

Paper 2 (4CH1/2C)

| Question number | Answer | Mark |
|-----------------|--------|------|
| 1(a) | A | 1 |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 1(b) | C | 1 |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 1(c) | B | 1 |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 1(d) | A | 1 |

Total for Question 1 = 4 marks

| Question number | Answer | Mark |
|-----------------|---|------|
| 2(a) | <ul style="list-style-type: none"> • (mass of solid) 5.3 (g) (1) • (mass of water) 20.9 (g) (1) | 2 |

| Question number | Answer | Mark |
|-----------------|--|------|
| 2(b) | <ul style="list-style-type: none"> • $(10.5 \div 16.8) \times 100$ (1) • 62.5 (grams of solid per 100 g of water) (1) | 2 |

| Question number | Answer | Mark |
|-----------------|---|------|
| 2(c) | <p>An explanation that links together the following three points:</p> <ul style="list-style-type: none"> • the gas will escape (1) • the mass of solid remaining will be less (than it should be) (1) • the value of the calculated solubility will be lower (than it should be) (1) | 3 |

Total for Question 2 = 7 marks

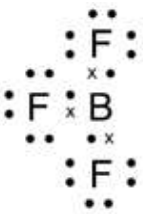
| Question number | Answer | Mark |
|-----------------|----------|------|
| 3(a) | Fluorine | 1 |

| Question number | Answer | Mark |
|-----------------|--------------------|------|
| 3(b) | Iodine OR astatine | 1 |

| Question number | Answer | Mark |
|-----------------|--|------|
| 3(c)(i) | $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + 2\text{Br}$ | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-----------------------------|---|------|
| 3(c)(ii) | (they are) Losing electrons | accept oxidation number (of bromine) increases accept oxidation number (of bromine) changes from -1 to 0 | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------|---|------|
| 3(c)(iii) | $2\text{Br} \rightarrow \text{Br}_2$ | accept $\text{Br} + \text{Br} = \text{Br}_2$ | 1 |

| Question number | Answer | Mark |
|-----------------|--|------|
| 3(d) | <p>A diagram that shows:</p> <ul style="list-style-type: none"> all three bonding pairs correct (1) all non-bonding pairs (1) <p>Example</p>  | 2 |

Total for Question 3 = 7 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 4 | <p>A description that makes reference to the following six points:</p> <p>Test for cation:</p> <ul style="list-style-type: none"> do a flame test (1) if flame is yellow then cation is sodium (1) if flame is lilac then cation is potassium (1) <p>Test for anion:</p> <ul style="list-style-type: none"> dissolve solid in water (1) <p>EITHER</p> <ul style="list-style-type: none"> add (dilute nitric acid and) aqueous silver nitrate (1) if (white) precipitate forms the anion is chloride/if no precipitate forms then anion is sulfate (1) <p>OR</p> <ul style="list-style-type: none"> add (dilute hydrochloric acid and) aqueous barium chloride (1) if (white) precipitate forms the anion is sulfate/if no precipitate forms then anion is chloride (1) | accept any combination of hydrochloric acid/nitric acid and barium chloride/barium nitrate | 6 |

Total for Question 4 = 6 marks

| Question number | Answer | Mark |
|-----------------|----------------------------|------|
| 5(a) | Zinc has displaced cadmium | 1 |

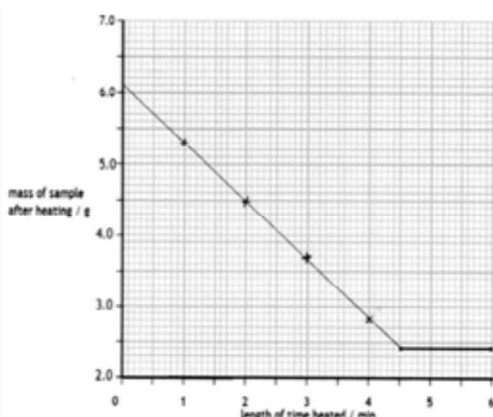
| Question number | Answer | Mark |
|-----------------|--|------|
| 5(b)(i) | $\text{Zn}^{2+} + 2\text{e}^{(-)} \rightarrow \text{Zn} (1)$ | 1 |

