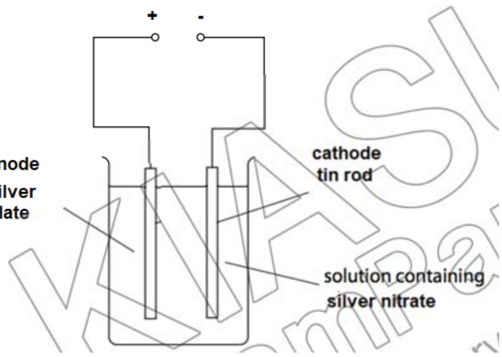
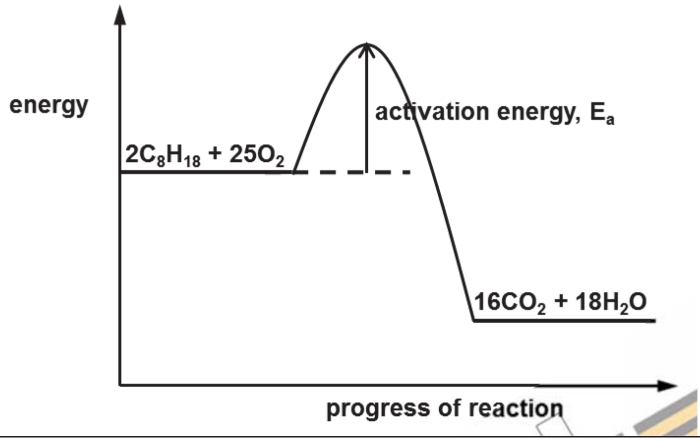
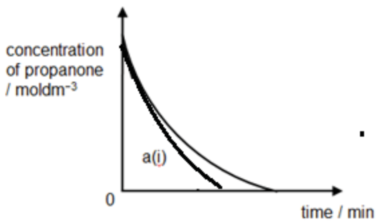
AHMAD IBRAHIM SECONDARY SCHOOL
4E PRELIMINARY EXAMINATION 2020
ANSWER SCHEME

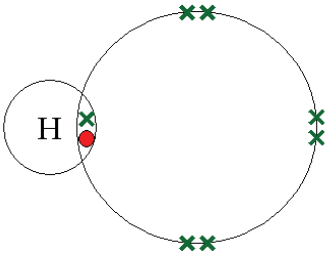
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
D	D	C	A	C	D	C	C	B	D
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
D	B	C	D	B	A	A	C	B	D
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
D	C	B	B	A	B	A	C	B	A
Q31	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	**Q37**	**Q38**	**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 giant ionic structure whereas chlorine has simple molecular structure sodium chloride has strong electrostatic forces of attraction between sodium positively charged ions and chloride negatively charged ions whereas chlorine has weak intermolecular forces of attraction between molecules. Larger amount of energy required to overcome the strong ionic bond in sodium chloride compares to smaller amount of energy to weaken the weak forces of attraction in chlorine molecules. Thus sodium chloride has higher melting point compare to chlorine molecules		1m 1m 1m 1m
	(b)	In molten sodium chloride, ions are free to move to carry the electric charges but in solid state, ions are in fixed positions and not able to carry electric charges.		1m 1m
	(c)	at the negative electrode / cathode, reduction takes place which is gain of electrons (by sodium ions) at the positive electrode / anode, oxidation takes place which is loss of electrons (by chloride ions) OR sodium ions are reduced because they gain electrons to form sodium atom chloride ions are is oxidised because they lose electrons to form chlorine molecules. OR sodium ion is reduced because oxidation number of sodium decreases from +1 in Na+ to 0 in Na. chloride ion is oxidised because the oxidation number of chlorine increases from -1 in Cl- to 0 in Cl2.		1m 1m 1m 1m 1m 1m
3	(a)	(i)	$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$	1m
		(ii)	$CaCO_3 \rightarrow CaO + CO_2$	1m

3	(b)	$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ Mole of iron = 1300 x 10^3 / 56 = 23,3 x 10^3 Mole Ratio of Fe_2O_3 : Fe 1 : 2 Mole of iron(III) oxide = 11.6 x 10^3 Mr = 56x2 +3x16 = 160 Mass of iron(III) oxide = 11.6 x 10^3 x 160 = 1857 x 10^3 = 1857 kg % purity = mass of pure iron(III) oxide / mass of haematite x 100% = 1857/2000 x 100% = 92.9%	 1m 1m 1m
	(c)	(i) Iron(III) ions causes iodide ions to be oxidised to iodine molecules by losing electrons	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 C*l* = 3.55/ 35.5 = 0.100 dividing masses by correct atomic masses (1) (mol Sn : mol C*l* = 1:2) formula is $SnCl_2$ (1)	 1m 1m
	(d)	mol tin(II) oxide = 13.5/ 135 = 0.100 mol (1) mass tin(IV) oxide expected = 0.100 x 151 = 15.1 g (1) % yield = $\frac{12.7}{15.1}$ x 100 = 84.1% (1)	1m 1m 1m
5	(a)(i)	As the percentage of carbon dioxide in the atmosphere increases, the average temperature at the Earth's surface increases.	1m
	(a)(ii)	The statement is not true. Increase in the amount of other greenhouse gases like methane will also result in global warming.	1m
	(a)	- polar ice caps will melt, causing sea level to rise and flood low-lying land	Any 2

