CHAMPIONS K.C.S.E CHEMISTRY

CHEMISTRY MOCKS 2016

Service Beyond expectation

TEL: 0725 733 640 (Marking Schemes available separately)

EMAIL:Cger89@gmail.com

FORM 1-4 CONTENT

CHAMPIONS CHEMISTRY MOCKS-2016

COMPILED BY MR. CHARLES O. GER
CONTACT: 0725 733 640
CHAMPIONS K.C.S.E REVISION SERIES EXECUTIVE COORDINATOR/EXAMINER HISTORY/AUTHOR CHAMPIONS K.C.S.E REVISION HISTORY AND GEOGRAPHY

233/1
CHEMISTRY

PAPER 1
JULY /AUGUST 2016

TIME: 2 HOURS

BARINGO COUNTRY EDUCATIONAL IMPROVEMENT EXAMINATION

Kenya Certificate to Secondary Education

INSTRUCTIONS TO CANDIDATES

- *Write your **name, admission number, date, index number** and school in the spaces provided*
- *Answer **all** the questions in the spaces provided*
- *All working **MUST BE** clearly shown where necessary*
- *Scientific calculators may be used*
- *Candidates should answer the questions in English*

FOR EXAMINER'S USE ONLY

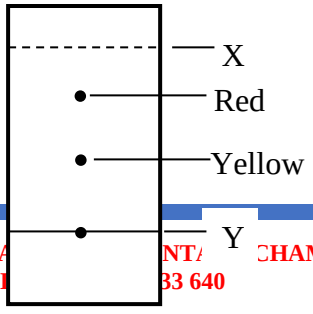
Questions	***Maximum score***	***Candidate's score***
1 – 30	80	

*This paper contains **11printed pages**. The candidates should check to confirm that all pages are printed and that no question is missing.*

1. (i) What is a fume chamber.
(1mk)

(ii) State 2 uses of fume chamber in a school laboratory
(2mks)

2. The chromatogram below shows the constituents of a flower extract. Study it and answer the questions.



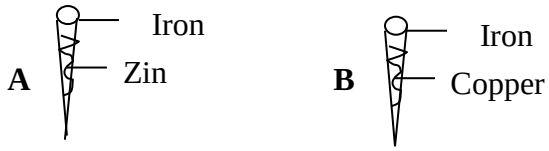
(a) Give a reason to explain the different positions of red and yellow pigments.
(2mks)

(b) What does the line labeled X represent?
(1mk)

3. (a) State the chemical name of rust
(1mk)

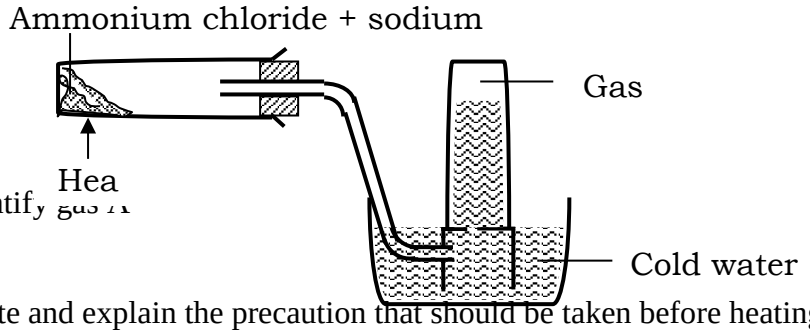
(b) Two iron nails were coated with zinc and copper as shown below

State and explain what was observed on each nail.
(2mks)



4. After a meal, bacteria in the mouth break down some food to produce organic acids, such as acetic acid and lactic acids. Therefore one is advised to brush his/her teeth using tooth paste containing fluoride compounds. Give a reason why.
(2mks)

5. A mixture of ammonium chloride and sodium nitrite was heated as shown in the set up below



(i) Identify gas X
(1mk)

(ii) State and explain the precaution that should be taken before heating is stopped.
(2mks)

6. Study the table below and answer the questions that follow.
(The letters are not the actual symbols of the elements)

Element	B	C	D	E	F
Atomic number	18	5	3	5	20
Mass number	40	10	7	11	40

(i) Which two letters represent the same elements? Give reason
(2mks)

(ii) Give the number of neutrons in an atom of element D. (Show your working)
(1mk)

7. Explain why red hot iron reacts with chlorine to form iron (III) chloride, but red hot iron reacts with iodine to form iron (II) iodine.
(1mk)

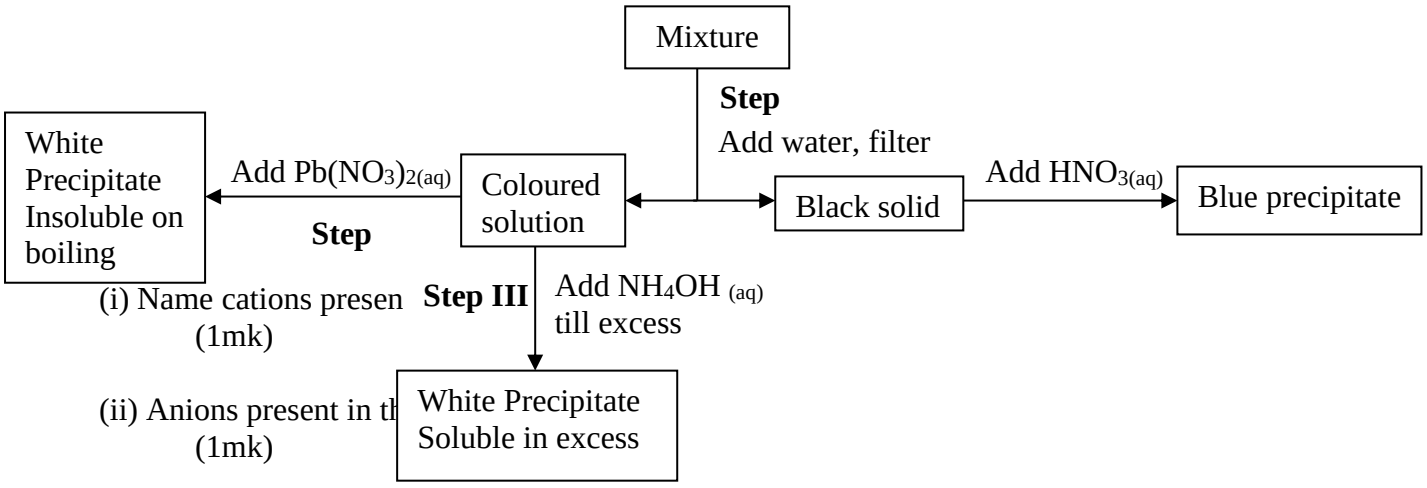
8. Explain the following trends in the periodic table
(i) Reactivity of alkali metals increases down the group.
(1mk)

(ii) The atomic radius of elements decreases across a period
(1mk)

9. Using dot(.) and cross(x) draw a diagram to represent carbon (II) oxide
(2mks)

10. When aluminium chloride is dissolved in water, an acidic solution is formed. Write the chemical equations to represent the observation made.
(2mks)

11. Study the flow chart below and answer the questionss



(i) Name cations presen
(1mk)

(ii) Anions present in th
(1mk)

(iii) Write an equation to show reaction taking place at step 3 .
(1mk)

12. State two gases found in water gas formed when carbon at about 1200˚C reduces steam (1mk)

13. (a) Explain why potassium carbonate cannot be manufactured by Solvay process.
(1mk)

(b) Write an equation for the reaction that takes place in the carbonator or Solvay tower.
(1mk)

(c) State one commercial use of soda ash.
(1mk)

14. (a) State the Gay Lussac's law .
(1mk)

(b) In an experiment 436cm^3 of hydrogen sulphide was exploded in 363cm^3 of oxygen and reacted as per the following equations

$2H_2S_{(g)} + 3O_{2(g)} \longrightarrow 2SO_{3(g)} + 2H_2O_{(g)}$

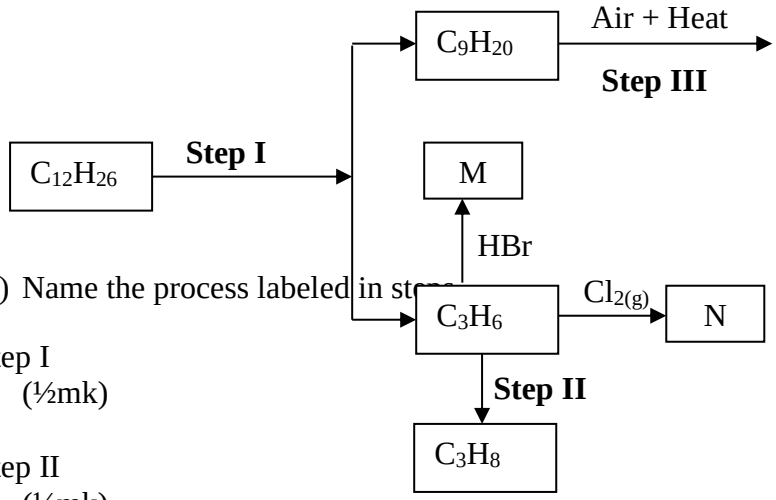
Determine the volume of the residue gas
(2mks)

15. **5.34g** of a salt of formula M_2SO_4 was dissolved in water. The sulphate was precipitated by adding excess barium chloride solution. The mass of the precipitate formed was **4.6g**.
(Ba=56, S=32, O=16)

(i) Determine the moles of sulphate ions present.
(1mk)

(ii) Calculate the relative atomic mass of M in M_2SO_4 .
(2mks)

16. Study the flow chart below and answer questions that follow:



(a) Name the process labeled in st[illegible]

Step I
(½mk)

Step II
(½mk)

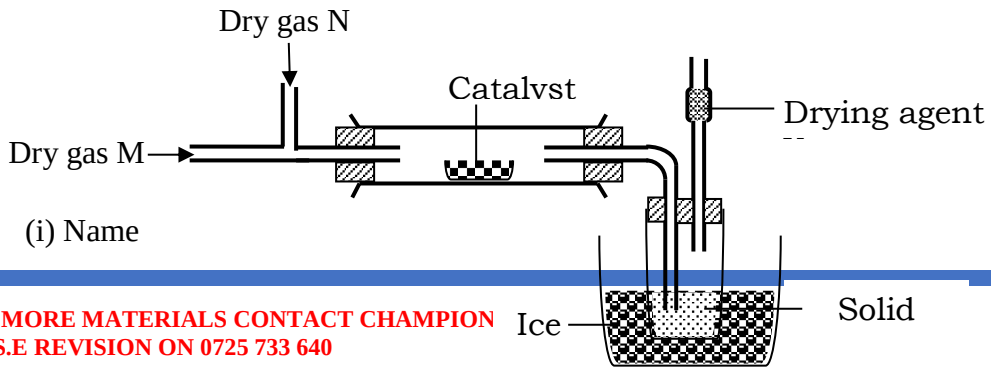
(b) State the physical condition required for step I to occur.
(1mk)

(c) Name the reagent and state the conditions required for step 2 to occur.
(1mk)

17. State one use of sulphur which is associated with.
(a) Medicine
(1mk)

(b) Agriculture
(1mk)

18. The set up of apparatus below used to prepare sulphur (VI) oxide :



(i) Name

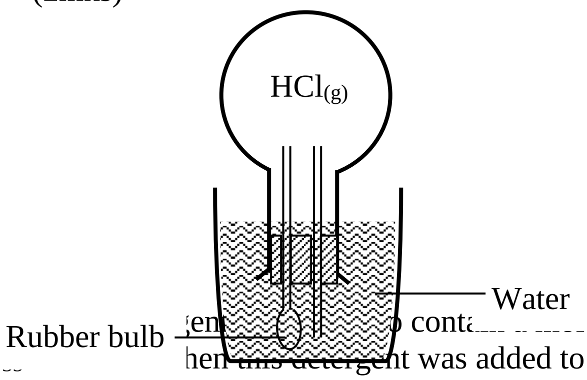
Gas N
(½mk)

Gas M
(½mk)

Catalyst X
(1mk)

(ii) Why is it necessary to use drying agent Y?
(1mk)

19. Consider the apparatus shown below when a small amount of water is introduced into the flask by squeezing the bulb of the medicinal dropper, water is squirted upward out of the long glass tubing. Explain this observation.
(2mks)



20. ... cule represented by the formula C_{17}... hen this detergent was added to a sample of water a white precipitate was formed.