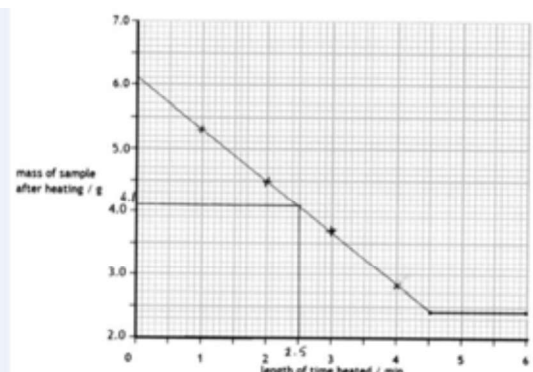
| Question number | Answer | Mark |
|-----------------|--|------|
| 5(b)(ii) | $2\text{H}_2\text{O} \rightarrow 4\text{H}^{+} + \text{O}_2 + 4\text{e}^{-}$ | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------------------|------|
| 5(b)(iii) | <p>An explanation that links the following two points:</p> <ul style="list-style-type: none"> pH decreases hydrogen ion/H^{+} (ion) concentration increases | accept hydrogen ions are formed | 2 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 5(c) | <p>An explanation that links three of the following points:</p> <ul style="list-style-type: none"> the ions of (pure) copper are the same size (1) the layers (of ions) can easily slide over one another (1) the ions of zinc and copper have different sizes (1) this disrupts the layers/structure/arrangement of the copper ions (1) hence it is more difficult for the layers (of ions) to slide over one another (1) | <p>accept atoms/particles for ions</p> <p>reject molecules once only</p> | 3 |

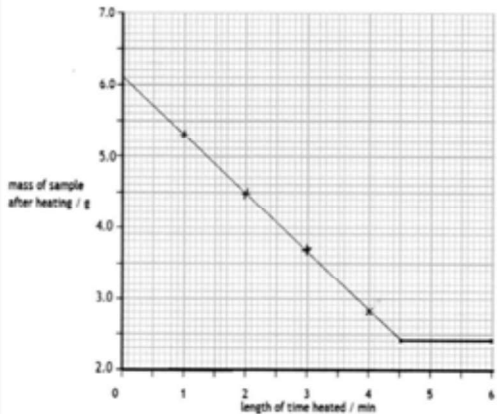
Total for Question 5 = 8 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------------------------|------|
| 6(a) | <ul style="list-style-type: none"> All points plotted correctly (1) Best fit line drawn (1)  | must be drawn with the aid of a ruler | 2 |

| Question number | Answer | Mark |
|-----------------|---|------|
| 6(b) | <ul style="list-style-type: none"> Answer read correctly from graph drawn/4.1 (g) (1) Appropriate horizontal or vertical line drawn (1)  | 2 |

| Question number | Answer | Mark |
|-----------------|---|------|
| 6(c) | All of the water has been removed/there is no more water left | 1 |

| Question number | Answer | Mark |
|-----------------|---|------|
| 6(d) | <ul style="list-style-type: none"> Calculate the amount of magnesium carbonate Calculate the amount of water Evaluation <p>Example calculation:</p> $n(\text{MgCO}_3) = (1.68 \div 84) = 0.02(0)(\text{mol}) \quad (1)$ $n(\text{H}_2\text{O}) = (1.08 \div 18) = 0.06(0)(\text{mol}) \quad (1)$ $x = 3 \quad (1)$ | 3 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------------------------|------|
| 6(a) | <ul style="list-style-type: none"> All points plotted correctly (1) Best fit line drawn (1)  <p>mass of sample after heating / g</p> <p>length of time heated / min</p> | must be drawn with the aid of a ruler | 2 |

