# Mark Scheme

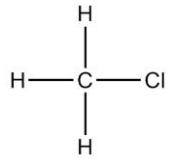
Sample Assessment Material 2018

Pearson Edexcel International
GCSE Chemistry (4CH1) Paper 1C

Pearson Edexcel International GCSE
in Science Double Award (4SD0) Paper 1C

| Question number | Answer | Additional Guidance | Marks |
|---|---|---|---|
| 1 (a) | **A** (a nihonium atom has 113 protons) | | 1 |
| (b) (i) | 3 | | 1 |
| (ii) | N already used for nitrogen / Ni already used for nickel<br><br>**OR**<br><br>each element in the Periodic Table has its own unique symbol / cannot share a symbol with another element | | 1 |
| (c) (i) | **M1** <u>atoms</u> of the same element<br><br>**M2** that have different masses | **ACCEPT** atoms with the same number of protons/atoms with the same atomic number….<br><br>**ACCEPT** different number of neutrons/different mass numbers | 2 |
| (ii) | **B** (173) | | 1 |
| (d) | **M1** (60.1 x 69) + (39.9 x 71)<br><br>**OR** 69/9.8<br><br>**M2** 6979.8÷100 **OR** 69.798<br><br>**M3** 69.8 | (69 x 0.601) ÷ (71 x 0.399) **OR** 69.798 with no working scores **2**<br><br>69.8 with no working scores **3** | 3 |

**Total for Question 1 = 9 marks**

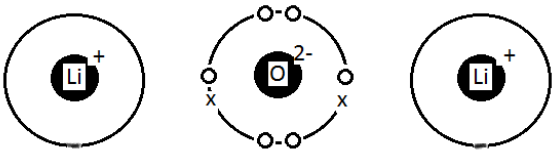
| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 2 (a) | **A** (compound P) | | 1 |
| (b) | $CH_2$ | | 1 |
| (c) | **C** (pentane) | | 1 |
| (d) |  | **ACCEPT** multiple substitution | 1 |
| (e) | Student X is justified because<br><br>**M1** **S** does not have a carbon-carbon double bond<br><br>**M2** so cannot be an alkene / must be an alkane<br><br>Student Y is justified because<br><br>**M3** **S** fits the general formula $C_nH_{2n}$<br><br>**M4** which is the general formula for alkenes | **ACCEPT**<br><br>**S** only has carbon-carbon single bonds<br><br>so must be an alkane / cannot be an alkene<br><br><br><br>**S** does not fit the general formula $C_nH_{2n+2}$<br><br>which is the general formula for alkanes | 4 |

**Total for Question 2 = 8 marks**

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 3 (a) | **2**$H_2O_2(aq) \rightarrow$ **2**$H_2O(l) + O_2(g)$ | **ACCEPT** multiples | 1 |
| (b) | Any two from:<br>temperature<br>mass of catalyst<br>surface area of catalyst | **IGNORE** same solution of hydrogen peroxide / water | 2 |
| (c) (i) | An explanation that links the following two points<br><br>**M1** no gas would be produced<br><br>**M2** because this solution would just be water / no hydrogen peroxide present to decompose | <br><br>**ACCEPT** the time would be infinite | 2 |
| (ii) | **M1** 20 ÷ 26<br>**M2** = 0.77 ($cm^3$ per second) | <br><br>**ACCEPT** any number of significant figures except 1 | 2 |
| (iii) | **M1** correct linear scale added to y-axis<br><br>**M2** axis labelled "Time taken to collect 20$cm^3$ of oxygen in s" | <br><br>**ACCEPT** "Time in s"<br>**ACCEPT** use of solidus i.e. "Time / s"<br>**ACCEPT** use of seconds, sec in place of s | 2 |
| (iv) | Any point drawn at 4$cm^3$ on the x-axis that is above the best fit line. | | 1 |
| (v) | **M1** 32 (s)<br><br>**M2** vertical line from x-axis to curve at 5 $cm^3$<br>**OR**<br>Horizontal line from the curve to the y-axis at 32 s | **ACCEPT** value read correctly to nearest gridline | 2 |

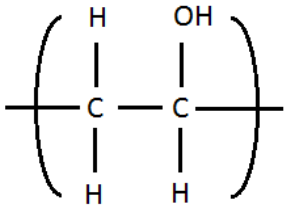
| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| (d) | **M1** $10cm^3$ of 10 volume hydrogen peroxide would produce $100cm^3$ of oxygen gas<br><br>**M2** which is the maximum capacity of the gas syringe<br><br>**OR** using more hydrogen peroxide would produce too much gas / push the plunger out of the gas syringe | | 2 |

