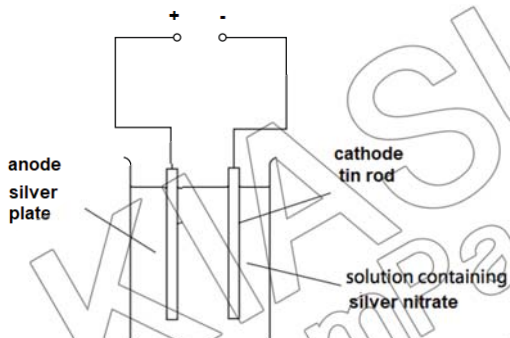
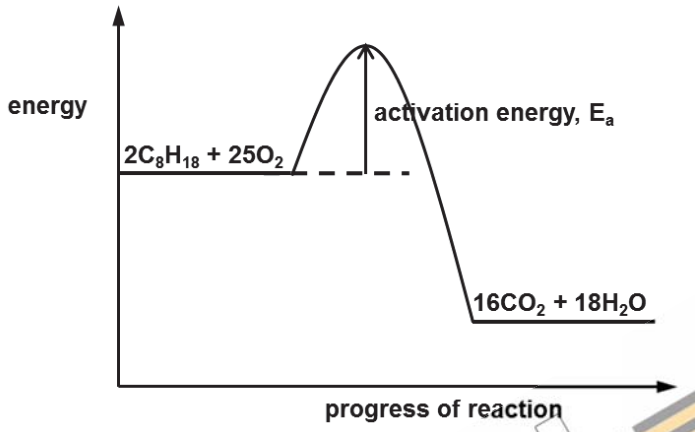
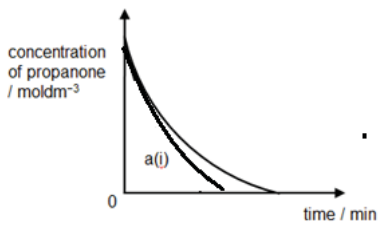


AHMAD IBRAHIM SECONDARY SCHOOL
4E PRELIMINARY EXAMINATION 2020
ANSWER SCHEME

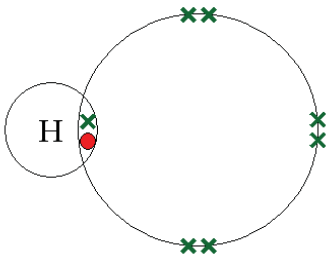
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
D	D	C	A	C	D	C	C	B	D
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
D	B	C	D	B	A	A	C	B	D
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
D	C	B	B	A	B	A	C	B	A
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
C	C	D	A	B	C	A	D	C	D

Section A				Marks
1	(a)	(i)	Zinc oxide	1m
		(ii)	Nitrogen dioxide	1m
		(iii)	Sodium iodide	1m
		(iv)	Copper(II) sulfate	1m
		(v)	Hydrochloric acid	1m
		(vi)	Sodium hydroxide	1m
	(b)	Calcium atom needs to lose 2 valence electrons to oxygen atom to form calcium ion whereas Oxygen atom will gain 2 valence electrons from calcium atom to form oxide ions Both atoms lose and gain electrons to achieve stable electronic configuration of noble gas		1m 1m
2	(a)	sodium chloride is <u>giant ionic structure</u> whereas chlorine has <u>simple molecular structure</u> sodium chloride has <u>strong electrostatic forces of attraction</u> between sodium <u>positively charged ions</u> and chloride <u>negatively charged ions</u> whereas chlorine has <u>weak intermolecular forces of attraction between molecules</u> . <u>Larger</u> amount of <u>energy</u> required to overcome the strong ionic bond in sodium chloride compares to <u>smaller</u> amount of <u>energy</u> to weaken the <u>weak forces of attraction</u> in chlorine molecules. Thus sodium chloride has higher melting point compare to chlorine molecules		1m 1m 1m
	(b)	In molten sodium chloride, <u>ions are free to move</u> to carry the electric charges but in solid state, <u>ions are in fixed positions</u> and not able to carry electric charges.		1m 1m
	(c)	at the negative electrode / cathode, <u>reduction</u> takes place which is <u>gain of electrons</u> (by sodium ions) at the positive electrode / anode, <u>oxidation</u> takes place which is <u>loss of electrons</u> (by chloride ions) OR sodium ions are <u>reduced</u> because they <u>gain electrons</u> to form sodium atom chloride ions are <u>oxidised</u> because they <u>lose electrons</u> to form chlorine molecules. OR sodium ion is <u>reduced</u> because <u>oxidation number of sodium decreases from +1 in Na⁺ to 0 in Na</u> . chloride ion is <u>oxidised</u> because the <u>oxidation number of chlorine increases from -1 in Cl⁻ to 0 in Cl₂</u> .		1m 1m 1m 1m 1m 1m
3	(a)	(i)	$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$	1m
		(ii)	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$	1m