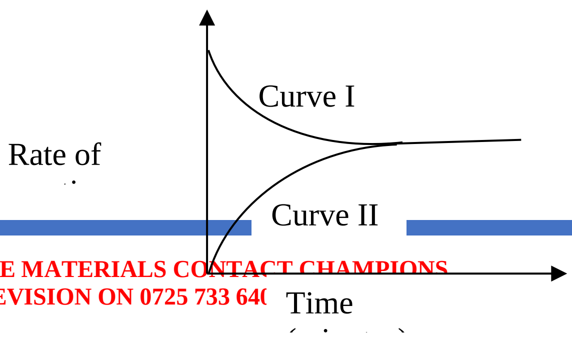
(i) State a possible reason for formation of the white precipitate .
(1mk)

(ii) Write down one possible formula of the white precipitate formed .
(1mk)

21. The solubility of salt X in water at 75^{0}C is 82g /100g of water, while that of salt Y is 37g/100g of water. Describe how a sample of salt Y can be obtained from their solid mixture. (2mks)

22. The figure below shows the variation in rates of the following reaction,

$$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)} \quad \Delta H = +Ve$$



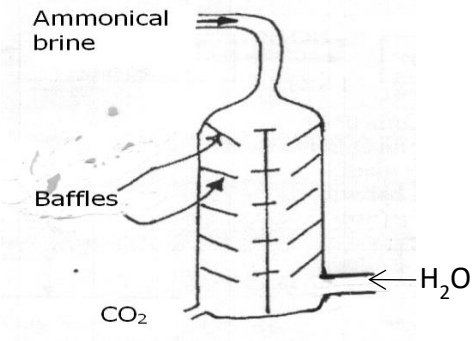
Other than concentration of either reactants or products, identify two other factors that can affect the rate of reaction above. Explain your answer.
(2mks)

23. In the industrial production of aluminium a current of 300,000A is passed through molten aluminium oxide for 24 hours. Calculate the mass of aluminium produced at the cathode. (Al =27, 1F=96500C)
(3mks)

24. (a) Radioactive materials pollutes the environment with great effects. State two ways of controlling the effects of radioactive material to the environment
(2mks)

(b)In a sample, there are $5.12x10^{20}$ atoms of Krypton 92 initially. If half-life of Krypton is 3.0 seconds, determine the number of atoms that will have decayed after 6 seconds.
(2mks)

25. Study the Solvay tower diagram shown below and answer the questions that follow:



(a) Give reasons why the baffles are used in the Solvay .
(2mks)

(b) A factory produces 63.6 tonnes of anhydrous sodium carbonate on a certain day by this process. Calculate the number of tonnes of sodium chloride used upon on this particular day. Assume the plant is working 100% efficient (C=12 , H=1, Cl=35.5, Na =23) (2mks)

26. When reacting sulphur (IV) oxide and hydrogen sulphide gases, some traces of water vapour is required for the reaction to occur.

(i) State the role of water vapour
(1mk)

(ii) Write the equation for the reaction that occurs .
(1mk)

(iii) Identify the reducing agent in the reaction in (b) above.
(1mk)

27. (a) Give the IUPAC names of the compounds listed below
(2mks)

(i) $CH_2Br\ CHBrCH_2CH_3$

(ii) $CH_2= CH =CH\ CH_3$

(b) Draw the structural formula of 2, 3- dimethylbutane
(1mk)

28. (a) The terms malleability and ductility are commonly used in chemistry. What is meant by the terms:

(i) Malleability
(1mk)

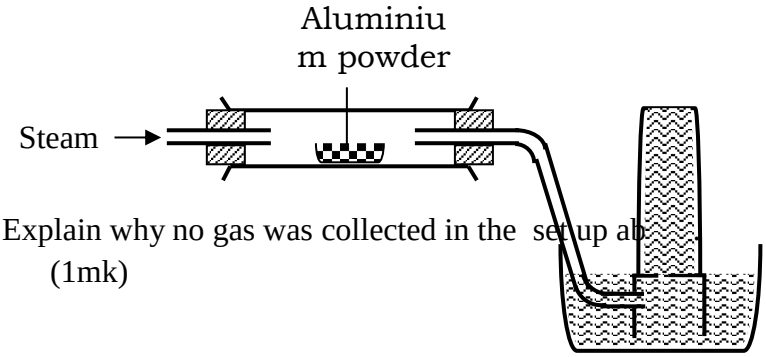
(ii) Ductility
(1mk)

(c) Name and write chemical formula for the slag formed during extraction of the following metals.

(i) Copper
(1mk)

(ii) Iron
(1mk)

29. Study the diagram below used to investigate the property of steam on aluminium



(a) Explain why no gas was collected in the set up ab
(1mk)

(b) Explain why the reaction between aluminium and steam stops after a short time
(2mk)

30. (a) State Hess law.
(1mk)

(b) Study the bond energies below and answer the questions that follow

Bond	Bond Energy kJ/mole
H−H	436
N−H	388

≡

N−N	944

Calculate heat of formation of one mole of ammonia gas from the equation below
$N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$
(3mks)

233/2
CHEMISTRY
Paper 2
(THEORY)
July/August, 2016
2 hours
BARINGO COUNTY EDUCATIONAL IMPROVEMENT EXAAMINATION – 2016
Kenya Certificate of Secondary Education (KCSE)
CHEMISTRY
Paper 2
Instructions

- ✓ *Write your name and index number in the spaces provided above.*
- ✓ *Sign and write the date of examination in the spaces provided above.*
- ✓ *Answer **all** the questions in the spaces provided*
- ✓ *Silent electronic calculators may be used.*
- ✓ *All working **must** be clearly shown where necessary.*
- ✓ ***This paper consists of 12 printed pages.***
- ✓ ***Candidates should check the question paper to ensure that all the pages are printed as indicated and that no questions are missing.***

For Examiner's use only

Question	Maximum Score	Candidate's Score
1	13	
2	12	
3	12	
4	10	
5	11	
6	10	
7	12	
Total Score	80	

1. The grid below shows part of the periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

			A			B	C	D	
E	F								
							G		
H									

(a) Give the name of the family to which element F belongs. (1mk)

(b) Identify an element which forms a stable divalent anion (1mk)

(c) Give the formula of:

(i) The compound formed between A and B (½mk)

(ii) The sulphate of H (½mk)

(d) Using dot(.) and cross(x) diagram, show the bonding in the compound formed between E and C.

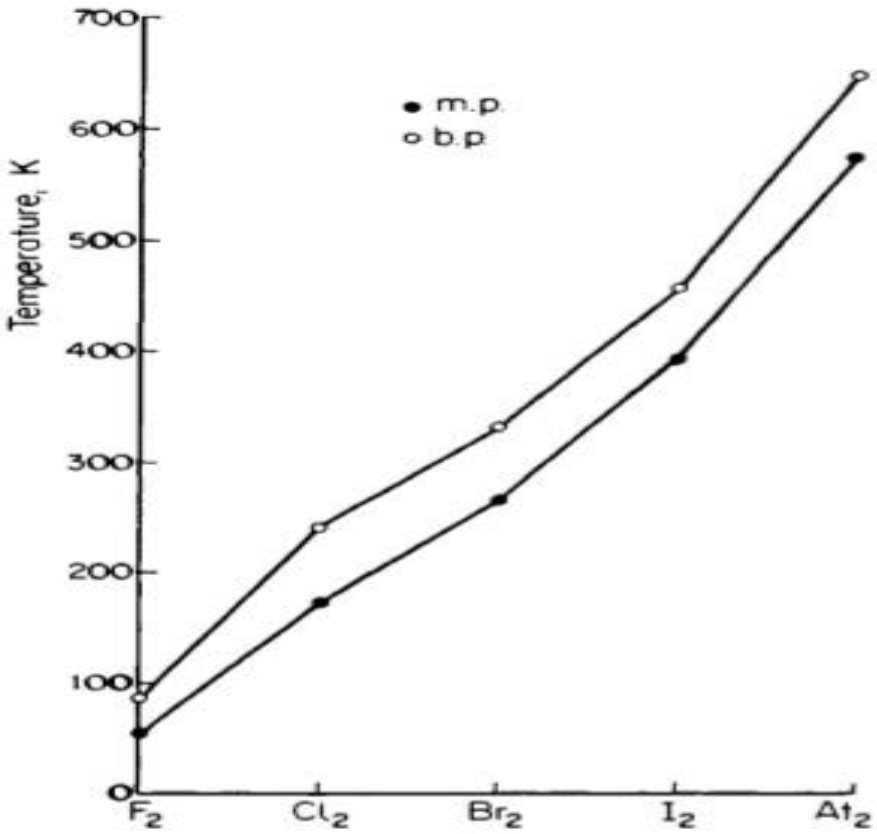
(2mks)

(e) Compare the atomic radii of elements C and D. Explain. (2mks)

(f) Select the element that has the lowest ionization energy. Explain. (1mk)

(g) 0.081g of element A reacts with $20cm^3$ of dilute hydrochloric acid. Calculate the molarity of the hydrochloric acid. (R.A.M = 27)
(3mks)

(h) The graph below shows the trend of the melting points and the boiling points of the family to which element G belongs. Explain the trend in the melting points. (2mks)



2 (a) (i) What is a fuel? (1 mk)

(ii) Calculate the heating value of propane, C_3H_8, given that its molar enthalpy of combustion is 2200 kJ mol^{-1}. . (2 mks)

(C=12, H=1)

(b) (i) Define molar enthalpy of combustion. (1 mk)

(ii) Use the information provided by the thermochemical equations below to calculate the molar enthalpy of combustion of ethyne. (3 mks)

$C(s) + O_2(g) \longrightarrow CO_2(g)$ $\Delta H = -394$ kJ mol^{-1}

$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g)$ $\Delta H = -286$ kJ mol^{-1}

$2C(s) + H_2(g) \longrightarrow C_2H_2(g)$ $\Delta H = +226$ kJ mol^{-1}

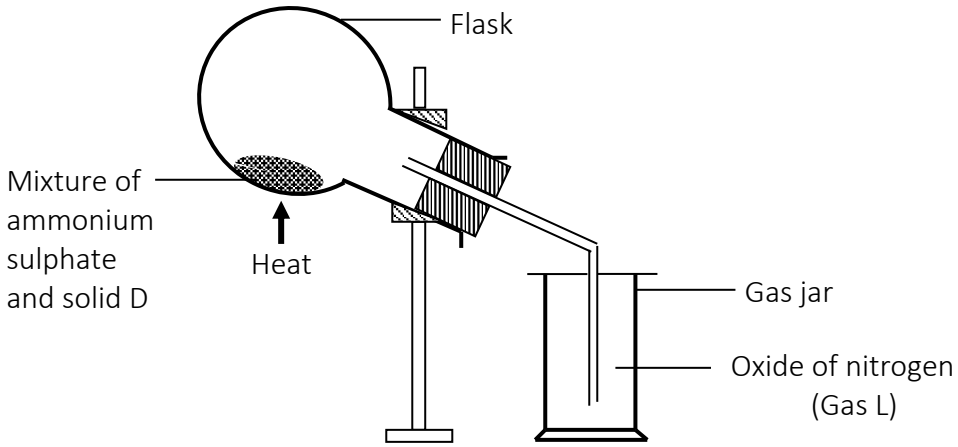
(c) Study the data given below and answer the questions that follow.

Substance/ion	Enthalpy change
$CaCl_2(s)$	Lattice energy = -2237 kJ mol^{-1}
$Ca^{2+}(g)$	Hydration energy = -1650 kJ mol^{-1}
$Cl^-(g)$	Hydration energy = -364 kJ mol^{-1}

(i) Determine the molar enthalpy of solution of calcium chloride in water. (2 mks)

(ii) Draw an energy level diagram for the dissolution of calcium chloride in water. (3 mks)

2. (a) The diagram below shows the preparation of an oxide of nitrogen. Study the diagram and answer the questions that follow.



(i) Name the solid D.
(1mk)

(ii) Write the equation for the reaction in the flask M (1mk)

(iii) Burning magnesium ribbon was lowered into the gas jar containing gas L. State and explain the observations made.
(2mks)

(iv) Write the two equations for the reactions taking place in (iii) above. (2mks)

I.

II.

(v) A drop of water was added to the product formed in (iii) above. A colourless gas **K** with a choking smell was produced. Write the chemical equation for the production of gas **K**

(1mk)

(b) (i) Give **two** uses for nitric (V) acid.
(2mks)

(ii) A factory uses nitric (V) acid and ammonia gas as the only reactants for the preparation of ammonium nitrate. If the daily production of the ammonium nitrate is 4800kg, calculate the mass of ammonia gas used daily in kg. (N=14.0, O = 16.0 H= 1.0) (3 mks)

4. A group of form four students of Cockelbet Secondary School carried out an experiment to determine the solubility of potassium chlorate. The table below shows the results obtained.

