VIRAJ INTERNATIONAL ACADEMY

NAME………………………………………….… INDEX NO……………………

SCHOOL……………………………………….… SIGN………………………….…

DATE………………………………………….…

233/2

CHEMISTRY

Paper 2

2 HOURS

<u>Instructions to candidates</u>

(a) *Write your **name, index number** and the **name** of your school in the spaces provided above.*

(b) ***Sign** and **write** the **date** of examination in the spaces provided above.*

(c) *Answer **all** questions in this question paper.*

(d) *Answers to **all** questions **must** be written in the spaces provided in this booklet.*

(e) *All working **MUST** be clearly shown.*

(f) *KNEC mathematical tables and non-programmable silent electronic calculators **may be** used.*

(g) ***Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.***

<u>For Examiner's Use Only</u>

Question	Maximum score	Candidate's score
1-7	**80**	

This paper consists of 1 printed pages.

READ, LEAD, SUCCEED

Q1. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent actual symbols of the elements.

							P	L	
G						W		Q	U
	R								
T					X		Y		

a) Which is the most reactive metal? ………………………… (1 mark)

b) What name is given to the family of the elements L and Q?

……………………..………….………… (1 mark)

c) Element Q reacts with both W and R. Write the formulae of the compounds formed between:

(i) W and Q   ………………………… (1 mark)

(ii) R and Q   ………………………… (1 mark)

d) Using dots and crosses to represent electrons, show the bonding in the compound formed when the following elements combine.
(i) X and L   (ii) T and P

(2 marks)

e) Compare and explain the difference between the atomic radii of X and Y. (2 marks)

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f) Explain why U is unreactive. (1 mark)

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g) Giving a reason, predict what the pH of an aqueous solution of the oxide of element G would be. (1 mark)

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Q2. The reaction scheme shows various reactions starting with ammonia. Study it and answer the questions that follow.
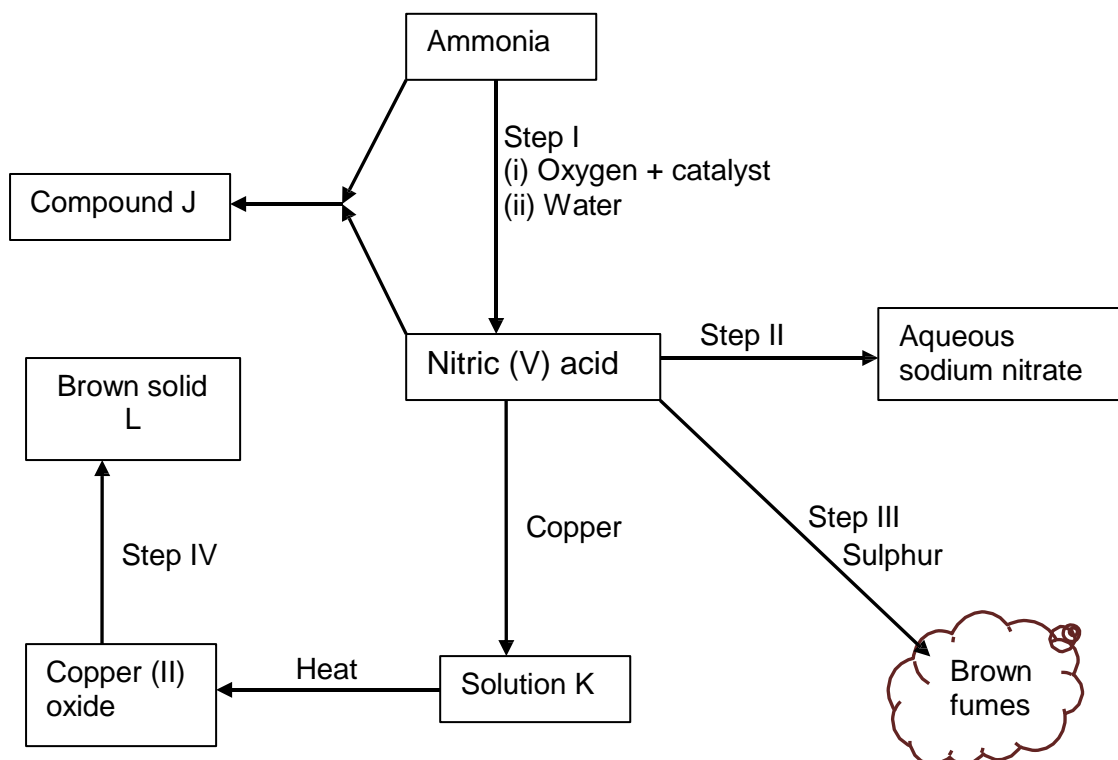
a) Name the raw materials used for the manufacture of ammonia.

