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)	• (mass of solid) 5.3 (g) (1) • (mass of water) 20.9 (g) (1)	2

Question number	Answer	Mark
2(b)	• $(10.5 \div 16.8) \times 100$ (1) • 62.5 (grams of solid per 100 g of water) (1)	2

Question number	Answer	Mark
2(c)	An explanation that links together the following three points: • 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)	$Cl_2 + \textbf{2}Br^- \rightarrow 2Cl^- + \textbf{2}Br$	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)	$2Br \rightarrow Br_2$	accept $Br + Br = Br_2$	1

Question number	Answer	Mark
3(d)	A diagram that shows: • all three bonding pairs correct (1) • all non-bonding pairs (1) Example 	2

Total for Question 3 = 7 marks

Question number	Answer	Additional guidance	Mark
4	A description that makes reference to the following six points: Test for cation: • do a flame test (1) • if flame is yellow then cation is sodium (1) • if flame is lilac then cation is potassium (1) Test for anion: • dissolve solid in water (1) **EITHER** • 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) **OR** • 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
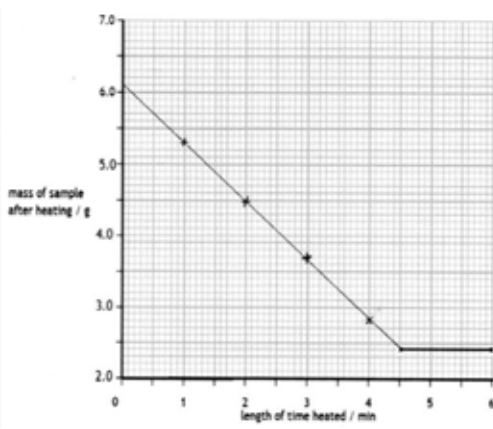
Question number	Answer	Mark
5(b)(i)	$Zn^{2+} + 2e^{(-)} \rightarrow Zn$ (1)	1
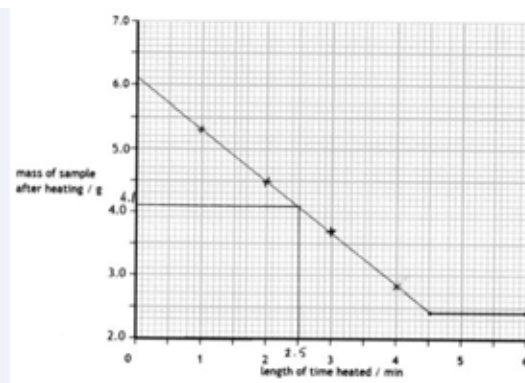
Question number	Answer	Mark
5(b)(ii)	$\mathbf{2}H_2O \rightarrow \mathbf{4}H^+ + O_2 + \mathbf{4}e^-$	1

Question number	Answer	Additional guidance	Mark
5(b)(iii)	An explanation that links the following two points: • pH decreases • hydrogen ion/H^+ (ion) concentration increases	accept hydrogen ions are formed	2

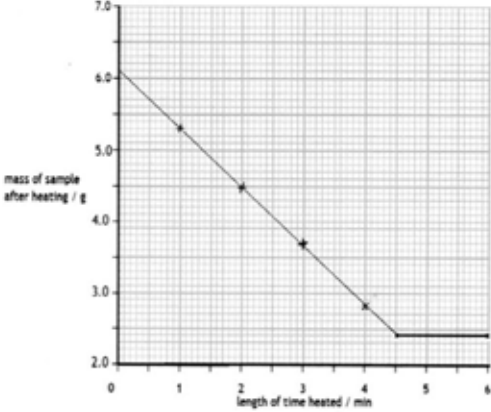| Question number	Answer	Additional guidance	Mark
5(c)	An explanation that links three of the following points: • the ions of (pure) copper are the same size (1) • the layers (of ions) can easily slide over one another (1) • the ions of zinc and copper have different sizes (1) • this disrupts the layers/structure/arrangement of the copper ions (1) • hence it is more difficult for the layers (of ions) to slide over one another (1)	accept atoms/particles for ions reject molecules once only	3

Total for Question 5 = 8 marks

Question number	Answer	Additional guidance	Mark
6(a)	• 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)	• 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)	• Calculate the amount of magnesium carbonate • Calculate the amount of water • Evaluation Example calculation: $n(MgCO_3) = (1.68 \div 84) = 0.02(0)$ (mol) (1) $n(H_2O) = (1.08 \div 18) = 0.06(0)$ (mol) (1) $x = 3$ (1)	**3**

Question number	Answer	Additional guidance	Mark
6(a)	• All points plotted correctly (1) • Best fit line drawn (1) 	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)	Graph A An explanation that links the following two points: • 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) Graph B An explanation that links the following two points: • 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)	ignore any references to or arguments based on Le Chatelier's principle accept the (forward) reaction is exothermic	**4**

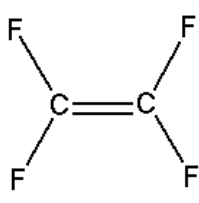| Question number	Answer	Additional guidance	Mark
7(a)(ii)	• (The catalyst/it) increases the rate of both the forward and reverse reactions (1) • To the same extent (1)	second mark is dependent on the first	**2**

Question number	Answer	Mark
7(b)(i)	Because a proton is transferred from HNO_3 to NH_3	**1**
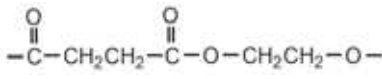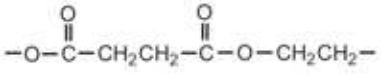
Question number	Answer	Mark
7(b)(ii)	• Calculate the amount of nitric acid • Calculate the volume of aqueous ammonia Example calculation: $n(HNO_3)$ = 15.8 × 150 mol (= 2370 mol) (1) vol(NH_3) required = (2370 ÷ 14.8) = 160(dm^3) (1)	**2**

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)	• Correct ester link (1) • Rest of unit correct (1) Example: 	accept: 	2

Question number	Answer	Additional guidance	Mark
8(c)(ii)	Water/H_2O	if both name and formula given, both must be correct	1

Total for Question 8 = 6 marks

Question number	Answer	Mark
9(a)(i)	• To provide an enzyme/zymase (1) • To increase the rate of the reaction (1)	**2**

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation that links the following two points: • 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)	An explanation that links the following two points: • 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)	Any two from the following: • 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 (*n*-)butyl alcohol	**2**

Total for Question 9 = 12 marks

TOTAL FOR PAPER = 70 MARKS