Total volume of water added(cm^3)	10.0	20.0	30.0	40.0	50.0
Mass of $KClO_3$(g)	5.0	5.0	5.0	5.0	5.0
Temperature at which crystals appear(^0C)	80.0	65.0	55.0	45.0	30.0
Solubility of $KClO_3$(g/100gH_2O)					

(a) Complete the table to show the solubility of $KClO_3$ at different temperatures. (3mks)

(b) Plot a graph of mass of $KClO_3$ per 100g water against temperature at which crystals form. (3 mks)

(c) From the graph, determine ;

(i) The solubility of $KClO_3$ at 40°C. (1mk)

(ii) The temperature at which the solubility of $KClO_3$ is 35g/100g water. (1mk)

(d) Explain the shape of the graph. (1mk)

(e) State **one** application of solubility and solubility curves. (1mk)

5. (a) Use the standard reduction potentials for elements P, Q, R, S and T given below to answer the questions that follow. (The letters do not represent the actual symbols of the elements).

		E^{θ} (Volts)
P^{2+} (aq) + 2e	$\rightleftharpoons$ P (s)	- 2.90
Q^{2+}(aq) + 2e	$\rightleftharpoons$ Q (s)	-2.36
R^{+} (aq) + e	$\rightleftharpoons$ ½R_2 (g)	0.00
S^{2+} (aq) + 2e	$\rightleftharpoons$ S (s)	+ 0.33
½ T_2 (g) + e	$\rightleftharpoons$ T^{-} (aq)	+2.86

(i) Which element is likely to be hydrogen? Give a reason for your answer.

(1½mks)

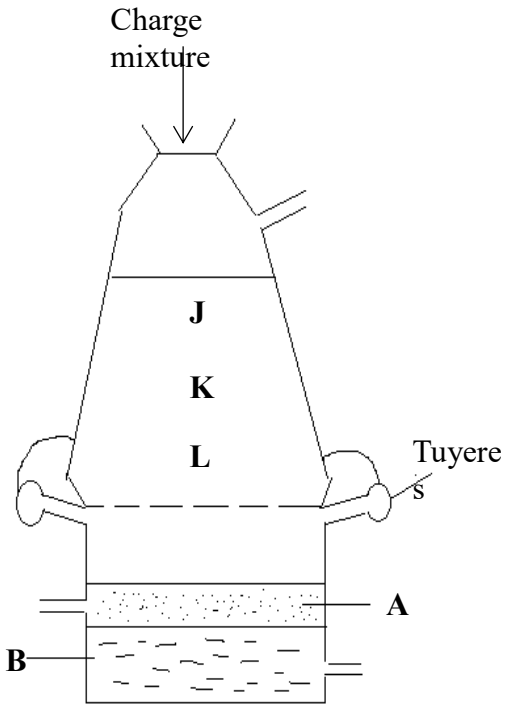
(ii) What is the E^{θ} value of the strongest reducing agent?
(1mk)

(iii) A form four student chose $S^{2+}_{(aq)}$ / $S_{(s)}$ as the reference half-cell. Use the space at the right side of **E^{θ} Volts)** to rewrite the **E^{θ}** values of the above half-cells.
(2½mks)

(iv) In the space provided below draw a labeled diagram of the electrochemical cell that would be obtained when half-cells of elements Q and S are combined.
(3mks)

(b) An iron spoon is placed in an electrochemical cell with $AuCl_3$ solution to be gold plated. How long must the spoon be in the electrolytic cell if the spoon is to be plated with 0.293 g of Au and the current of the cell is 1.03A. (RAM of Au =197; 1F = *96,485 C*).
(3mks)

6 The diagram below represents a blast furnace used for the extraction of iron.



(a) Name three substances contained in the charge mixture. (1½mks)

(b) Name the substances labeled A and B. (2mks)

A……

B……

(c) Arrange regions J, K and L in order of decreasing temperature. (1mk)

(d) Write an equation for the reaction that occurs in region L. (1mk)

(e) What is the function of the tuyeres? (1mk)

(f) Distinguish between cast iron and wrought iron.
(1mk)

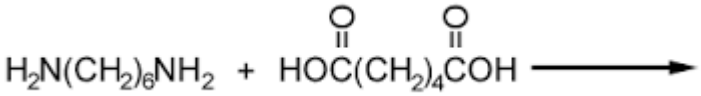
(g) Write an equation for the reaction between heated iron and chlorine. (1mk)

(h) Iron-60 is a radioisotope of iron (half-life 2.6×10^6 years). Its ultimate decay product is nickel-60. Write a nuclear equation for this process.
(Atomic numbers: Fe= 26, Ni= 28) (1mk)

(i) State one use of stainless steel. (½mks)

7. (a) Draw and name all the isomers of C_4H_6
(2mks)

(b) The following monomers react to form a polymer:



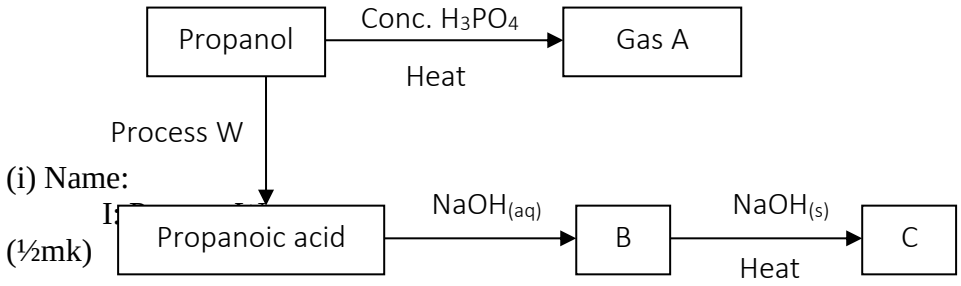
Draw and name the structure of the polymer
(2mks)

(c) Chlorofluorocarbons have a wide range of uses. However they have been linked to depletion of ozone.

(i) Explain the problem caused by depletion of ozone layer. (1mk)

(ii) Give one other environmental problem caused by chlorofluorocarbons. (1mk)

(d) Study the flow chart below and use it to answer the questions that follow.



(i) Name:
I:
(½mk)

II: Substances A, B and C
(1½mks)
A:
B:
C:

(ii) Write an equation for the combustion of substance C
(1mk)

(iii) Give one use of gas A
(1mk)

(e) Explain how a sample of propan-1-ol could be distinguished from a sample of propanoic acid by means of a chemical reaction
(2mks)

233/1
CHEMISTRY
Paper 1

Time: 2 hours

EKSIKA MOCK 2016

Kenya Certificate to Secondary Education

CHEMISTRY PAPER 1

INSTRUCTIONS TO CANDIDATES

- *Write your name, admission number, date and school in the spaces provided.*
- *Answer all the questions in the spaces provided.*
- *All working must be clearly shown where necessary.*
- *Scientific calculators may be used.*

FOR EXAMINERS' USE ONLY

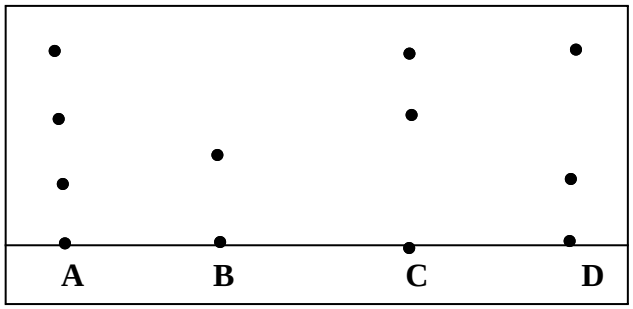
Questions	Maximum Score	Candidate's Score
1 – 31	**80**	

This paper consists of **13** printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.

1. Elements X and Y reacted forming a compound Z. the compound has the following properties
   i) It does not conduct electricity in solid state
   ii) It has low melting and boiling points
   a) What is the nature of elements X and Y
   1mk

   b) What type of structure does compound Z have
   1mk

2. The following chromatogram was obtained from an experiment to investigate the component of a certain dye

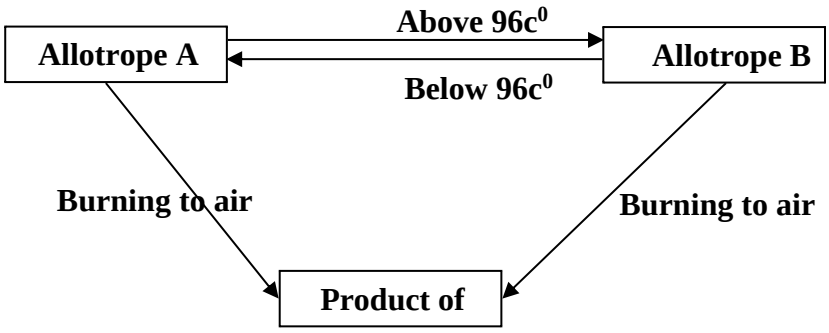


a) Which two dyes when mixed would produce A
1mk

b) Which dye is pure
1mk

c) Indicate on the diagram the probable position of the solvent front
1mk

3. The flow chart below shows some properties of two allotropes of element P



a) Name allotrope A
1mk

b) Write an equation to show the formation of the product of P
1mk

c) What does 96^0 C
1mk

4. Study the equation and answer the questions that follows

   $2SO_2(g)+O_2(g) \rightleftharpoons 2SO_3(g) \Delta H=-197Kj$

   a) Suggest two changes to which the yield of sulphur (vi) oxide could be improved
   2mks

   b) Determine the molar heat of formation of SO_3 from SO_2 and O_2
   1mk

5. In an experiment soap solution was added to three separate water samples. The table below shows the volumes of soap solution required to form lather with $100cm^3$ of each water sample before and after boiling

	sample		
	A	**B**	**C**
Volume of soap before boiling (cm^3)	**27**	**3**	**10.6**
Volume of soap after boiling (cm^3)	**27**	**3**	**3**

Which water sample is likely to be;

a) Soft water
   1mk

b) Water with temporary hardness
   1mk

c) Water with permanent hardness
   1mk

6. 5.0g of calcium carbonate were allowed to react with $25cm^3$ of 0.1M hydrochloric acid until there was no further reaction. Calculate the mass of calcium carbonate that remained unreacted. (Ca=40.0,C=12.0, O=16)
   3mks

7. Silicon has three isotopes such as silicon-X, silicon-29 and silicon-30. Their percentages abundance are 92%, 5% and 3% respectively

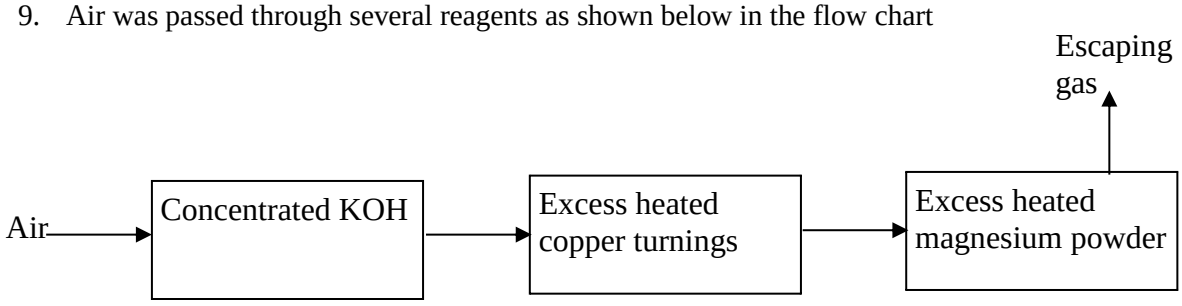
a) Given that the relative atomic mass of silicon is 28.11, determine the value of X
2mks

b) Identify the most stable isotope. Give a reason for your answer
1mk

8. i) Starting with calcium oxide, describe how a solid sample of calcium carbonate can be prepared in the laboratory
3mks

ii) State one use of calcium oxide
1mk

9. Air was passed through several reagents as shown below in the flow chart



a) Write an equation for the reaction which takes place in the chamber with magnesium powder
1mk

b) Name one gas which escapes from the chamber. Give a reason for your answer
2mks