………………………………………………………………………………………………….. (1 mark)

b) Write an equation for the reaction that occurs between ammonia and oxygen in step I.

………………………………………………………………………………………………… (1 mark)

c) Name the process that takes place in step II.

………………………………………………………………………………………………… (1 mark)

d) Explain how the reaction in step III takes place. (2 marks)

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e) Name: (i) A gas that can be used to carry out step (IV) …………………………..($^1/_2$ mark)

(ii) A substance that can be added to solution K to form solid L directly.

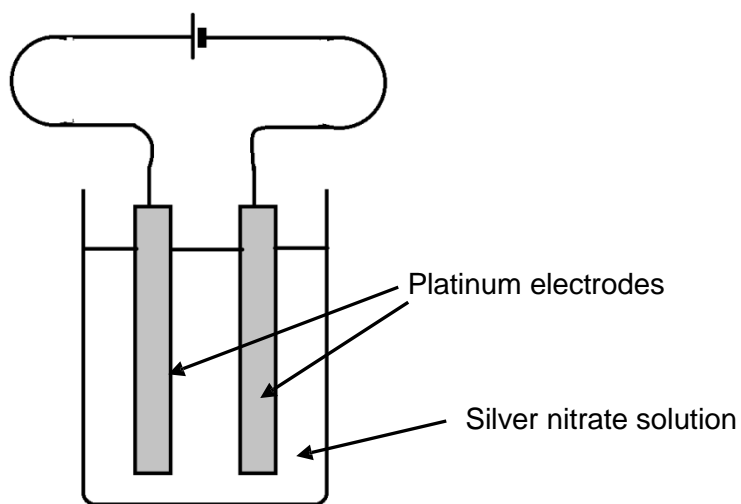………………………………………………………………………………………… ($^1/_2$ mark)

f) (i) Write the formula of compound J. ……………………………………………… (1 mark)

(ii) Calculate the mass of compound J that would contain 140kg of nitrogen. (2 marks)
   (R.A.M. N=14, O=16 H=1)

Q3. a) What is an anode?   (1mark)

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b) The diagram below shows a setup that that was used to electrolyse silver nitrate solution

Platinum electrodes

Silver nitrate solution

(i) State the observation made at the cathode.   (1mark)

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(ii) Write an ionic equation for the reaction taking place at the anode. (1mark)

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(iii) Explain why the pH of the electrolyte was found to have decreased at the end of the experiment. (2 marks)

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c) During the electrolysis, a current of 8A was passed through the electrolyte for 5 minutes. Determine the;

(i) Quantity of electricity generated. (1mark)

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(ii) Mass change at the cathode. (R.A.M Ag =108, 1F = 96500C). (2 marks)

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d) Use the cell representation below to answer the questions that follow.

$$Fe_{(s)} / Fe^{+2}_{(aq)} \parallel Fe^{+3}_{(aq)} / Fe^{2+}_{(aq)}, Pt$$
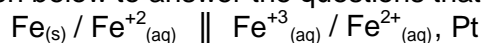
(i) Write the equation for the cell reaction. (1mark)

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(ii) If the e.m.f of the cell is 0.33 Volts and E^{θ} value for $Fe^{2+}_{(aq)} / Fe_{(s)}$ is -0.44 Volts. Calculate the E^{θ} value for $Fe^{3+}_{(aq)} / Fe^{2+}_{(aq)}$. (2 marks)

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Q4. a) Give the systematic name of the following compounds.