Total for Question 6 = 11 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|----------|
| 7(a)(i) | <p>Graph A</p> <p>An explanation that links the following two points:</p> <ul style="list-style-type: none"> the backward/reverse reaction is endothermic (1) so an increase in temperature shifts the equilibrium to the left (hence the percentage of NO decreases) (1) <p>Graph B</p> <p>An explanation that links the following two points:</p> <ul style="list-style-type: none"> there are fewer molecules/moles of gas on the left (1) so an increase in pressure shifts the equilibrium to the left (hence the percentage of NO decreases) (1) | <p>ignore any references to or arguments based on Le Chatelier's principle</p> <p>accept the (forward) reaction is exothermic</p> | 4 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------------------------|----------|
| 7(a)(ii) | <ul style="list-style-type: none"> (The catalyst/it) increases the rate of both the forward and reverse reactions (1) To the same extent (1) | second mark is dependent on the first | 2 |

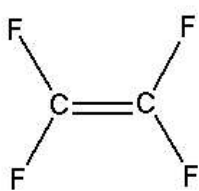
| Question number | Answer | Mark |
|-----------------|--|----------|
| 7(b)(i) | Because a proton is transferred from HNO ₃ to NH ₃ | 1 |

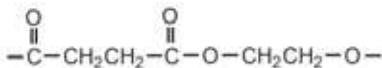
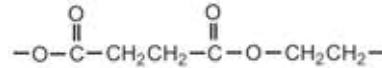
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|-----------------|--|----------|
| 7(b)(ii) | <ul style="list-style-type: none"> Calculate the amount of nitric acid Calculate the volume of aqueous ammonia <p>Example calculation:</p> <p>$n(\text{HNO}_3) = 15.8 \times 150 \text{ mol} (= 2370 \text{ mol})$ (1)</p> <p>$\text{vol}(\text{NH}_3) \text{ required} = (2370 \div 14.8) = 160(\text{dm}^3)$ (1)</p> | 2 |

Total for Question 7 = 9 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------|-----------------------|------|
| 8(a)(i) | Chloroethene | accept vinyl chloride | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------|---|------|
| 8(a)(ii) | Poly(chloroethene) | accept polyvinyl chloride ignore PVC | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 8(b) |  | ignore bond angles | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 8(c)(i) | <ul style="list-style-type: none"> Correct ester link (1) Rest of unit correct (1) <p>Example:</p>  | <p>accept:</p>  | 2 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------|--|------|
| 8(c)(ii) | Water/H ₂ O | if both name and formula given, both must be correct | 1 |

Total for Question 8 = 6 marks

| Question number | Answer | Mark |
|-----------------|---|------|
| 9(a)(i) | <ul style="list-style-type: none"> To provide an enzyme/zymase (1) To increase the rate of the reaction (1) | 2 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 9(a)(ii) | <p>An explanation that links the following two points:</p> <ul style="list-style-type: none"> Oxygen (from the air) reacts with ethanol (1) To form ethanoic acid (1) | accept the ethanol undergoes microbial oxidation to ethanoic acid for 2 marks | 2 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 9(a)(iii) | <p>An explanation that links the following two points:</p> <ul style="list-style-type: none"> Reaction is too slow at lower temperatures (1) Zymase/the enzyme is denatured at higher temperatures (1) | accept the yeast is killed ignore yeast is denatured ignore zymase is killed | 2 |

| Question number | Answer | Mark |
|-----------------|--------------------------------------|------|
| 9(b)(i) | $C_2H_4 + H_2O \rightarrow C_2H_5OH$ | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------|---------------------|------|
| 9(b)(ii) | Addition | accept hydration | 1 |

| Question number | Answer | Mark |
|-----------------|--|------|
| 9(b)(iii) | <p>Any two from the following:</p> <ul style="list-style-type: none"> phosphoric acid catalyst (1) 300 °C (1) 60–70 atm (1) | 2 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 9(c) | (Carboxylic acid) propanoic acid (1) (Alcohol) butanol-1-ol/butanol (1) | accept propionic acid accept (<i>n</i> -)butyl alcohol | 2 |

Total for Question 9 = 12 marks

TOTAL FOR PAPER = 70 MARKS