10. Draw a setup that can be used to separate a mixture of sand and ammonium chloride
3mks

11. Study the table below and use it to answer the questions that follow

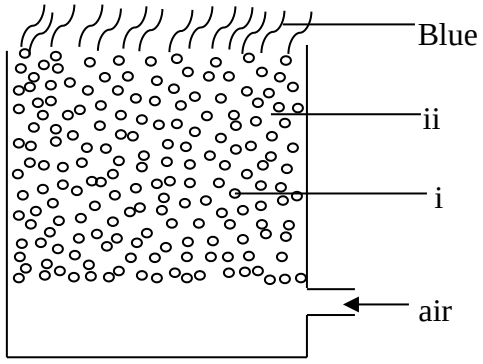
	Add sodium carbonate solution	Add few drops of phenolphthalein
Substance X	No effervescence	pink
Substance Y	Effervescence occurs	colorless
Substance Z	No effervescence	colorless

i) Which substance contains hydrogen ions
1mk

ii) Which substance could be sodium chloride solution
1mk

iii) Which substance could react with an acid to form salt and water only
1mk

12. The diagram below represents a charcoal burner. Study it and answer the questions that follow



Write an equation for the reaction taking place at I and ii
i-
1mk

ii-

1mk

ii) What safety precautions should be taken when using the charcoal burner

1mk

13. a) A gaseous hydrocarbon contain 80% carbon by mass. Determine it empirical formula (C=12, H=1)

$1^{1}/_{2}$mk

b) Given that 0.3g of the hydrocarbon occupy a volume of 224 cm^3 at s.t.p, determine its molecular formula (C=12, H=1) , molar gas volume at s.t.p =22.4 dm^3

$1^{1}/_{2}$mk

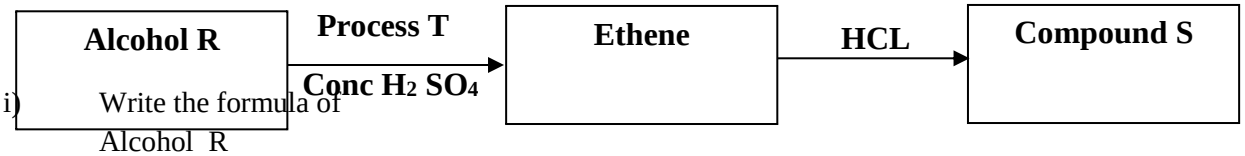
14. a)State Charles law

1mk

b) The volume of a sample of nitrogen gas at a temperature of 291k and $1.0x10^5$ pascal was $3.5x10^{-2}m^3$. Calculate the temperature at which the volume of the gas would be $2.8x\ 10^{-2}m^3$ at $1.0x10^5$ pascal

2mks

15. Study the following flow chart and answer the questions that follow



i) Write the formula of

Alcohol R

1mk

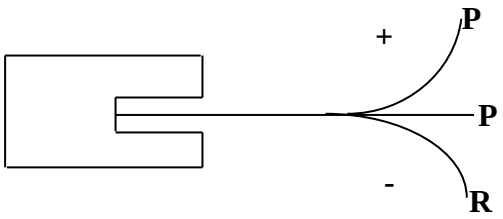
Compound S

1mk

ii) Name process T

1mk

16. Study the diagram below and use it to answer the questions that follow



a) Name;

i) Radiation represented by Q

$^1/_2$mk

ii) Radiation represented by R

$^1/_2$mk

iii) Explain why radiation P is deflected more than R

1mk

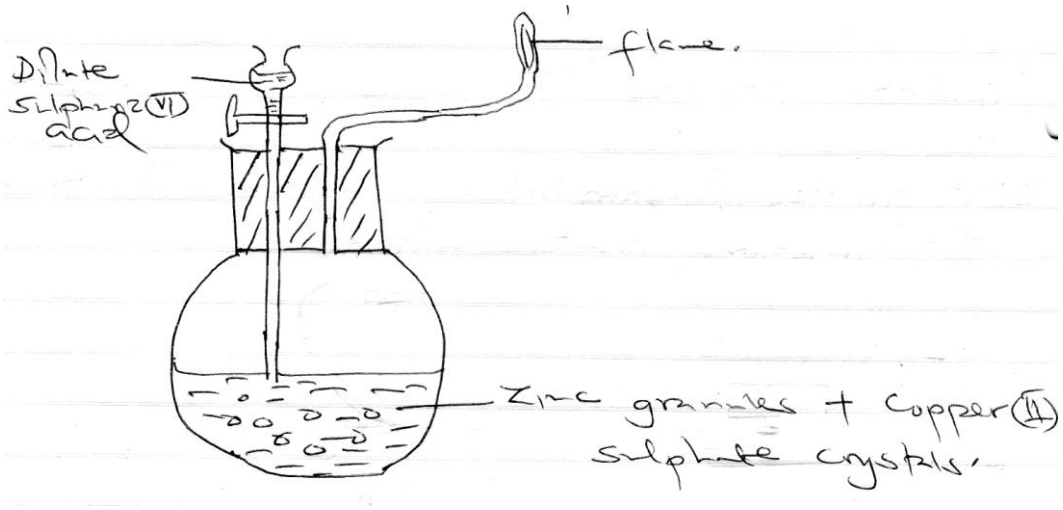
b) Study the symbols below and answer the questions that follow.

$$^{208}_{82}X \quad ^{212}_{83}Y \quad ^{212}_{82}Z \quad ^{226}_{86}A$$

Note that the letters are not the actual symbols of the elements. Name any two letters that are isobars. Explain

2mks

17. Study the diagram below and answer the questions that follow



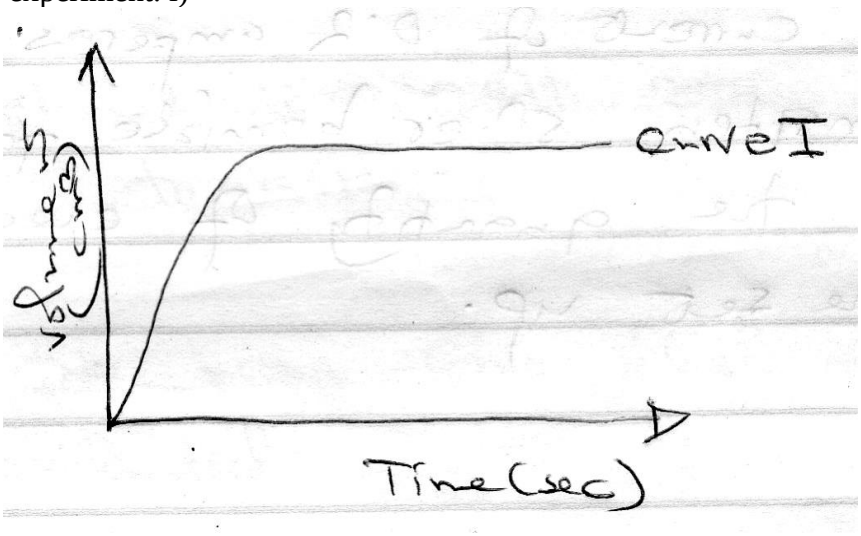
a) Write three equations for the reaction that takes place in the set up above
3mks

b) State the role of copper (ii) sulphate crystal in the set up
1km

18. the table below describe three experiment on reaction of excess sulphate (vi) acid with 0.5g of zinc done under different conditions. In each case the volume of gas produced was recorded at different time intervals

Experiment	Form of zinc	Concentration H_2SO_3
I	Powder	0.8M
Ii	Powder	1.0M
iii	Granules	0.8M

The graph below was obtained when volume of gas produced was plotted against time to experiment. i)



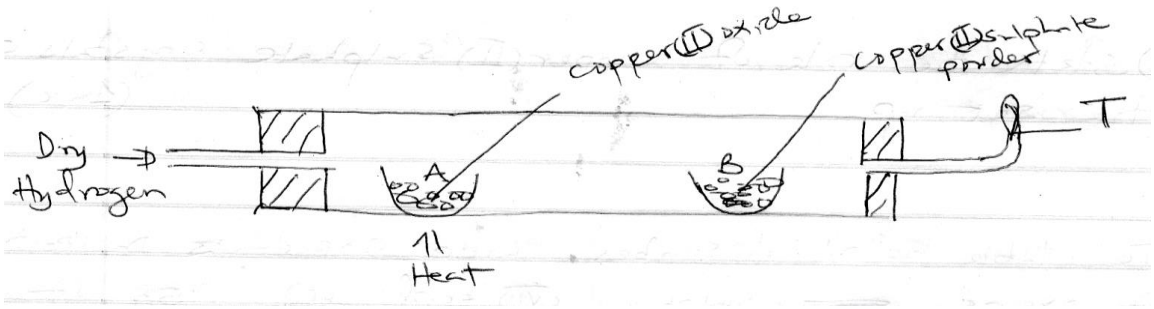
a) On the same axes above, sketch and label curves experiments ii& iii

2mks

b) A part from concentration ,name the other factor which affect the rate of reaction that was being investigated

1mk

19. The diagram below was used to investigate some property of hydrogen. Study it and answer the questions that follow.



i) State two observations that would be made at the of the experiment

2mks

ii) Why is it necessary to burn gas at point T

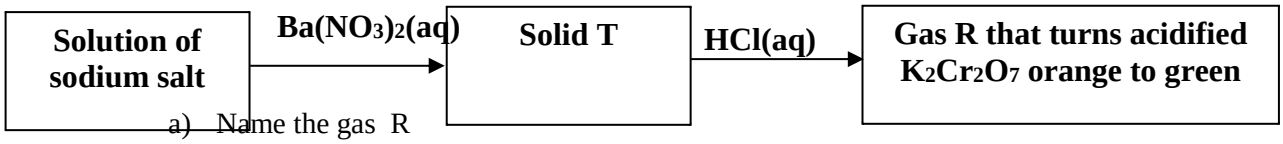
1mk

iii) Write an equation for the reaction that occurs at A
1mk

20. A steady current of 0.2 amperes was passed through molten silver bromide for 80 minutes.
a) Calculate the quantity of electricity passed through the set up.
1mk

b) Calculate the mass of products deposited at the cathode
(1F=96500C,Ag=108,Br=80) 3mks

21. Study the flow chart below and answer the questions that follow



a) Name the gas R
1mk

b) Write ionic equation for formation of solid T
1mk

c) Use the information in (b) to write chemical equation for the reaction between solid and dilute hydrochloric acid
1mk

22. Name the process which takes place when;
a) A red litmus paper turns white when dropped into chlorine water
1mk

b) Propane gas molecules are converted into a giant molecule
1mk

c) White phosphorus melts into a ball when exposed to air
1mk

23. a) Name two ores from which zinc metal mostly extracted
1mk

b) One of the steps to the extraction of zinc metal from its ore is roasting of the ore in excess oxygen. Write an equation for the reaction that takes place when the ore in (a) above is roasted 1mk

24. The nitrates of the metal A,B &C were heated over a Bunsen burner flame . The table below shows the products of the reaction. (A,B & C are not the actual symbols of the metals)

Nitrate of metals	Products
A	Metal nitrate and oxygen
B	Metal, nitrogen (iv) oxide and oxygen
C	Metal oxide, nitrogen (iv) and oxygen

a) State the chemical family that metal A belongs to
1mk

b) Name one metal that is likely to be B
1mk

c) Arrange the metals above in order of reactivity starting with the least reactive
1mk

25. a) Define the term molar heat of centralization
1mk

b) The rise to temperature when 50cm^3 of sodium hydroxide is reacted with two acids is given in the table below

Acid	50cm^{3}of Hcl	50cm^3 oxalic acid
Temperature rise (0c)	7	4

Explain the difference to temperature
2mks

26. Carbon (iv) oxide, methane, nitrogen (i) oxide and trichloromethane are green hones gases

i) State one effect of an increased level of these gases to the environment
1mk

ii) Give one source from which each of the following gases is released to the environment;

a) Nitrogen (i) oxide
$^1/_2$mk

b) Trichloromethane
$^1/_2$mk

233/2
CHEMISTRY
Paper 2
MAY/JUNE, 2016
Time: 2 Hours

EKSIKA JOINT EVALUATION TEST

K. C. S. E. (Kenya Certificate of Secondary Education)
233/2
CHEMISTRY
Paper 2
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

- *Write your name and index number in the spaces provided.*
- *Answer **all** questions in the spaces provided*
- *Mathematical tables and silent electronic calculators **may** be used for calculations.*
- *All workings **must** be clearly shown where necessary.*

- *Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*

For Examiners Use Only

Questions	Maximum Score	Score
1		
2		
3		
4		
5		
6		
7		
8		
TOTAL	**80**	

1. Study the table below and answer the questions that follows

Ions	A^+	B^{2+}	C^-	D^{2-}
Electronic configuration	2:8	2:8	2:8:8	2:8:8

i) Compare how the reactive of ions A^+ and C^-
1mk

ii) Explain how the reactivity of C and D. Compare
2mks

iii) 2.5g of A reacts completely with 1.2dm^3 of gas C at s.t.p

a) Write a balanced chemical equation for the reaction between A and C
1mk

b) Determine the RAM of A (molar gas volume at s.t.p 22.4dm^3)
3mks

c) State two observations that would be made when A is dropped in water in a trough
2mks

iv) a) Draw a dot (.) and cross (x) diagram for the $ALCL_3 .NH_3$
(A1=13,N=14,H=1,CL=17)

