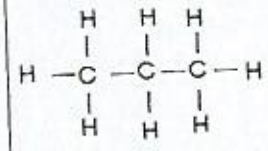
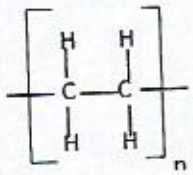
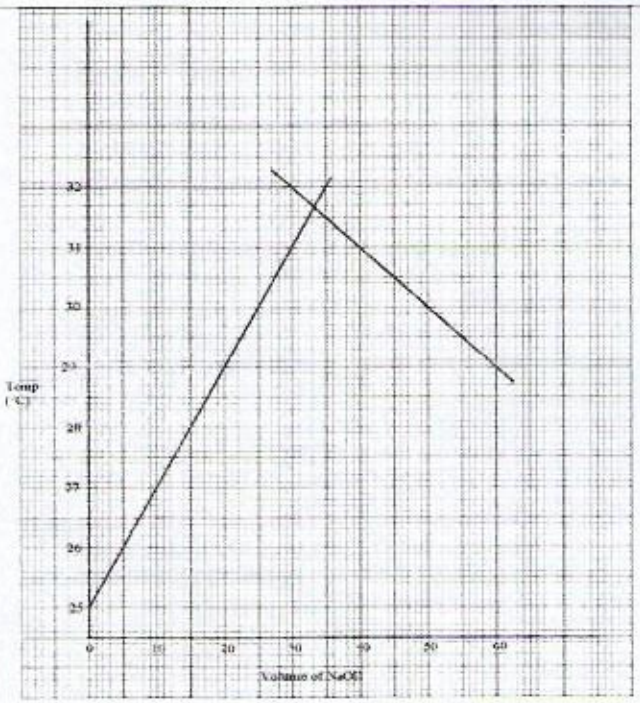
5.5.2 Chemistry Paper 2 (233/2)

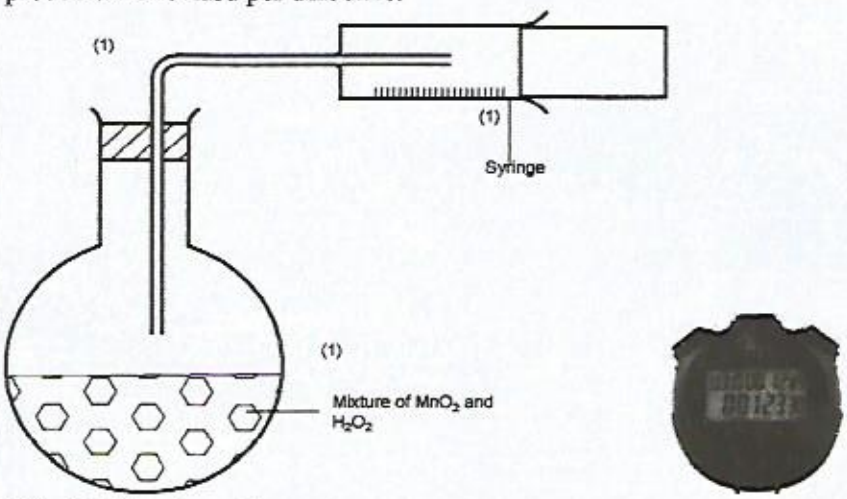
No.	Responses	Marks
1(a)(i)	Compounds made of carbon and hydrogen only and where the bonds (carbon to carbon) are single covalent /every carbon atom contains its maximum number of hydrogen atoms.	(1 mark)
(ii)		(1 mark)
	- propane	(1 mark)
(b) (i)	$C_6H_{14} \rightarrow C_2H_4 + C_4H_{10}$	(1 mark)
(ii)	thermal cracking	(1 mark)
(c) (i)	ethene / CH_2CH_2	(1 mark)
(ii)	-Sweet/pleasant smell / fruity smell - Miscible /soluble in water	(1 mark)
(iii)		(1 mark)
(iv)	It is non-biodegradable	(1 mark)
(v)	$CH_3COOH(aq) + NaOH(aq) \longrightarrow CH_3COONa(aq) + H_2O(l)$	(1 mark)
(d)	Add bromine water to both yellow colour of bromine persists in butanol butene decolourises bromine water **OR** Burn each one of them in air. butene burns with a luminous flame while butanol burns with a non luminous flame.	(1 mark) (½mark) (½mark)
2(a)	$ZnCO_3$/Zinc Carbonate, ZnO/Zinc Oxide	(1 mark)
(b)(i)	$2ZnS + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$	(1 mark)