(i) **CH₃CH₂COOH** …………………………………………………………..…… (1 mark)

(ii) **CH₃CH₂CH₂CHCH₂** ………………………………………………….…..…… (1 mark)

 (iii) **CHCCH₂CH₃** …………………………………………………………..…… (1 mark)

b) Study the reaction scheme below and use it to answer the questions that follow.
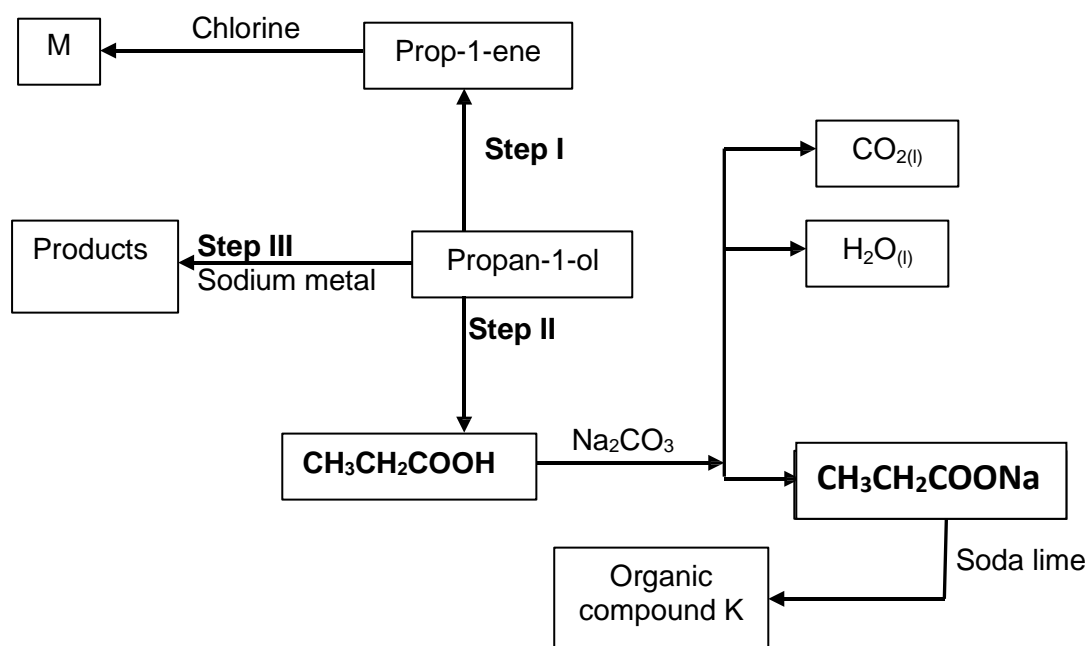
(i) Identify the organic compound K ……………………………………………….. (1 mark)

(ii) Name compound M …………………………………………………………….. (1 mark)

(iii) Write the structural formula of M. (1 mark)

(iv) Give the reagent that can be used in:

Step I   …………………………………………………………………….. (1 mark)

Step II   …………………………………………………………………….. (1 mark)

(v) Write the equation of the reaction in step **III**

……………………………………………………………………..……………….. (1 mark)

c) The structure shown below represents a type of cleansing agent.

$$R - \bigcirc - SO_3^- \ Na^+$$
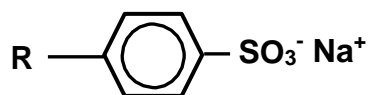
Describe how the cleansing agent removes grease from a piece of cloth. (2 marks)

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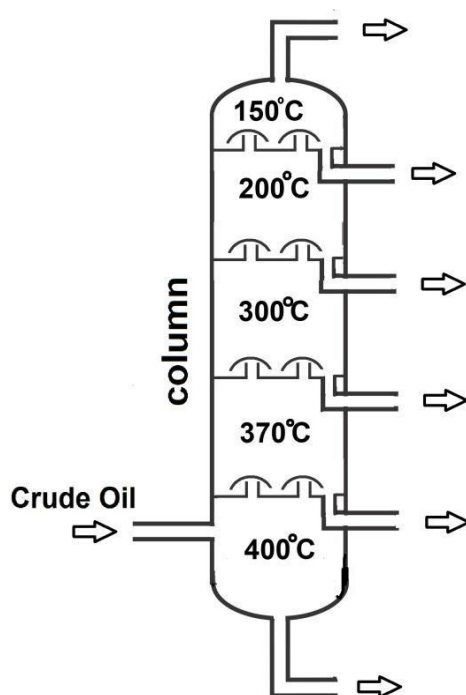
Q5. a) Study the diagram below and answer the questions that follow.