1mk

b) What type of bond is formed between $AICL_3$ and NH_3
1mk

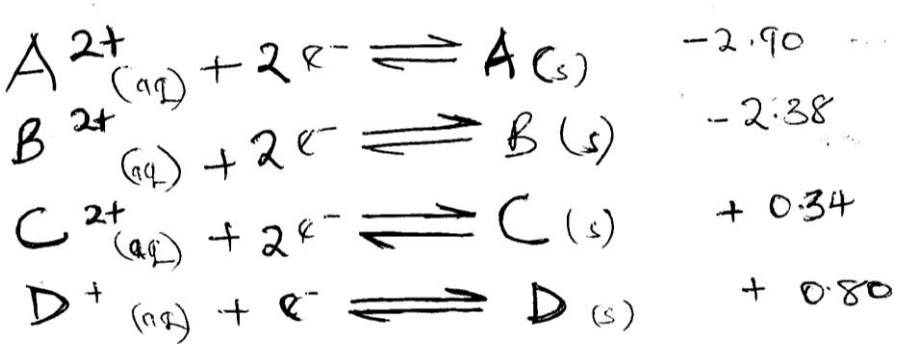
v). An element X is just below carbon in the periodic table. State the type of structure its oxide would exhibit
1mk

2. a) During the electrolysis of concentrated copper (ii) chloride using graphite electrode, a current of 0.4 amperes was passed through the cell for 5 hours
i) Write an ionic equation for the reaction that took place at the cathode
1mk

ii) Calculate the volume of chlorine liberate at the anode (Molar gas volume at r.t.p 24.0dm^3, IF=96500C
2mks

iii) What observation would be made at the cathode 1mk

b) Use the standard electrode potentials for elements A,B,C and D given below to answer the questions that follows. The letters are not then actual symbols of the elements



i) Compare the oxidizing power of C^{2+} and D^{+}
1mk

ii) An aqueous solution containing B^{2+} ions are placed in a container made of A. determine whether a reaction occur or not. Showing how you arrive to your answer
2mks

iii) in the space provided , draw a well labeled diagram of an electrochemical cell that would be obtained when half-cells of elements B and C are combined
3mks

c) What is the E^0 value of the electrochemical cell constructed in b (iii) above
1mk

d) Which species is the most powerful oxidizing agent
1mk

3.a) State Hess's law
1mk

b) Use the information below to answer the questions that follow. X is not the actual symbol of the element.

$X_{(S)} + {}^{1}/_{2}O_{2(g)} \longrightarrow XO_{(s)}$ $\Delta H = -635kj/mole$
$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H = -394kj/mole$

$X_{(s)} + C_{(S)} + {}^{3}/_{2}\, O_{2(g)} \longrightarrow XCO_{3(s)}$ $\Delta H = -1207kj/mole$

Calculate the enthalpy for the reaction below
2mks

$XCO_{3(s)} \xrightarrow{heat} XO_{(s)} + CO_{2(g)}$

c) Use the following information to answer the questions that follow

$\Delta H^{\ominus}_{latH}$ $MgCl_2 = -2489\ kJ/mole.$
$\Delta H^{\ominus}_{Hyd}$ $Mg^{2+}_{(g)} = -1891\ kJ/mole.$
$\Delta H^{\ominus}_{Hyd}$ $Cl^{-}_{(g)} = -384\ kJ/mole.$

i) Draw an energy level diagram for the dissolving of magnesium chloride ($MgCl_{2(s)}$)

2mks

ii) Calculate the heat of solution of magnesium chloride

2mks

d) Use the equation below to answer the questions that follow.

$Zn(s)+Cu^{2+}(aq) \longrightarrow Zn^{2+}+Cu(s)$

i) What type of enthalpy change is shown on the equation above

1mk

ii) If Zinc powder reacted completely with $50cm^3$ of 0.25M copper (ii) sulphate solution. Calculate the mass of zinc powder used in the above reaction (Zn=65)

2mks

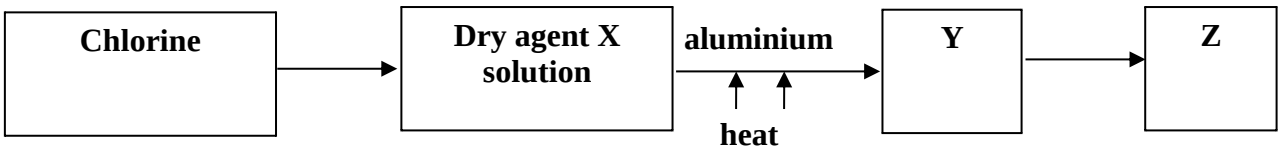
iii) What observations would be made during the reaction above

2mks

e) If this experiment was repeated with magnesium powder instead of zinc powder, how would you expect the molar enthalpy of that reaction to compare with the obtained would be obtained in (d) above

1mk

4. Below is a sketch required to investigate the reaction between chlorine and heated aluminium. Use it to answer the questions that follow



a) i) Name a suitable drying agent X
1mk

ii) Write the formula of the product collected in Y
1mk

iii) Box Z contains a chemical reagent used to absorb excess chlorine

a) Name the reagent 1mk

b) Apart from absorbing excess chlorine , what other role does the chemical reagent in (iii) above play 1mk

b) Using dots (.) and crosses (x) Al_2Cl_6 (Al=13, Cl=17)
1mk

c) Write an equation for the reaction between potassium manganate (vii) crystals and concentrated hydrochloric acid that lead to production of chlorine
1mk

d) Study the information in the table below and the questions that follow

Formula of compound	NaCl	$AlCl_3$	$SiCl_4$
Boiling point(0l)	1470	Sublimes	60
Melting point(0l)	800	sublimes	-7

I) Why does the $AlCl_3$ sublimes when heated
1mk

II) Explain why when sodium chloride (Nacl) is dissolved in water, the PH of the solution formed is 7 while when $AlCl_3$ dissolved in water the PH of then solution formed is 3
2mks

III) What type of structure does $AlCl_3$ dimer exhibit
1mk

IV) Which chloride above is a liquid at room temperature
1mk

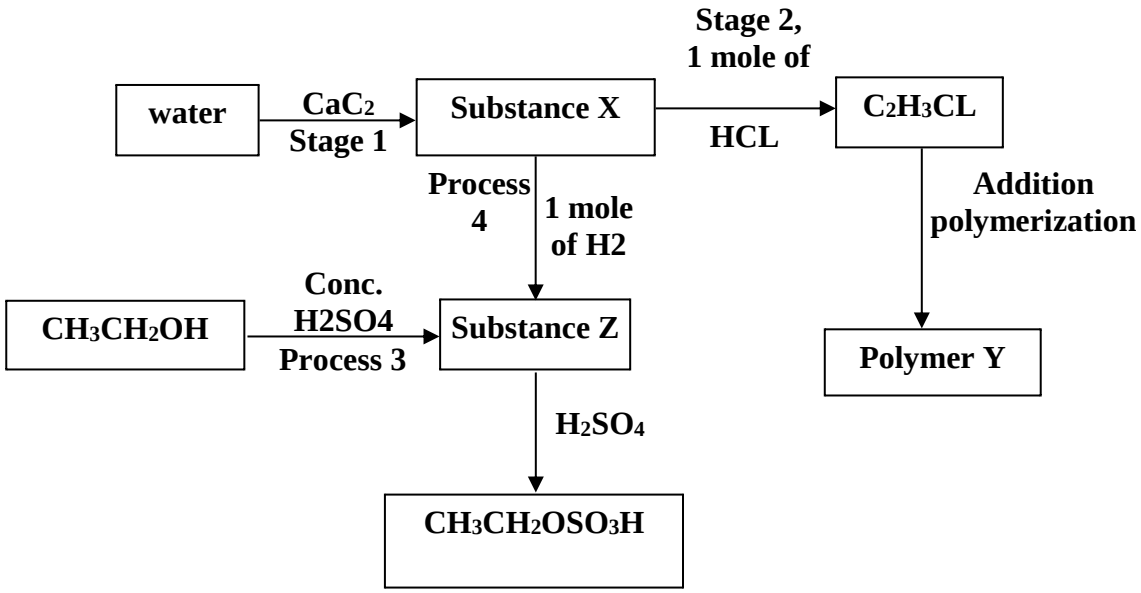
f) The table below shows results obtained when the first four halogens of the periodic table were reacted with their halides. A cross (x) shows no reaction and a tick (√) a reaction occurred

Halogens	Halide ions			
	A	B	C	D
A		X	X	X
B	√		X	X
C	√	√		√
D	√	√	X	

i) Which halide ion is the strongest reducing agent
1mk

ii) Arrange the halogens in order of reactivity least reactive
1mk

5. Study the reaction scheme below and answer the questions that follow



a) Identify substances
3mks

X

Y

Z

b) Draw the structural formula of polymer Y
1mk

c) What type of reaction is shown in process 3
1mk

d) Write an equation for the reaction between CaC_2 and water in stage 1
1mk

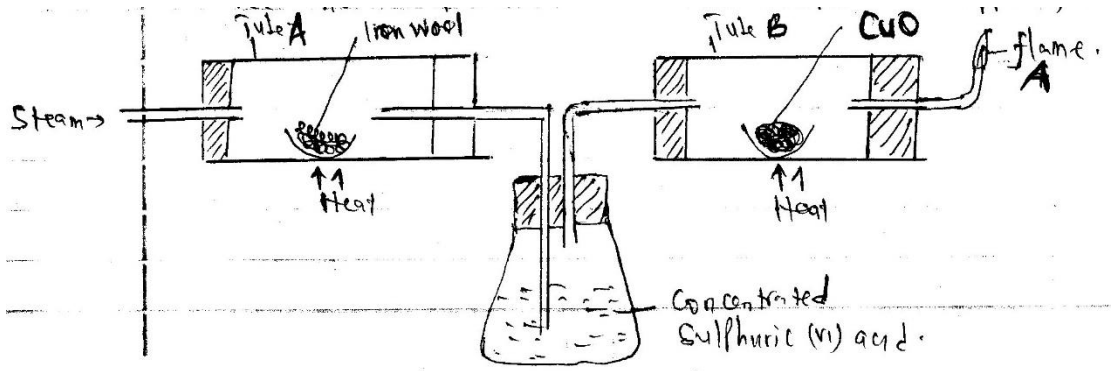
e) Name the conditions needed for the process 3 and 4
2mks

Process	conditions
Process 3	
Process 4	

f) Describe a simple chemical process that can be used to differentiate CH_3CH_2OH and CH_3COOH
2mks

g) If the molecular mass of polymer Y is 50,000. Calculate the number of monomers in it
2mks
(C=12, H=1, Cl=35.5)

6. In the experiment, steam was passed over heated iron wool as shown in the diagram below. The gas produced was then dried and passed through heated copper (ii) oxide



a) Write an equation for the reaction between steam and iron
1mk

b) What observation would be made in tube B at the end of reaction? Explain
2mks

c) What precaution should be taken into consideration before lighting the gas at A
1mk

d) What type of reaction takes place in the tube B
1mk

e) Give TWO uses that are for both carbon(ii) oxide and hydrogen gases
2mks

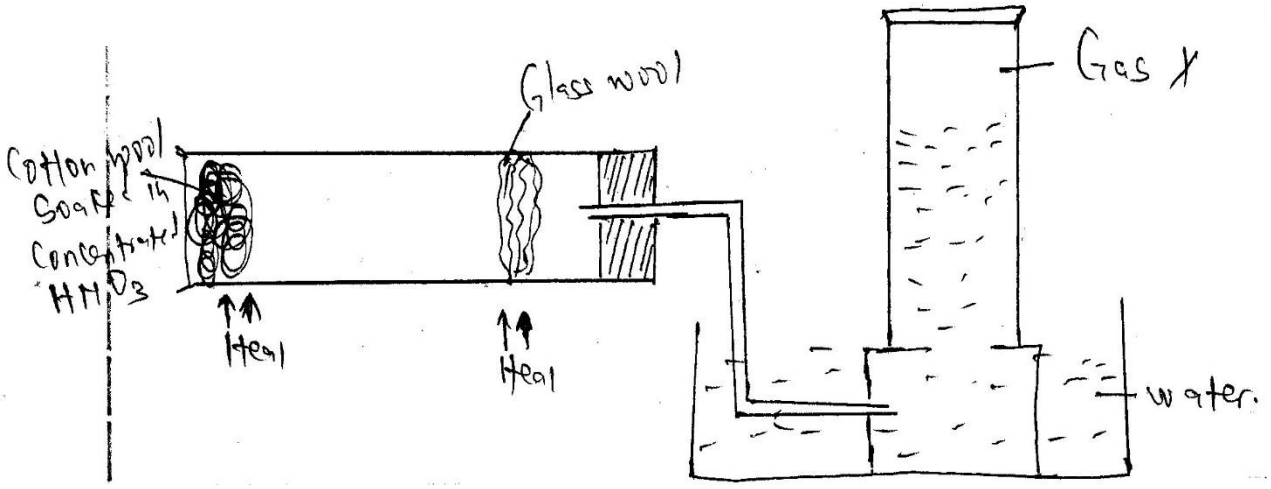
f) i)Give the name of the process described below
1mk