**Total for Question 3 = 14 marks**

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 4 (a) | **M1** correct outer shell for oxide ion<br><br>**M2** correct outer shell for **two** lithium ions<br><br>**M3** charges of +1 and -2 shown on ions<br><br>  | **ALLOW** any use of dots or crosses<br><br>**ACCEPT** outer shell shown with two electrons | 3 |
| (b) (i) | **M1** calculation of amount of sodium i.e. 1.38 / 23 = 0.06 mol<br><br>**M2** calculation of amount of oxygen i.e. 0.96 / 16 = 0.06 mol<br><br>**M3** ratio of Na : O is 1 : 1, so NaO | Answer must give formula, not just ratio | 3 |
| (ii) | 78 ÷ (23 + 16) = 2, so $Na_2O_2$ | | 1 |

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| (c) (i) | KOH | **REJECT** symbols in wrong order | 1 |
| | | | |
| (ii) | **M1** amount carbon dioxide **=** 5 500 000 / 44 = 125 000 mol<br><br>**M2** ratio 2:1, so 250 000 moles potassium superoxide<br><br>**M3** mass potassium superoxide = 250 000 x 71 = 17 750 000 = 18 million tonnes (2sf)<br><br>NOTE: the calculation above can be done in megamoles i.e. with no conversion to grams<br><br>**ACCEPT** 17.8 or 17.75 million tonnes<br><br>**ACCEPT** answer in grams only if units have been altered on the answer line | **OR**<br>Mr seen:<br>$CO_2$ = 44 and $KO_2$ = 71<br><br>142 tonnes of $KO_2$ react with 44 tonnes of $CO_2$, or ratio of 2:1 seen in calculation<br><br>(5.5 ÷ 44) x 142 = 17.75 = 18 million tonnes | 3 |

**Total for Question 4 = 11 marks**

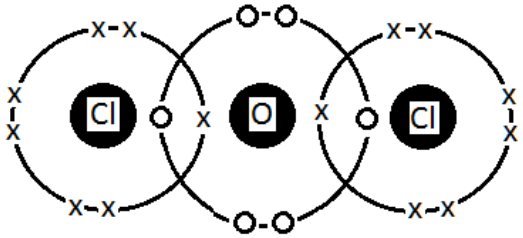
| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 5 (a) | **B** (ethenol) | | 1 |
| (b) | An explanation that links the following two points<br><br>**M1** bromine is decolorised / turns colourless<br><br>**M2** because vinyl alcohol has a double bond/is unsaturated | **IGNORE** any starting colour given | 2 |
| (c) | **M1** single bond between the carbon atoms<br><br>**M2** continuation bonds shown<br><br>NOTE brackets are optional |  | 2 |
| (d) | **M1** $M_r$ of the repeat unit = 2(12) + 4(1) + 16 = 44<br><br>**M2** 27 500 ÷ 44 = 625 | | 2 |
| (e) | impure PVA would melt over a range of temperatures / would not all melt at 200°C | **ACCEPT** impure PVA would melt below 200°C<br><br>**ACCEPT** any specified range of temperatures below 200°C | 1 |

**Total for Question 5 = 8 marks**

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 6 (a) | **B** (lilac) | | 1 |
| (b) | $Al^{3+}(aq) + 3OH^{-}(aq) \rightarrow Al(OH)_3(s)$<br><br>**M1** balanced equation<br><br>**M2** state symbols | | 2 |
| (c) | **M1** add hydrochloric acid<br><br>**M2** and barium chloride solution<br><br>**M3** white precipitate | **ACCEPT** nitric acid<br><br>**ACCEPT** barium nitrate | 3 |
| (d) (i) | x = 1, y = 1, z = 2<br>**OR**<br>$KAl(SO_4)_2$ given as formula | **ACCEPT** other combinations that give a neutral product e.g. x = 3, y = 1, z = 3 | 1 |
| (ii) | **M1** formula mass of $KAl(SO_4)_2$<br>= 39 + 27 + 2×(32 + (4x16))<br><br>**M2** mass water = 474 – **M1** = 216<br><br>**M3** moles water = 216 ÷ 18 = 12<br><br>**Mark CQ** on answer to (d)(i).<br><br>Final answer must be a whole number. | | 3 |

**Total for Question 6 = 10 marks**

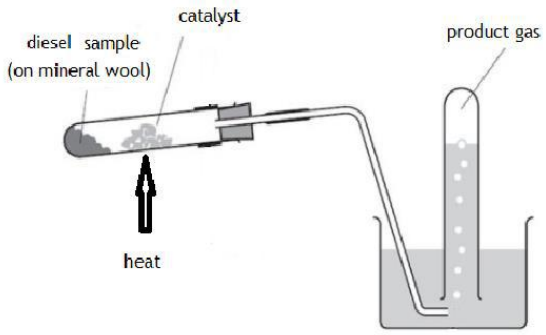
| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 7 (a) | Any value in the range 40 – 110 °C | Actual boiling point is 59 °C | 1 |
| (b) | **M1** colour = pale yellow<br>**M2** state = gas | **ACCEPT** colourless | 2 |
| (c) (i) | **M1** bromine (molecules) gain electrons, so are reduced<br>**M2** $Fe^{2+}$ ions lose electrons, so are oxidised | | 2 |
| (ii) | **M1** solution of suitable named iron(II) salt e.g. iron(II) nitrate<br>**M2** chlorine water added / chlorine gas bubbled into the solution of the iron(II) salt<br>**M3** sodium hydroxide solution added<br>**M4** if $Fe^{2+}$ did not react, green ppte forms<br>**M5** if $Fe^{3+}$ does react, red-brown ppte forms<br>**M6** suitable safety precaution e.g. fume cupboard for using chlorine, safety glasses for using sodium hydroxide | **ACCEPT** solution containing $Fe^{2+}$ ions | 6 |