(i) Name the method of separation above. …………………………….……………….. (1 mark)

(ii) Bitumen has a boiling point of more than 500°C. Indicate on the diagram where bitumen can be collected. (1 mark)
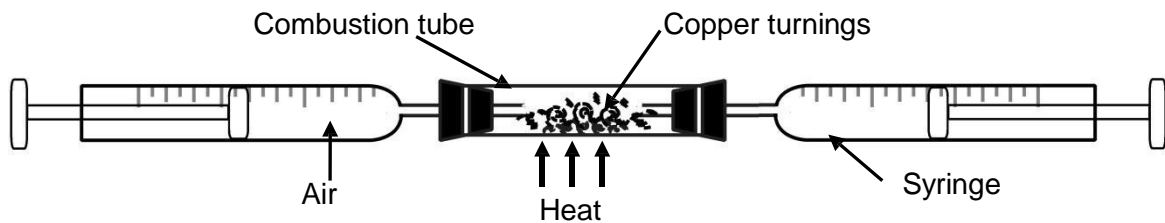
(iii) State one use of bitumen. ………………………………………………….………. (1 mark)

(iv) Explain how the column works. (1 mark)

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(v) Give one town in Kenya where crude oil is refined. ……………………………….. (1 mark)

b) The apparatus below shows the setup used to determine the percentage of oxygen in air.

The air was slowly and repeatedly passed through the copper turnings until a constant volume was obtained.

(i) Explain why air was passed slowly and repeatedly. (1 mark)

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(ii) State the observation made at the end of the experiment. (1 mark)

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(iii) Is it advisable to use potassium in this experiment? Give a reason. (1 mark)

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c) (i) What is rust? (1 mark) ………………………………………….…………………………

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(ii) Give the chemical formula of rust ……………………………………………….. (1 mark)

(iii) Define the term galvanisation. (1 mark)……………………………………………………..

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Q6. Study the energy level diagram below and answer the questions that follow.

$$C_{(S)} + 2H_{2(g)}$$

$$\Delta H_4$$

$$\Delta H_1 = -393 \text{ KJ mol}^{-1}$$

$$CH_{4(g)}$$

$$CO_{2(g)} + 2H_{2(g)}$$

Energy

$$\Delta H_3 = -750 \text{ KJ mol}^{-1}$$

$$\Delta H_2 = -582 \text{ KJ mol}^{-1}$$

$$CO_{2(g)} + 2H_2O_{(g)}$$
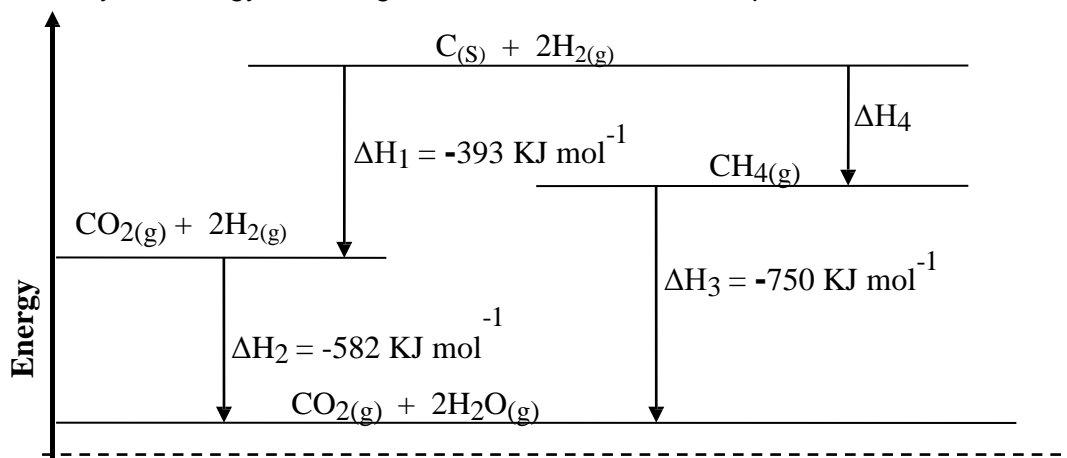
a) Name the enthalpy change represented by

(i) ΔH_1 ……………………………………………………………… (1mark)

(ii) ΔH_4 ……………………………………………………………… (1mark)

c) Calculate the value of ΔH_4 (1mark)

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e) The table below gives the bond energies of some bonds.