Substance	condition	Name of the process
Iron(ii) sulphate heptahydrate	Exposed to air ,changes from crystalline to powder form	
Concentrated sulphuric(vi) acid	Exposd to air, volume of the acid increases	
Zinc nitrate	Exposed to air changes in solution	

ii) Name another substance that can undergo the same process as zinc nitrate above
1mk

iii) Write the formula of copper (ii) sulphate crystals
1mk

7. The set up below shows the effects of heat on concentrated nitric (v) acid



a) Explain the observations made in the combustion tube
2mks

b) Write the equation for the reaction in the combustion tube
1mk

c) State the role of glass wool in the set up above
1mk

d) Identify gas X
1mk

e) The resultant solution formed in the basin containing water is found to be acidic at the end of the experiment. Explain
1mk

f) Nitric (v) acid is always stored in dark glass bottles. Explain
1mk

g) Concentrated nitric (v) acid reacts with carbon as shown in the equation below

$$C_{(s)} + 4HNO_{3(l)} \rightarrow CO_{2(g)} + 2H_2O_{(l)} + 4NO_{2(g)}$$

What property of nitric (v) acid is shown in the equation above
1mk

233/1

Chemistry

Theory

July/August 2016

Time: 2 Hours

KAKAMEGA SOUTH SUB-COUNTY JOINT EVALUATION TEST – 2016

Kenya Certificate of Secondary Examination (KCSE)

233/1

Chemistry

Theory

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all the questions in the spaces provided in the questions paper.
4. Mathematical tables and silent electronic calculators may be used.
5. All working must be shown where necessary.

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
	80	

This paper consists of 12 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.

1. Identify the laboratory apparatus used for each of the following purposes in a chemistry laboratory?

   i) Holding and supporting pieces of apparatus such as burettes during experiments. (1mk)

   ……

   ……

   ii) Scooping solid chemical substances during experiments (1mk)

   ……

   ……

   iii) Storage of liquid chemicals in a laboratory.

   ……

   ……

2. Pure air contains about 1% argon.

   i) State the name of the group of elements to which argon belongs. (½ mk)

   ……

   ……

   ii) Write the electronic configuration to argon? (½ mk)

   ……

   ……

   iii) Why is argon used in lamps? (1mk)

   ……

   ……

   ……

   ……

   iv) An Isotope of argon has a mass number of 40. Calculate the number of neutrons in this Isotope of argon. (1mk)

   ……

   ……

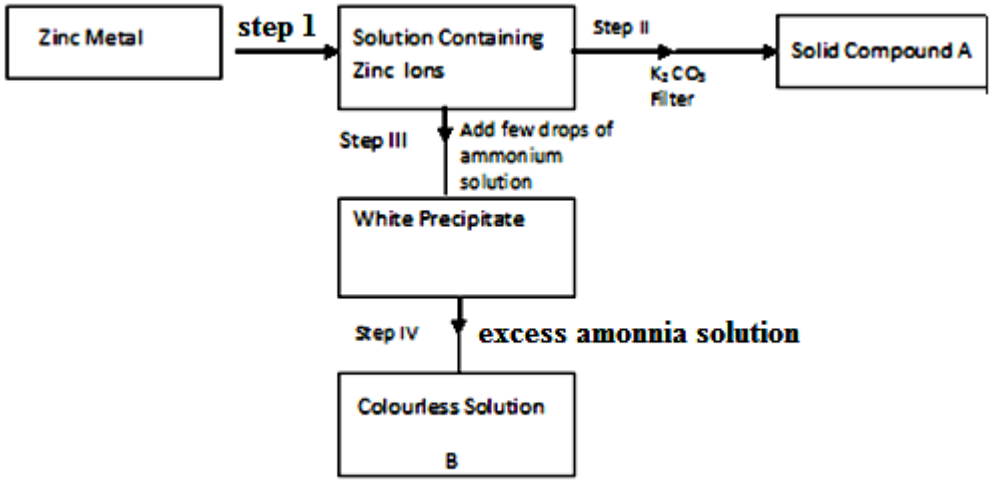
……

……

……

……

3. Study the flow chart below and answer the questions that follow:



a) Name the reagent in step I (½ mk)

……

……

ii) Compound A (½ mk)

……

……

b) Write an ionic equation for the reaction in step (IV) (1mk)

……

……

4. 30 cm^3 of the solution containing 2.88gdm^{-3} of an alkali MOH completely reacts with 40 cm^3 of 0.045M sulphuric (Vi) acid .

a) Calculate the molarity of the alkali.

(2mks)

……

……

……

……

……

……

b) Calculate the relative atomic mass of x in the alkali (0 = 16, S= 32,H = 1.

(2mks)

……

……

……

……

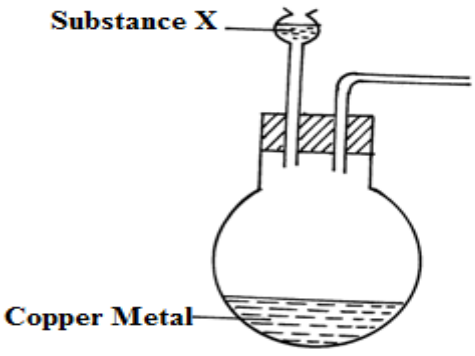
……

……

5. The table below gives some information about the melting and the likely structures in substances V,W, and X. Complete the table by filling the missing Information in the spaces numbered. I,II and III (3mks)

Element	Structure	Example	Melting point
V	Grant Metallic	(i)	High
W	II	F_2	Low
X	III	Si	Very high

6. The arrangement below is used to prepare nitrogen (iv) oxide.



(i) Complete the diagram to show the collection of the gas.

(1mk)

(ii) Identify substance X.

(1mk)

……

…….

(iii) Write a balanced equation for the reaction that occurs in the conical flask.

(1mk)

……

…….

……

…….

7. Given the standard electrodes potentials.

Half reactions	Elvolts
$Zn^{2+}_{(aq)} / Zn_{(s)}$	-0.76
$Cu^{2+}_{(aq)} / Cu_{(s)}$	+ 0.34
$Cr^{3+}_{(aq)/} Cr_{(s)}$	- 0.74
$Co^{2+}_{(aq)} / Co_{(s)}$	+ 0.28

From the following cell combinations copper- Zinc half cells.

Chromium cobalt half cells.

i) Which reaction is faster? Explain by use of electrode potentials?

(2mks)

……

……

……

……

……

……

ii) Write the cell representation for the chromium – cobalt half cells.
(1mk)

……

……

……

……

8. A freshly picked red flower petal was placed in a gas jar containing moist sulphur (IV) oxide gas.

i) State the observation made after sometime. (1mk)

……

……

……

……

ii) Consider the reaction shown below.

$2H_2S_{(g)} + SO_{2(g)} \longrightarrow 3S_{(s)} + 2H_2O_{(1)}$

From the above reaction. Identify the reducing agent. Explain.
(2mks)

……

……

……

……

……

……

iii) Using the equation, show how calcium hydroxide is used to control pollution caused by sulphate (iv) oxide in a sulphuric (vi) acid plant.
(1mk)

……

……

……

……

9. The relative rate of diffusion of two gases X and Y are in the ratio 3:2 respectively. Given that the

relative formula mass of X is 48, calculate the relative formula mass of Y.
(2mks)

……

…….

……

……

……

…….

10. a) In the fractional distillation of liquid air explain how each of the following components
are removed prior to liquifaction of air.

i) Dust particles
(1mk)

……

……

……

……

ii) Carbon (iv) Oxide
(1mk)

……

……

……

……

iv) Water Vapour
(1mk)

……

……

……

……

c) Explain why removal of carbon (iv) oxide should occur before compression and condensation of air into liquid state.
(1mk)

……

……

……

……

11. An element R has an atomic number 12.

a) Write the electro configuration of the ion of R.

(1mk)

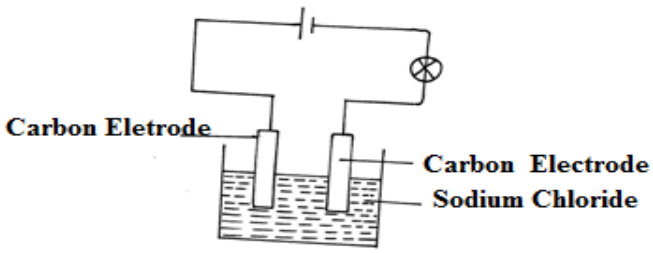
b) Write the formula of the nitride of R.

(1mk)

c) The nitride of R dissolves in water. Write a balanced equation to show what happens.

(1mk)

12. The set up below was set up to electrolysis molten sodium chloride.



a) State the observation that was made at the anode during the electrolysis.

(½ mk)

……

……

……

……

b) Name the electrode of which reduction occurs

(½ mk)

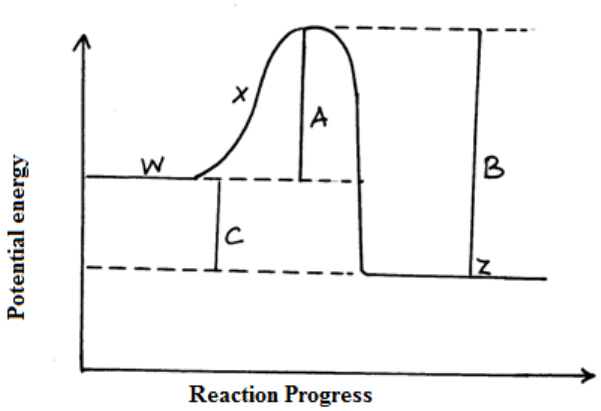
……

……

c) Write an equation for the reaction that occurs at anode electrode.

(1mk)

13. Use for diagram below to answer the questions that follows:-



a) Name the letter that corresponds to:_

i) Activation energy of the reaction

(1mk)

……

……

……

……

ii) Change in energy for the overall reaction.

(1mk)

……

……

……

……

b) The reaction exothermic or endothermic. Explain.

(2mk)

……

……

……

……

……

……

14. The solubility of potassium nitrate is 155g/100g of solvent at 75^0C and 38g/100g potassium

nitrate will crystallizes out if 50g of a saturated solution at $75c^0$ was cooled to 25^0c.

(3mks)

……

……

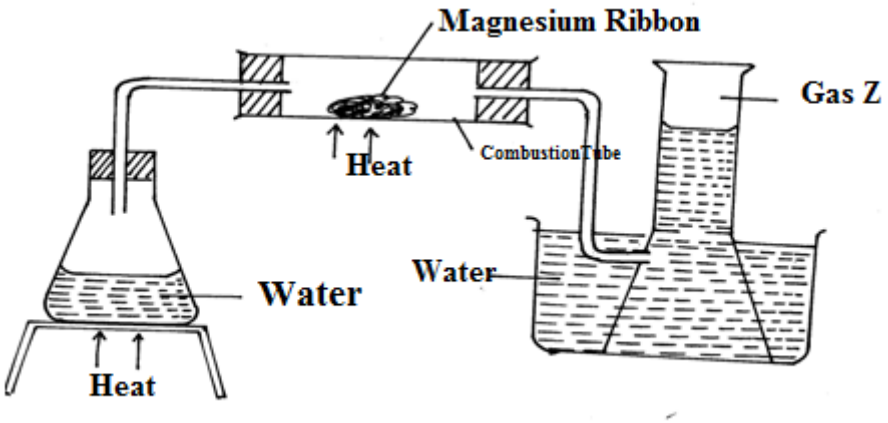
……

……..

……

……..

15. Study the set up below and answer the question that follows.



a) Write an equation for the reaction which takes place in the combustion tube.

(1mk)

……

……

……

……

b) What property of gas Z to allows it to be collected as shown in the diagram.

