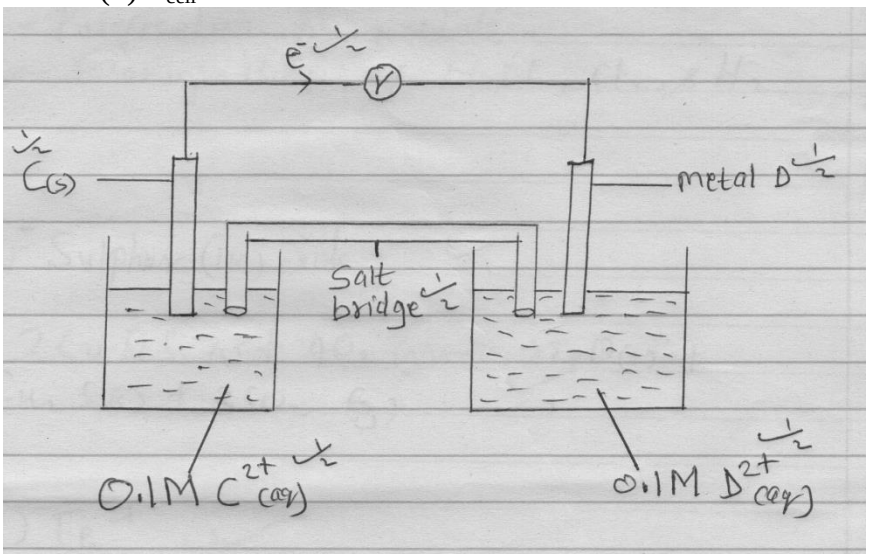
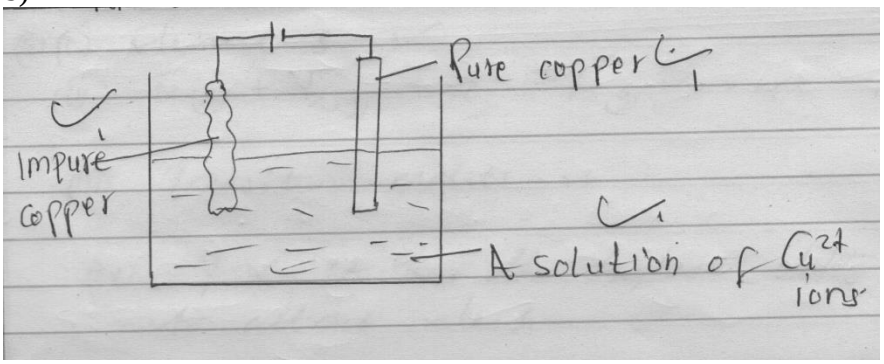
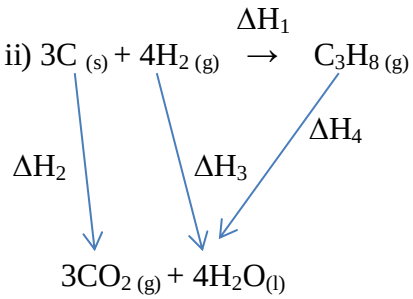
233/2 MARKING SCHEME

NO	ANSWERS	REMARKS
1	a) (i) Strong reducing agent →E ; highest –ve volts 1	
	Strong oxidizing agent → H_2 ; higher +ve volts 1	2
	(ii) E_{cell} = 0.44- 0.34 =+ 0.10V 1	
		3 1 1
	c) Shown on the diagram 1	1
	d) (i) Gas U → hydrogen gas ½ Gas V → oxygen gas ½	1
	(ii) $4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$ 1	
	e) Electrolysis is passage of electric current through an electrolyte hence decomposing it 1	
	• Electroplating • Extraction of metals • Purification of metals • Manufacture of NaCl, Cl_2, and H_2	Any 2 carry each one mark 3
	SUB-TOTAL	**12**
2	a) (i) Sulphur (IV) oxide 1	
	(ii) $2CuFeS_{2(s)} + 4O_{2(g)} \rightarrow 2FeO_{(s)} + Cu_2S_{(s)} + 3SO_{2(g)}$ 1	
	(iii) Fe^{2+} 1	