	(iii)	- reduced rain fall can cause a decrease in crops yield and consequently, shortage of food. - more occurrences of unusual weather conditions such as warm spells, droughts, unexpected storms and hurricanes, and floods in some parts of the world - rise in ocean temperature results in lesser volume of carbon dioxide being able to dissolve in the sea water and this leads to an increase in the amount of carbon dioxide in the atmosphere, aggravating global warming. *Any 2 of the consequences*	
	(b) (i)		1m
	(b) (ii)	The energy level of the products are lower than the energy level of the reactants./ Heat energy absorbed for bond breaking of octane and oxygen is smaller than heat energy releaded for bond making of carbon dioxide and water.	1m
	(b) (iii)	Amount of heat energy released to form carbon dioxide = 16 × 2 × 743 = 23776 kJ Amount of heat energy released to form water = 18 × 2 × 463 = 16668 kJ Enthalpy change = 32104 – 16668 – 23776 = −8340 kJ/mol	 1m 1m 1m
6	(a)	$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ (reversible sign)	1m
	(b)	400 atm, 0 °C	1m
	(c)	As temperature increases, the percentage of ammonia at equilibrium decreases.	1m
	(d)	increase the rate of production of ammonia	1m
	(e)	Ammonium compounds react with alkalis to form ammonia gas. When ammonia gas escapes into the atmosphere, the nitrogen content is lost and this makes the fertiliser ineffective.	1m 1m
7	(a) (ii)	concentration of propanone decreases at a higher rate and ending at shorted time. 	1m

	(a)(i)	Iodine is in excess. Based on Fig. 8.1, all the propanone is completely used up in the reaction, indicating that propanone is the limiting reagent	1m
	(b)	0.0010 mol/dm^3	1m
	(c)	When the concentration of propanone increases, the initial rate of reaction increases. This is illustrated by Fig. 8.3, where a steeper gradient was observed when higher concentrations of propanone were used As the concentration of iodine increases, there is no effect on initial rate of reaction. This is illustrated by Fig. 8.4, where the gradient remains constant when higher concentrations of iodine were used	1m 1m 1m 1m
	(d)(ii)	A catalyst provides an alternative reaction pathway with a lower activation energy [*1 mk pt*] than the uncatalysed reaction. As such, there is an increase in the number of reacting particles colliding with energy equal to or greater than the activation energy [*1 mk pt*] and the frequency of effective collisions increases / probability of successful collision increases [*1 mk pt*], increasing the rate of reaction.	1m 1m
	(d)(ii)	The product formed is HI which can ionise to form hydrogen / H^+ ions [1]. The hydrogen ions regenerated from the products can be used to catalyse the reaction, hence only a small volume of acid is needed [1].	1m 1m
	(e)	Brown solution turns colourless solution	1m
8	(a)(i)	Z, iron, X, Y	1m
	(a)(ii)	Green solution becomes lighter in colour / green solution turns colourless / green solution is decolourised grey deposit formed X is more reactive than iron as X displaced iron from iron(II) sulfate solution to form iron	1m 1m 1m
	(a)(iii)	The gas produced extinguish the lighted splint with a pop sound.	1m
	(b)(i)	Accumulation/greater volume of water on the soil surface / Photosynthesis by grass produces oxygen	1m
	(b)(ii)	Galvanising coats the steel with a more reactive metal such as zinc. Zinc will corrode in place of the steel protecting the steel from rusting. It is preferred because even when the layer is scratched, the steel will still not rust.	 1m 1m
E 9	(a)	Lead It has higher density than water	1m 1m
	(b)	After 5 mins, Anode : 2Br- → Br_2 + 2e Cathode: $2H^+$ + 2e → H_2 At the start, the concentration of Bromide ions is high and bromide ions are preferentially oxidised to bromine molecule at the anode .	 1m 1m
		After 60 min, Anode : $4OH^-$ → O_2 + $2H_2O$ + 4e after 60min, the concentration of bromide decreases and thus hydroxide ions are oxidised to form water and oxygen	 1m 1m
	(c)(i)	Hydrogen ions are preferentially reduced at the at the cathode to form hydrogen gas . The concentration of hydrogen ions decreases and becomes lesser than concentration hydroxide ions resulting in alkaline solution.	1m 1m
	(c)(ii)	Bromine gas produced at the anode escapes as gas during electrolysis	1m
	(d)	Reddish brown solution	1m

O 9	(a)	Hydroiodic acid. It has the largest K_a value.	1m 1m
	(b)	$HClO \rightarrow H^+ + ClO^-$	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>, formed by the hydrogen halides.	1m
	(d)(ii)	<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