(½ mk)

……

……

c) Identify gas Z

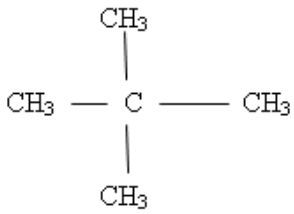
(½ mk)

……

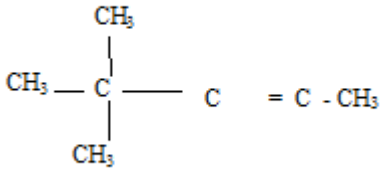
……

16. a) Give the IUPAC names of the following compounds.

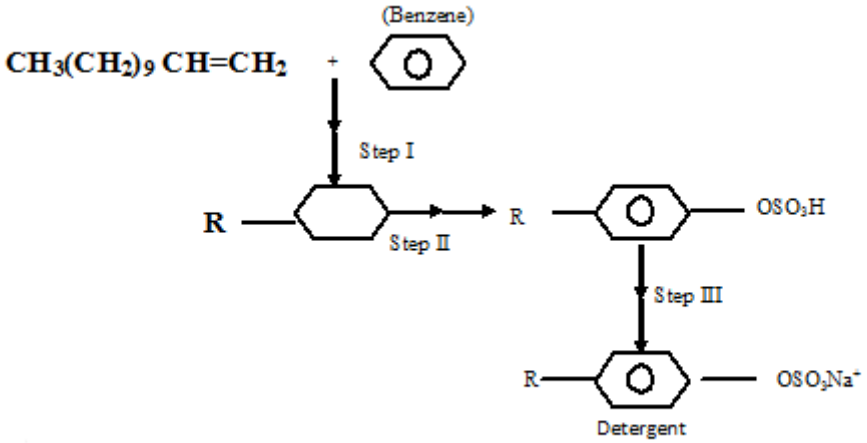
i)



ii)



b) The flow chart below shows the three main steps in the preparation of a detergent.



i) State the condition for step I

(½ mk)

……

……

(ii) Name the reagent for the reaction in step (II)

(½ mk)

……

……

iii) For step III Name :

a) The reaction

(½ mk)

……

……

b) The reagent used

(½ mk)

……

……

17. You are provided with dilute sulphuric (vi) oxide nitric acid and lead (ii) Oxide. Explain how you

can prepare a sample of lead (ii) sulphate.

(2mks)

……

……

……

……

……

……

18. a) Distinguish between allotropes and Isomers.

(2mks)

……

……

……

……

b) Other than sulphur , Name two elements that are allotropic.

(2mks)

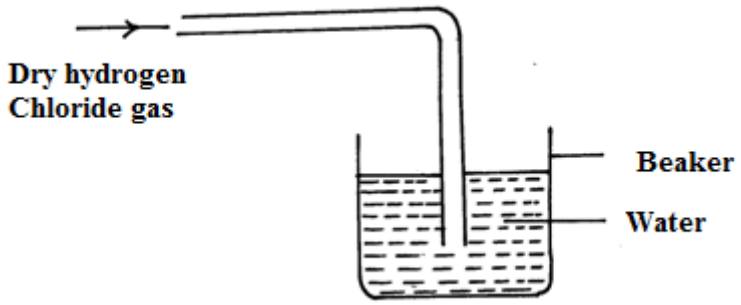
……

……

……

……

19. The diagram below shows preparation hydrochloric acid.



i) State one mistake in the diagram (

1mk)

……

……

……

……

ii) Hydrogen chloride gas does not have any effect on litmus paper unlike hydrochloric acid. Explain.

(1mk)

……

……

……

……

iii) State one use of hydrogen chloride gas.

(1mk)

……

……

……

……

20. A radioactive element R decays emitting two alpha(α) and Beta(β) Particle to form $^{214}_{81}Si$

a) What is the atomic number of R?

(1mk)

……

……

b) After 224 days 1/16 of mass of R remained. determine the half life of R?

(2mks)

……

……

……

……

……

……

21. The table below shows atomic numbers of elements represented by the letter R to Y. The letters are not the actual chemical symbols of the elements.

Elements	R	S	T	U	V	W	Z	Y
Atomic Number	3	7	8	9	10	11	12	13

i) Two elements that belong to the same period of the periodic table. (½ mk)

……

……

ii) Two elements in the same group (½ mk)

……

……

iii) Write down the formula of the compounds when Z combines with U. (1mk)

……

……

……

……

22. Using dots(.) and crosses (x), draw electronic structures to show the bonding in the following compounds.

i) Water

(1mk)

……

……

……

……

ii) Calcium oxide

(1mk)

……

……

……

……

23. a) State the Le chatelieur's principle.

(1mk)

……

……

……

……

b) One of the steps in the commercial manufacture of nitric (v) acid is the oxidation of ammonia according to the equation.

$4\ NH_3\ (g) + 5O_{2(g)} \rightleftharpoons 4No\ (_{g)} + 6\ H_2\ 0_{(i)}$ DH = 908 KJmol^{-}.

How would true position of the equilibrium change in the following circumstances? Explain.

i) An increase in pressure (1 ½ mk)

……

……

……

…….

ii) A decrease in temperature (1 ½ mk)

……

……

……

……

iii) The addition of a catalyst (1mk)

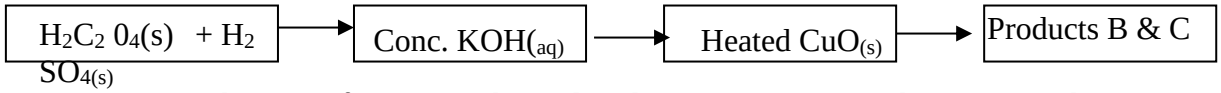
……

……

……

……

24. The flow chart below shows the preparation of carbon (ii) Oxide and its reaction.



a) Name the type of reaction taking place between $H_2C_2O_4$ and concentrated H_2SO_4

……

……

……

……

b) Write an equation for the production of B and C.

(1mk)

……

……

……

……

c) State two uses of carbon (II) Oxide .

(1mk)

……

……

……

……

25. Paper chromatography of a plant extracts gave the following results.

Solvent	Number of sports
Quinine	1
Cocaine	6
Papain	4
Titanium	2

Which of the extracts.

i) Is more pure. Explain.

(1mk)

……

……

……

……

ii) Is most dense. Explain?

……

……

……

……

26. 50 cm^3 of methane gas (CH_4) was exploded until 170 cm^3 of oxygen and under complete

Combustion.

a) Write an equation for the complete combustion of methane.

(1mk)

……

……

……

……

b) Determine the amount of oxygen that remained unreacted.

(2mks)

……

……

……

……

27. The main reaction of the contact process is $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ $\Delta H = -98KJ$

a) Name two factors that would favour maximum yield in this reaction.

(1mk)

……

……

……

……

b) Which substance can be recycled in this process.

(1mk)

……

……

……

……

b) Why is SO_3 formed dissolves in sulphuric acid and not in water.

……

……

……

……

……

……

233/2

Chemistry

Theory

July/August

Time: 2 Hours

KAKAMEGA SOUTH SUB- COUNTY JOINT EVALUATION TEST – 2016

Kenya Certificate of Secondary Examination (KCSE)

233/2

Chemistry

Theory

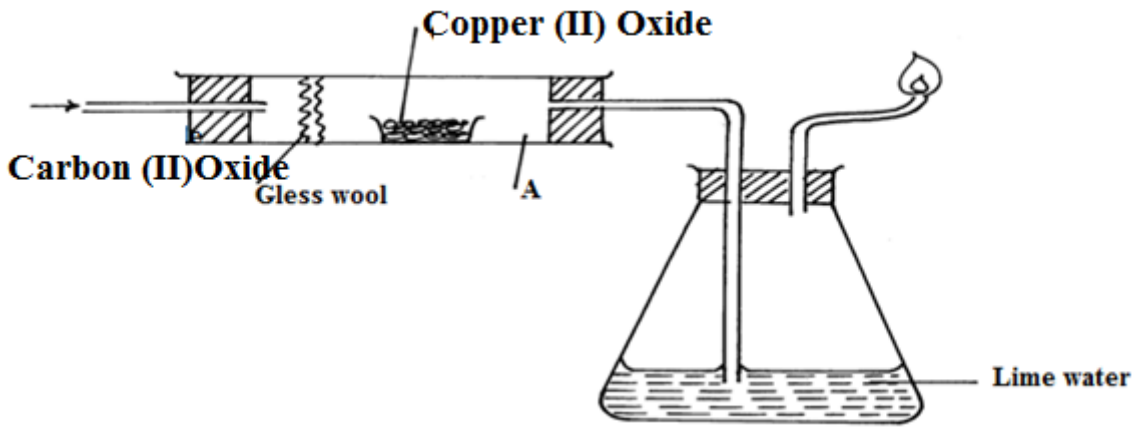
INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all the questions in the spaces provided in the questions paper.
4. Mathematical tables and silent electronic calculators may be used.
5. All working must be shown where necessary.

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
	80	

This paper consists of 10 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.

1. The figure below is used to investigate the effect of carbon (II) Oxide on copper (II) Oxide. Study it and answer the questions that follow.



a) Write a chemical equation of the reaction for the preparation of carbon (II) oxide in the laboratory.
(1mk)

b) What precaution should be taken when preparing carbon (II) Oxide?
(2mks)

……

……

……

……

c) State the observations made in apparatus A and B at the end of the experiment? (2mks)

A……

……..

B……

……..

d) Write the chemical equation for the reaction in apparatus A.

(1mk)

……

……

……

……

e) State the reducing agent in (d) above.

(1mk)

……

……

……

……

f) State two application of carbon (II) Oxide

(2mks)

……

……

……

……

g) Carbon (IV) oxide in air forming a Gas P.

(i) Name the gas P

(1mk)

……

……

……

……

ii) State two applications of the gas P

(2mks)

……

……

……

……

2. The table below shows some information concerning elements S, T,V, U and W,. The letters are not the actual symbols of the elements.

Elements	Formula of Oxide	Period
S	S_20	2
T	T_2O_3	3
U	UO_2 or UO_3	3
V	Does not form oxide	3
W	W_2O	4

a) Write down:

i) The electron arrangement of element W.

(1mk)

……

……

……

……

ii) The formula of the ion formed by element T.

(1mk)

……

……

……

b) Two of the oxides, S_2O and UO_3 were separately dissolved in distilled water. Compare the PH values of resulting solutions.

(2mks)

……

……

……

……

c) Compare with explanations, the following.

i) The reactivity of S with that of W.

(3mks)

……

……

……

……

ii) The electrical conductivity of element T with that of magnesium.

(2mks)

……

……

……

……

iii) The meeting point of element V with that of element x which is just below U in the group.

(2mks)

……

……

……

……

d) Identify element V.

(1mk)

……

……

……

3. a) The following table gives the standard electrode potential for a number of half.-reactions

$Zn^{2+}_{aq)} + 2e^- \longrightarrow Zn_{(s)}$	-0.76
$Fe^{2+}_{(aq)} + 2e^- \longrightarrow Fe_{(s)}$	-0.44
$I_{2(s)} + 2e- \longrightarrow 2I^-_{(aq)}$	+ 0.54
$Fe^{3+}_{(aq)} + e \longrightarrow Fe^{2+}_{(aq)}$	+ 0.77
$Ge^{4+}_{(aq)} + e- \longrightarrow Ge^{3+}_{(aq)}$	+ 1.61

i) Write a cell equation for the reaction that would give the highest emf.

(2mks)

ii) The strongest reducing agent. Give reason.
(2mk)

……

……

……

iii) Which substances in the table could be used to convert iodide ions to iodine(1mk)

……

……

……

iv) Write an equation for the reaction you would expect to occur when an iron nail is placed in a solution of iron (II) sulphate.
(1mk)

b) In the production of aluminum for aluminum oxide, 100 A was passed for 5 hours. How much aluminum was obtained? (1F = 96500C,Al = 27)
(2mks)

……

……

……

……..

c) With an example ,define

i) Primary cell

(2mks)

……

……

……

ii) Secondary cell

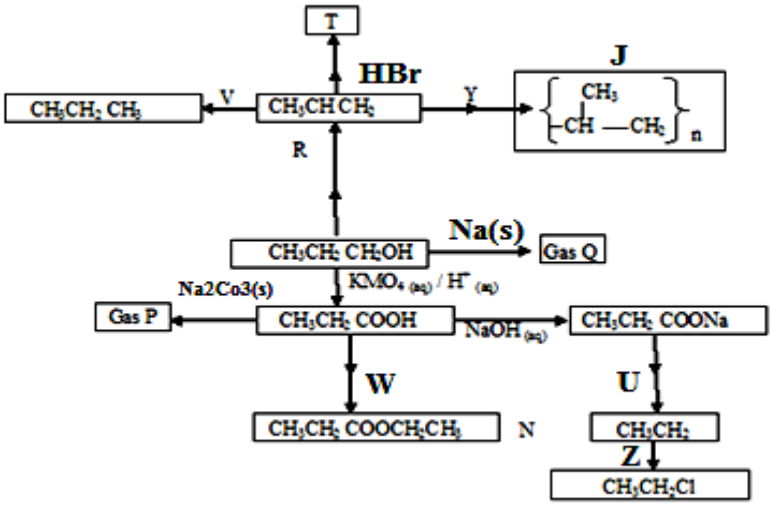
(2mks)

……

……

……

4. Study the reaction scheme below and answer the questions that follow.



a) Name

i) Gas

P……

ii) Gas

Q……

iii) Substance

J……..

b) Write the structural formula of T

(1mk)

……

……

……

……

c) State the characteristics property of substance N

(1mk)

……

……

……..

d) Name process Y

……

……

e) Name the type of reaction represented as Z.