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| (d) (i) | **M1** shared pair of electrons between one of the Cl atoms and the O atom<br>*These may be shown within the overlap area*<br><br>**M2** 3 pairs of non-bonded electrons on a Cl atom<br>**OR**<br>2 pairs of non-bonded electrons on an O atom<br><br>**M3** rest of the diagram correct<br>  | **M1** <u>both</u> shared pairs of electrons between each Cl atom and the O atom<br><br>**M2** 3 pairs of non-bonded electrons on both Cl atoms<br><br>**M3** **2** pairs of non-bonded electrons on O atom | 3 |
| (ii) | **M1** acidic / pH less than 7<br><br>**M2** because chlorine is a non-metal | **ACCEPT** $Cl_2O$ is the oxide of a non-metal | 2 |

**Total for Question 7 = 16 marks**

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 8 (a) | **C** (one week) | | 1 |
| (b) | iron goes rusty / turns brown | | 1 |
| (c) | An explanation that links the following two points<br><br>**M1** tube is held upright<br><br>**M2** so that scale can be correctly read / volume recorded is accurate | **ACCEPT**<br><br>equalise the levels of water<br><br>so that the gas in the test tube is at atmospheric pressure | 2 |
| (d) (i) | **M1** for (32 – 26) or 6 seen<br><br>**M2** (6 ÷ 32) x 100% = 18.75 = 19% | <br><br>**ALLOW**<br>18.75 or 18.8 | 2 |
| (ii) | An explanation that links the following two points<br><br>**M1** volume change is small /data recorded to nearest $1cm^3$<br><br>**M2** so a small error in making the measurement will give a very different value | **ACCEPT**<br><br>temperature may not be constant<br><br>therefore volume of gas may alter | 2 |
| (e) (i) | **M1** percentage oxygen would be lower<br><br>**M2** because some oxygen remains unreacted with the iron | | 2 |
| (ii) | **M1** no change in percentage oxygen<br><br>**M2** because the iron wool is in excess | | 2 |

**Total for Question 8 = 12 marks**

| Question number | Answer | Additional Guidance | Marks |
|---|---|---|---|
| 9 (a) | **D** (octane) | | 1 |
| (b) (i) | nitrogen | | 1 |
| (ii) | produces acid rain | | 1 |
| (iii) | An explanation that links the following three points<br><br>**M1** the fuel react/combines with <u>oxygen</u><br><br>**M2** by complete combustion to produce carbon dioxide<br><br>**M3** and incomplete combustion to produce carbon monoxide | | 3 |
| (c) | **M1** Brent Crude has a higher proportion of lighter fractions<br><br>**M2** lighter fractions are more economically useful / have higher demand<br><br>**M3** therefore Brent Crude has a higher price than Maya crude oil<br><br>**ACCEPT** reverse argument for Maya crude | **ACCEPT** named fraction e.g. gasoline | 3 |
| (d) |  <br><br>**M1** diesel sample in test tube<br><br>**M2** heat / Bunsen burner<br><br>**M3** catalyst<br><br>**M4** suitable method of collection e.g over water | **ACCEPT** named catalyst e.g. porcelain | 4 |

**Total for Question 9 = 13 marks**

| Question number | Answer | Additional guidance | Marks |
|---|---|---|---|
| 10 (a) | **M1** in a compound, elements are chemically combined together<br><br>**M2** in fixed proportions | **ACCEPT** can only be separated by chemical reactions | 2 |
| (b) (i) | **B** (chloride) | | 1 |
| (ii) | **M1** magnesium is reactive, so would react with the acid (to form hydrogen)<br><br>**M2** but no visible reaction / only a slow reaction when acid is added to the coin | | 2 |
| (c) (i) | **M1** prevents spots spreading sideways (and merging together) | | 1 |
| (ii) | **M1** the iron salt is insoluble / has very low solubility in the solvent | | 1 |
| (iii) | **M1** nickel <u>and</u> copper<br><br>**M2** the Rf values of these reference samples are the same as spots in the coin solution | **ACCEPT** the spots have travelled the same distance | 2 |

**Total for Question 10 = 9 marks**