mol) **M2** conc. H_2SO_4 = 0.00477 × (1000 ÷ 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	

Total for Question 9 = 14 marks