	(iv) P is carbon (IV) oxide 1 (v) Reduction – oxidation (redox) reaction 1 This is because copper (I) oxide (Cu_2O) is reduced to copper while coke is oxidized to carbon (IV) oxide. b)  c.(i) Acid rain may form due to presence of sulphur (IV) oxide (SO_2) and carbon (IV) oxide (ii) Dumping of the waste like the slag prevent vegetation growth (iii) Large gullies left after the ore is excavated destroys the environment	Any solution with Cu^{2+} i.e $CuSO_4$, $Cu(NO_3)_2$, $CuCl_2$ 3mks Any two correct award 1 mark each
	SUB-TOTAL	**9**
3	a) (i) Element S 1 (ii) $E_{(s)} + Y_{2\,(g)} \rightarrow EY_{2(g)}$ (iii) Transition metals 1 (iv) Y √ 1; it has the highest ability to attract electrons√ 1 (v) Y is smaller than T. √1 since Y has greater nuclear charge than T √1 OR it has many protons than T b) (i) F ½ atomic number 13 G ½ atomic number 20 (ii) F ½ and H ½ OR F and I OR H and I (iii) $2I_{(s)} + 2H_2O_{\,(l)} \rightarrow 2IOH_{\,(aq)} + H_{2\,(g)}$ **NB: Penalize accordingly IF NOT balanced; ½ missing symbols** (iv) The ion has one energy level √ 1 less than H. G loses its valence electrons with much ease than H √ 1 (v) G is more reactive than H. G loses its valence electrons with much ease than H √ 1	1 1 1 2 2 1 1 1 2 1
	SUB-TOTAL	**13**

4	**a)** (i) NB: scale√1 Plot √1 Axis√1 (ii) V = 325cm^{3}√ NB,must be shown on the graph for full mark **b)** (540-410)÷60√ = 2.16cm^{3}/sec√ **c)** Some solid remained due to presence of unreacted copper √½ since copper is below hydrogen in the reactivity series √½ **d)** Volume of hydrogen = 640-2.5 = 637.5cm^{3}√½ moles of hydrogen = 637.5÷24000 = 0.02656√ ½ mole ratio Al : H_2 = 2**:**3 based on equation moles of Al = 0.02656 x 2/3 = 0.0177 √½ mass of Al = 0.0177 x 27 = 0.478 g√ ½ % Al = (0.4748÷0.5) x 100 = 96.625% √½ e) It is cheaper than pure Aluminum 1 It is harder than Aluminum Lighter than Aluminum 1	**3** **1** **1** **1** **3** **Any two** **1** **1**
	SUB-TOTAL	**11**
5	a) i) Ammonia 1 ii) Ammonium chloride 1 iii) sodium hydrogen carbonate 1 iv) Calcium chloride/ water 1 b) $2NH_4Cl_{(aq)} + Ca(OH)_{2(aq)} \rightarrow CaCl_{2(aq)} + 2H_2O_{(l)} + 2NH_{3(g)}$ 1 c) carbon (IV) oxide√/ calcium carbonate√/ Brine√/Ammonia√ d) (i) G; Carbon (IV) oxide / ammonia/ water ii) Its denser than air 1 does not support combustion 1 iii) There would be formation of $PbSO_4$ ½ which is insoluble ½ . This insoluble $PbSO_4$ coats ½ the lead carbonate thus stops further reaction ½ **SUB-TOTAL**	**Reject formula 4** **Each 1 mark 2mrk** **Any one carry 1 mark** **2** **2** **12**

6	a) Lubricating oil, fuel oil, diesel, kerosene, petrol, bitumen, gasoline, naptha,	**2** **Any four** ½ each
	b) Thermal cracking is breaking down long chain alkanes using high temperatures 1 Catalytic cracking involves breaking long chain alkanes at lower temperatures in the presence of catalysts 1	**2**
	c) i) W → Fermentation ½	**1**
	X→ Distillation ½	**1**
	ii) B→ Ethane ½ C→ sodium ethanoate ½	**1**
	iii) $C_2H_5OH \xrightarrow[H_2SO_4]{\text{Conc.}} C_2H_{4\,(g)} + H_2O_{\,(l)}$ 1	**1**
	iv) $2C_2H_{6\,(g)} + 5O_{2\,(g)} \rightarrow 4CO_{2\,(g)} + 6H_2O_{\,(l)}$ 1	**2**
	v) Brown/Yellow/Red bromine is decolorized in the presence of sunlight; substitution reaction takes place 2	**2**
	vi) RMM of ethene = 28 ½ 28n = 112000 ½ n = 112000÷28 ½ = 4000 ½	
7	a) Is the heat given out when one mole of a substance burns completely in air 1	**1**
	b) Enthalpy change for a reaction is the same whether the change is brought about in one step or through various intermediate steps. OR The energy changes in converting reactants to products is the same regardless of the route by which the chemical change occurs.	**1**
	c) i) $3Cu_{\,(s)} + 4H_{2\,(g)} \rightarrow C_3H_{8\,(g)}$	**1**

	ii) 	**3**
	iii) $\Delta H_4 = \Delta H_2 + \Delta H_3 - \Delta H_1$	**1**
	$= (-393 \times 3) + (-286 \times 4) - (-104)$ ½	**1**
	$= -2219$kJ/mol ½	**Any one**
	d) Polution/heating value/availability/cost	
	e) The enthalpy of neutralization of ethanoic acid is less than√ ½that of HCl and HNO_3. This is because ethanoic acid is a weak acid ½ hence ionizes partially½ and some energy is used to ionize it fully ½	**2**
	END	