No.	Responses	Marks
(ii)	-Zinc oxide reacts with coke to form Zinc vapour. -The lime reacts with silica to form calcium silicate. -The Impurity (lead) separates, from the silica because it is denser and settles at the bottom of furnace. **OR** - Decomposition of calcium carbonate/ formation of oxides of carbon; - Reduction of zinc oxide; - Formation of calcium silicate; - Formation of slag.	(1 mark) (1 mark) (1 mark)
(iii)	Lead is more reactive than zinc hence, the coating protects it from re-oxidation/ it acts as a coolant.	(1 mark)
(iv)	-Making brass; -Galvanizing iron; - as the negative terminal in dry cells. **(Any 1 correct @ 1 mark)**	(1 mark)
(v)	-Gullies are formed; -Emission of by-product sulphur(IV) oxide and carbon(II) oxide which are poisonous; -Causes acid rain formation; -Carbon(IV) oxide causes global warming; -lead is poisonous.	(1 mark)
(c)	-Zinc reacts with hot sodium hydroxide to form Zincate because Zinc is amphoteric OR -Zinc dissolves in sodium hydroxide to form a solution -bubbles of a colourless gas formed as zinc reacts with steam	(1 mark) ($^1/_2$ mark) ($^1/_2$ mark)
3(a)(i)	**P** - Nitrogen **Q** - Hydrogen **R** - Nitrogen(II) oxide **S** - Water	(1 mark) (1 mark) (1 mark) (1 mark)
(b)(i)	Platinum/Rhodium (Pt/Rh)	(1 mark)
(ii)	$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$ $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$	(1 mark) (1 mark)
(iii)	nitrous(III) *acid* (HNO_2)	(1 mark)

No.	Responses	Marks
(c)(i)	-Fertilizers improve the soil fertility; -Adds nutrients to the soil; - increases food productivity	(2 marks)
(ii)	• Excess nitrates in drinking water causes stomach upsets • When nitrates are converted to nitrites by bacteria, the nitrites react with blood affecting its ability to react with oxygen • Eutrophication.	(2 marks)
4(a)(i)	The blue colour is due to presence of (Cu^{2+}) ions. Magnesium is more reactive than copper, therefore it displaces copper (Cu^{2+}) ions from solution	(1 mark) (1 mark)
(ii)	In the presence of air (oxygen) and water , iron is oxidized to hydrated iron (III) oxide which is the brown porous substance.	(1 mark)
(b)	-Add excess aqueous ammonia to the water, formation of white precipitate shows presence of Al^{3+} or Pb^{2+} ions To another sample of water add dilute H_2SO_4 / HCl formation of colouress solution shows presence of Al^{3+} / add potassium iodide if a yellow precipitate does not form it confirms presence of Al^{3+} ions.	(½ mark) (1mark) (½ mark) (1 mark)
(c)(i)	-Heat strongly and weigh. -re-heating the substance and re-weighing. If mass does not change constant mass has been attained.	(1 mark) (1 mark)
(ii)	Molar mass of residue = 142g Mass of water = 5 - 2.205 = 2.795g Moles H_2O : Na_2SO_4 $\frac{2.795}{18}$: $\frac{2.205}{142}$ $\frac{0.155}{0.0155}$: $\frac{0.0155}{0.0155}$ 10 : 1 10 moles of water of crystallization.	(½ mark) (½ mark) (1 mark) (1 mark)
5(a)	Heat change that occurs when one mole of OH^- ions reacts with one mole of H^+ ions to form 1 mole of water.	(1 mark)
(b)(i)	$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$	(1 mark)