Bond	H – H	Cl – Cl	C - H	H – Cl	C – Cl
Bond energy (kJ/ mol)	435	243	415	431	339

Calculate the enthalpy changes for the following reactions.

(i) $H_{2(g)} + Cl_{2(g)} \longrightarrow 2HCl_{(g)}$ (2 marks)

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(ii) $CH_{4(g)} + Cl_{2(g)} \longrightarrow CH_3Cl_{(g)} + HCl_{(g)}$ (2 marks)

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f) Given that:

$$\Delta H_f^{\theta} (C_4H_{10}) = -275 \text{ kJ mol}^{-1}$$

$$\Delta H_f^{\theta} (CO_2) = -393 \text{ kJ mol}^{-1}$$

$$\Delta H_f^{\theta} (H_2O) = -286 \text{ kJ mol}^{-1}$$

(i) Calculate the molar heat of combustion of butane (C_4H_{10})   (2 marks)

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(ii) A portable burner containing butane is weighed and found to have a mass of 798g. What mass would it weigh if it was used to heat 5 litres of water at 18°C to a boil? (3 marks)
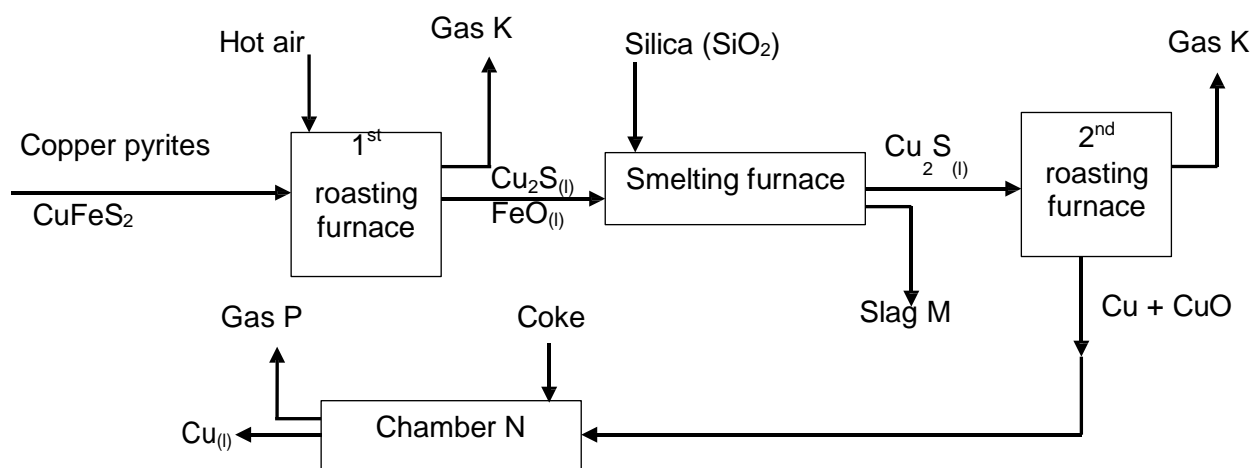
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Q7. The flow chart below outlines some of the processes involved during the extraction of copper from copper pyrites. Study it and answer the questions that follow.

a) (i) Name gas K …………………………………………………….……………….. (1 mark)

(ii) Write an equation for the reaction that takes place in the 1st roasting furnace (1 mark)

……………………………………………………………………….……………………….

(iii) Write the formula of the cation present in the slag …………………………….. (1 mark)

(iv) Identify gas P ……………………………………………………….. (1 mark)

(v) What name if given to the reaction that occurs in chamber N? Give a reason for your answer. (2 marks)

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b) The copper obtained from chamber N is not pure. Draw a well labelled diagram to show the setup you would use to refine the copper by electrolysis. (3 marks).

c) Given that the mass of copper obtained from the above extraction was 210kg. Determine the percentage purity of copper in the ore if 14000kg of it was fed into the 1st roasting furnace. (1 mark)

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d) Give two adverse effects of the process of extracting copper on the environment. (2 marks)

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