3	(b)	$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ Mole of iron = $1300 \times 10^3 / 56 = 23,3 \times 10^3$ Mole Ratio of $\text{Fe}_2\text{O}_3 : \text{Fe}$ 1 : 2 Mole of iron(III) oxide = 11.6×10^3 Mr = $56 \times 2 + 3 \times 16 = 160$ Mass of iron(III) oxide = $11.6 \times 10^3 \times 160 = 1857 \times 10^3 = 1857 \text{ kg}$ % purity = mass of pure iron(III) oxide / mass of haematite $\times 100\%$ = $1857/2000 \times 100\% = 92.9\%$	1m 1m 1m
	(c)	(i) Iron(III) ions causes <u>iodide ions to be oxidised to iodine molecules by losing electrons</u>	1m
		(ii) ~~The yellow solution changes to brown solution~~	1m
		(iii) add (aqueous) sodium hydroxide / add (aqueous) ammonia red-brown precipitate	1m 1m
4	(a)	One mark each for any two suitable properties e.g.: ☐ shiny ☐ conducts heat / conducts electricity ☐ malleable ☐ ductile	Any 2
	(b)	 electrolyte labelled as named soluble silver compound / silver nitrate solution silver anode / silver positive electrode AND tin cathode / tin negative electrode	1m 1m 1m
	(c)	mol Sn = $5.95 / 119 = 0.0500$ mol Cl = $3.55 / 35.5 = 0.100$ dividing masses by correct atomic masses (1) (mol Sn : mol Cl = 1:2) formula is SnCl_2 (1)	1m 1m
	(d)	mol tin(II) oxide = $13.5 / 135 = 0.100 \text{ mol}$ (1) mass tin(IV) oxide expected = $0.100 \times 151 = 15.1 \text{ g}$ (1) % yield = $\frac{12.7}{15.1} \times 100$ = 84.1% (1)	1m 1m 1m
5	(a)	As the <u>percentage of carbon dioxide</u> in the atmosphere <u>increases</u> , the average	1m
	(i)	<u>temperature at the Earth's surface increases.</u>	
	(a)	The statement is <u>not true</u> . Increase in the amount of <u>other greenhouse gases like</u>	1m
	(ii)	<u>methane</u> will also result in global warming.	
	(a)	- polar ice caps will <u>melt</u> , <u>causing sea level to rise</u> and <u>flood low-lying land</u>	Any 2

	(iii)	- <u>reduced rain fall</u> can cause a <u>decrease in crops yield</u> and consequently, <u>shortage of food</u>. - more occurrences of <u>unusual weather conditions</u> such as warm spells, droughts, <u>unexpected storms and hurricanes</u>, and <u>floods</u> in some parts of the world - rise in ocean temperature results in <u>lesser volume of carbon dioxide</u> being able to <u>dissolve in the sea water</u> and this leads to an <u>increase</u> in the amount of carbon dioxide in the atmosphere, <u>aggravating global warming</u>. Any 2 of the consequences	
	(b) (i)		1m
	(b) (ii)	The <u>energy level</u> of the <u>products</u> are <u>lower</u> than the <u>energy level</u> of the <u>reactants</u> ./ Heat energy <u>absorbed for bond breaking</u> of octane and oxygen is <u>smaller</u> than heat energy <u>released for bond making</u> of carbon dioxide and water.	1m
	(b) (iii)	Amount of heat energy released to form carbon dioxide $= 16 \times 2 \times 743$ $= 23776 \text{ kJ}$ Amount of heat energy released to form water $= 18 \times 2 \times 463$ $= 16668 \text{ kJ}$ Enthalpy change $= 32104 - 16668 - 23776$ $= -8340 \text{ kJ/mol}$	1m 1m 1m
6	(a)	$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ (reversible sign)	1m
	(b)	400 atm, 0 °C	1m
	(c)	As temperature <u>increases</u> , the percentage of ammonia at equilibrium <u>decreases</u> .	1m
	(d)	increase the rate of production of ammonia	1m
	(e)	Ammonium compounds react with alkalis to form <u>ammonia gas</u> . When ammonia gas <u>escapes into the atmosphere</u> , the <u>nitrogen content is lost</u> and this makes the fertiliser ineffective.	1m 1m
7	(a) (ii)	concentration of propanone decreases at a higher rate and ending at shorter time. 	1m