No.	Responses	Marks
(ii)	 Labeling - ½ mark Scale -½ mark Plots – 1 mark Curves - 1 mark	(3 marks)
(iii) I.	Volume of sodium hydroxide (correct value read fron the graph) From graph $33.5cm^3$	(1 mark) (1 mark)
II.	$\Delta T = 31.65-25.0 = 6.65^oc$ /ΔT = value from the graph - 25	(1 mark)
(vi) I.	$\Delta H = 83.5\times4.2\times6.65$ / value from the graph + $50 \times 4.2 \times \Delta T$ $= 2332.155$ J	(1mark)
II.	Moles of $HCl = \frac{50x1}{1000}$ OR $\frac{\text{Ans from vi I}}{0.05}$ $= 0.05$ 0.05 moles = 2332.2 1 mole = $\frac{2332.2}{0.05}$ $= -46.64 kJmol^{-1}$	(1 mark) (1mark)

No.	Responses	Marks
(v)	The molar heat of ethanoic acid would be lower. Ethanoic acid is a weak acid and thus some of the heat energy is utilized in ionizing the acid.	(1 mark) (1 mark)
6 (a)	This is the potential difference between a standard hydrogen half- cell and a half-cell of an element containing 1moldm^{-3} of the ions at 298 K and 1 atmospheric pressure	(1 mark)
(b)(i)	MnO_4^- will oxidize M^{2+} Because it has a higher E^{θ} value than M^{3+}	(1 mark)
(ii)	$2Q^-_{(aq)}/Q_{2(g)}$ and $P^{2+}_{(aq)}//P_{(s)}$ OR P and Q	(1 mark)
(iii)	$P_{(s)}/P^{2+}_{(aq)}//Q_2Q^-/Pt$	(1 mark)
(iv)	E^{θ} value = 2.87 + 0.23 = 3.10V	(1 mark) (1 mark)
(c)	Quantity of electricity = 6 x 12 x 60 = 4320 C	(1 mark)
	2 x 96500 = 1 mole of metal 4320 C = 1.24g of metal	(1 mark)
	2 x 96500 = $\frac{1.24}{4320}$ x 2 x 96500 = 55.4	(1 mark
(d)	-decoration -purification of metals -extraction of metals -manufacture of sodium hydroxide **(Any 2 correct @ 1mark)**	(1 mark)

No.	Responses	Marks
7 (a)	Rate = change in concentration	(1 mark)
	$\frac{\text{reagents/products}}{\text{time}}$ or	(1 mark)
	Reaction rate is a measure of how much of reactants are consumed or how much products are formed per unit time.	
(b)		3 marks
	-Workability - 1 mark - Means of measuring the gas - 1 mark - means of timing (stop watch)	
(c) (i)I.	After two minutes, red/brown colour fumes of bromine are observed on the surface of the bromine liquid.	(½ mark)
II.	After 30 minutes, the gas jar is filled with yellow fumes.	(½ mark)
(ii)I.	Bromine liquid is volatile, the molecules escape from the liquid but the vapour being denser than air will occupy the space on the surface of the liquid.	(1 mark)
II.	With time, since molecules in the vapour phase move randomly, bromine molecules will undergo collisions with air molecules and mix thus filling the gas jar,	(1mark)
(d)(i)	The seeds are crushed in a mortar with a pestle to increase surface area for oil extraction.	(1 mark)
	Then a solvent (ethanol/acetone) is added with continued crushing. The liquid is then decanted into an evaporating dish. The evaporating dish is placed out into the sun to allow solvent to evaporate because of its low RMM, leaving behind the oil.	(1 mark) (1 mark)
(ii)	The liquid left after evaporation is placed on a piece of paper. If it leaves a translucent mark then it proves it is oil.	(1 mark)