	(a) (i)	<u>Iodine</u> is in excess. Based on Fig. 8.1, <u>all the propanone is completely used up</u> in the reaction, indicating that propanone is the limiting reagent	1m
	(b)	0.0010 mol/dm ³	1m
	(c)	When the <u>concentration of propanone increases</u> , the initial rate of reaction <u>increases</u> . This is illustrated by Fig. 8.3, where a <u>steeper gradient</u> was observed when higher concentrations of propanone were used As the <u>concentration of iodine increases</u> , there is <u>no effect</u> on initial rate of reaction. This is illustrated by Fig. 8.4, where the <u>gradient remains constant</u> when higher concentrations of iodine were used	1m 1m 1m 1m
	(d) (ii)	A catalyst provides an <u>alternative reaction pathway</u> with a <u>lower activation energy</u> [1 mk pt] than the uncatalysed reaction. As such, there is an <u>increase</u> in the number of reacting particles colliding with <u>energy equal to or greater than the activation energy</u> [1 mk pt] and <u>the frequency of effective collisions increases / probability of successful collision increases</u> [1 mk pt], <u>increasing the rate of reaction</u> .	1m 1m
	(d) (ii)	The product formed is <u>H₂</u> which can <u>ionise</u> to form <u>hydrogen / H⁺ ions</u> [1]. The <u>hydrogen ions regenerated</u> from the products can be used to <u>catalyse</u> the reaction, hence only a small volume of acid is needed [1].	1m 1m
	(e)	<u>Brown</u> solution turns <u>colourless</u> solution	1m
8	(a)(i))	Z, iron, X, Y	1m
	(a) (ii)	<u>Green solution becomes lighter in colour</u> / <u>green solution</u> turns colourless / <u>green</u> solution is decolourised <u>grey deposit</u> formed X is <u>more reactive</u> than iron as X displaced iron from iron(II) sulfate solution to form iron	1m 1m 1m
	(a)(i ii)	The gas produced <u>extinguish the lighted splint with a pop sound</u> .	1m
	(b)(i)	<u>Accumulation/greater volume of water</u> on the soil surface / <u>Photosynthesis by grass produces oxygen</u>	1m
	(b) (ii)	<u>Galvanising coats the steel with a more reactive metal such as zinc</u> . <u>Zinc will corrode in place of the steel</u> protecting the steel from rusting. It is preferred because <u>even when the layer is scratched, the steel will still not rust</u> .	1m 1m
E 9	(a)	Lead It has higher density than water	1m 1m
	(b)	After 5 mins, Anode : $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$ Cathode: $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ At the start, the <u>concentration of Bromide ions is high</u> and bromide ions are preferentially <u>oxidised to bromine molecule at the anode</u> .	1m 1m
		After 60 min, Anode : $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$ after 60min, the <u>concentration of bromide decreases</u> and thus <u>hydroxide ions are oxidised to form water and oxygen</u>	1m 1m
	(c) (i)	Hydrogen ions are <u>preferentially reduced</u> at the at the <u>cathode to form hydrogen gas</u> . The concentration of hydrogen ions <u>decreases</u> and becomes <u>lesser than concentration hydroxide</u> ions resulting in alkaline solution.	1m 1m
	(c)(i i)	<u>Bromine gas produced at the anode escapes as gas</u> during electrolysis	1m
	(d)	Reddish brown solution	1m

O 9	(a)	Hydroiodic acid. It has the largest K_a value.	1m 1m
	(b)	$\text{HClO} \rightarrow \text{H}^+ + \text{ClO}^-$	1m
	(c)(i))	Correct bonding e – 1m Correct lone pair e – 1m 	
	(c) (ii)	Hydrogen fluoride only conduct electricity <u>when it dissolves in water</u> to form hydrofluoric acid. The <u>hydrogen ions and fluoride ions are free to move</u> to carry electric charges to conduct electricity.	1m 1m
	(d)(i))	The <u>greater the atomic size</u> of Group VII, <u>higher the K_a</u> , <u>formed by the hydrogen halides</u> .	1m
	(d)(i) i)	<u>Less acidic.</u> The <u>atomic size of bromine is smaller than iodine</u> , hence the <u>K_a of HBr will be smaller</u> than that of HI.	1m 1m