(1mk)

……

……

f) Name the reagent and condition for reaction

i) V

…… (2mks)

……

…

ii)

U……

… (2mks)

……..

iii) W……..

(2mks)

……..

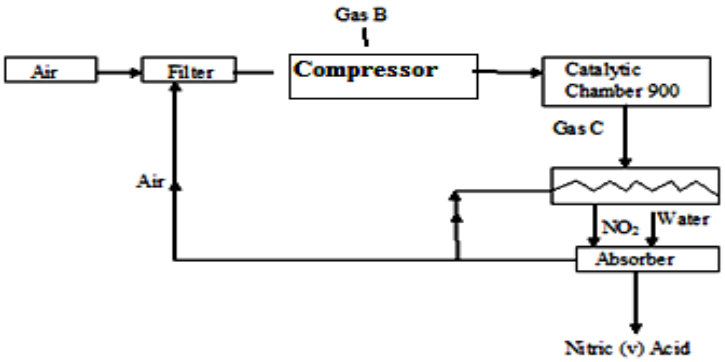
g) Name Process R

……

(1mk)

5. a) The flow chart below shows the industrial manufacture of nitric (v) acid. Study it and

answer the questions that follow:



i) Identify substances B and C

(2mk)

B……

C…….

ii) Write an equation for the reaction that occurs in the catalytic chamber.

(1mk)

……

……

……

(iii) Using an equation or otherwise. Explain the reaction that takes place in the absorber.(1mk)

……

……

……

(iv) Explain why nitric (v) acid is stored in brown bottles.

(1mk)

……

……

……

……

(v) Explain what happens when drops of concentrated nitric (v) acid are put on dry, warm sawdust.

(2mks)

……

……

……...

(vi). Give one industrial use of nitric (vi) acid.

(1mk)

……

……

……

b) Chlorine and ammonia gas react producing products depending on the reagent in excess. Write the equations for the reactions when:-

i) Chlorine is in excess

(1mk)

……

……

……

ii) Ammonia is excess.

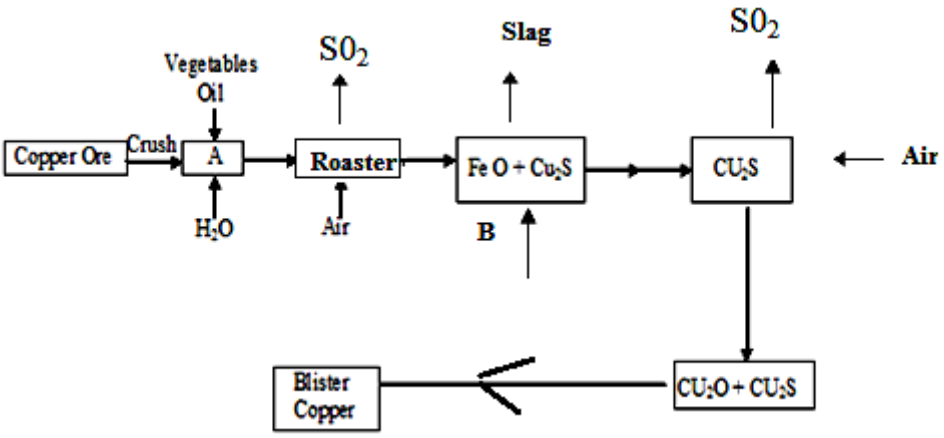
(1mk)

……

……

……

6. Study the flow diagram below on extraction of copper and answer the questions that follow.



a) Name the copper ore used for the extraction of copper.

(1mk)

……

……

……..

b) The amount of copper in the copper ore is small state the method used to separate the impurities from the ore in chamber A.

c) i) Which substances is fed into the roaster from chamber A?

(1mk)

……

……

……

ii) Write an equation for the reaction that takes place in the roaster.

(1mk)

……

……

……

d) Name B and state it's function.

(2mks)

……

……

……

……

e) Why is blister copper not fit for making electrical conductors?

(1mk)

……

……

……

g) When copper is reacted with concentrated nitric (v) acid & blue solution is formed.

i) Name the blue solution.

(1mk)

……

……

……..

ii) Name and write the formula of the substance formed when the blue solution reacts with

excess aqueous ammonia.

(2mks)

……

……

……

7. The solubility in grammes of sodium nitrate in 100g of water are given for various temperatures

in ^{0}c.

Temp (^{0}C)	10	20	30	40	50	60	70	80	90	100
Solubility in g/100g of H_2O	73	80	88	96	104	114	124	148	162	180

a) i) Plot the solubility curve for sodium Nitrate.(Temperature on x-axis)

(3mks)

……

……

……

……..……

ii) Determine the temperature at which the solubility of the salt is 150g/100g of water.(1mk)

……

……

……

b) Given 100g of a saturated solution of sodium Nitrate at 10^0C, Determine the mass of .

i) Solute in the solution

……

……

……

ii) Solvent in the solution.

(1mk)

……

……

……

iii) Salt that will be dissolved by the amount of solvent in (b) above at 12^0 C.

(1mk)

……

……

……

iv) Salt which must be added to the solution to form a saturated solution at 80^0 C?

(1mk)

……

……

……

c) If a solution containing 140g of salt in 100g of solvent initially at 95^0 is cooled to 45^0C.

(i) At what temperature will crystals start forming?

(1mk)

……

……

……

……

(ii) How much salt will crystallize out?

(1mk)

……

……..

.....

233/1
CHEMISTRY
Paper 1
THEORY
JUNE 2016
Time: 2 hours

KASSU JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

CHEMISTRY

Paper 1

Instructions to Candidates

- *Write your name and index number in the spaces provided above.*
- *Sign and write the date of the examination paper.*
- *Answer **ALL** the questions in the spaces provided in the question paper.*
- *ALL working **MUST** be clearly shown where necessary.*
- *Mathematical tables and silent electronic calculators may be used.*
- *Candidates should check the paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

1. (a) Give ***two*** differences between luminous and non-luminous flames. (2 marks)

.....

.....

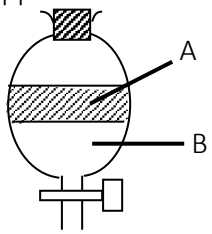
.....

(b) How is the non-luminous flame produced? (1 mark)

.....

.....

2. (a) The apparatus below were used to separate a mixture of liquid A and B.



State ***two*** properties of liquids that make it possible to separate using such apparatus. (2 marks)

.....

.....

(b) Give the name of the above apparatus. (1 mark)

.....

3. (a) Explain why solid Carbon (IV) oxide is preferred over ordinary ice for use by ice cream venders. (1 mark)

.....

.....

(b) Name one piece apparatus used to measure volume of gases. (1 mark)

.....

(c) Draw a diagram of a deflagrating spoon. (1 mark)

4. The table below shows the pH values of solutions P, R, Q and S.

Solution	P	R	Q	S
pH	2	7	6.5	13.5

(a) Which solution represent:

(i) Strong base - ..... (1 mark)

(ii) Weak acid - .....(1 mark)

(b) Give an example of solution S. (1 mark)

.....

5. 6.95g of hydrated iron (II) sulphate $FeSO_4$. nH_2O was dissolved in 250 cm^3 solution resulting into a 0.1M solution. Determine the value of n. (3 marks)
(Fe = 56, O = 16, S = 32, H = 1).

6. Rusting leads to fast wearing out of farm tools and equipment as well as buildings.
(a) Give the chemical name of rust. (1 mark)

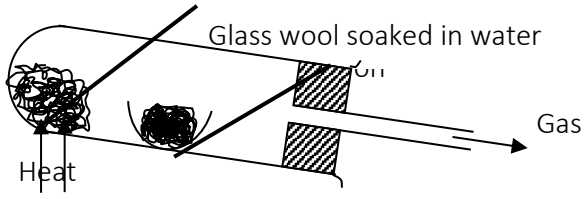
.....

(b) What ***two*** conditions accelerate rusting process? (2 marks)

.....

.....

7. Study the diagram below and answer the questions that follow.



(a) Write an equation for the reaction that take place in the combustion tube.
(1 mark)

.....

(b) Why would it not be advisable to use potassium in place of iron in the set-up?
(1 mark)

.....

.....

(c) Glass wool should be heated before heating iron. Explain. (1 mark)

.....

.....

8. I. Name the following organic compounds.
(a) $CH_3\ CH\ CH_2\ CH\ CH_3$ (1 mark)
CH_3 Br

.....

(b) $HOCH_2 - CHOH - CH_2OH$ (1 mark)

.....

II. Given
A $CH_3(CH_2)_{16}\ COO^-\ Na^+$
B $CH_3(CH_2)_6\ CH(CH_3)CH_2\ SO^-_3\ Na^+$

Identify detergent

A - ..... (1 mark)

B - ..... (1 mark)

9. In terms of structure and bonding, explain the following.

(a) Graphite is used as a lubricant. (1 mark)

.....

.....

.....

(b) Alluminium is better conductor of electricity then magnesium. (1 mark)

.....

.....

(c) Water is a liquid at room temperature while hydrogen sulphide is a gas. (1 mark)

.....

.....

10. (a) Define the term molar latent heat of fusion. (1 mark)

.....

.....

(b) The molar heat of fusion of ice at O^0C is 6kJ mol^{-1}. Calculate the heat change when 36g of ice is converted to 36g of water at 10^0C. (3 marks)
(SHC = $4.2^{-1}g\ K^{-1}$, density = $1.0g/cm^3$, H = 1.0, O = 16.0)

11. Draw a well labeled diagram showing how blister copper is purified. (3 marks)

12. Gas Q with a relative molecular mass of 48 took 50 seconds to diffuse through a porous diaphragm. How long will it take for the same amount of hydrogen Chloride (HCl) to diffuse through the same diaphragm under similar conditions? (H = 1.0, Cl = 35.5). (3 marks)

13. (a) Calculate the oxidation state of chromium in the ion $Cr_2 O^{2-}$. (1 mark)

(b) Using oxidation numbers, determine from the equation below the species which undergoes oxidation and reduction.

$2FeCl_{2(aq)} + Cl_{2(g)} \longrightarrow 2Fe Cl_{3(aq)}$

Oxidation - ..... (1 mark)

Reduction - ..... (1 mark)

14. Given elements A, B and C with atomic numbers 11, 19 and 13 respectively.

(a) Compare the atomic radius of A and C. Explain. (2 marks)

.....

.....

(b) Compare reactivity of A and B. (1 mark)

.....

15. Haber process (the manufacture of ammonia gas) is given by the following equation.

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ $\Delta H = -92kJ\ mol^{-1}$.

State and explain the effect of:

(a) Introducing some drops of water to the equilibrium. (1 mark)

.....

.....

(b) Pumping nitrogen gas to the equilibrium mixture. (1 mark)

.....

.....

(c) Lowering the temperature of the reaction. (1 mark)

.....

.....

16. Elements P and Q have the following atomic numbers 19 and 8 respectively.

(i) Using dot (•) and cross draw a diagram to show how the elements form bonds. (1 mark)

17. Describe how sodium sulphate crystals can be prepared starting with $50cm^3$ of 2M sodium hydroxide and 1M sulphuric (VI) acid. (3 marks)

.....

.....

.....

.....

.....

18. Write ionic equations to show how;

(a) (i) Excess ammonia solution reacts with a solution containing Copper II ions. (1 mark)

.....

(ii) Excess sodium hydroxide added to a solution containing Al^{3+} ions. (1 mark)

.....

(b) Give the name of the following ion $[Zn(NH_3)_4]^{2+}$ (1 mark)

.....

19. (a) Define electrolysis. (1 mark)

.....

.....

(b) During the electrolysis of molten aluminium oxide, write the equations at the;

Anode - ..... (1 mark)

Cathode - ..... (1 mark)

20. (a) Give any ***two*** differences between alpha and beta particles. (2 marks)

.....

.....

(b) A radioactive isotope T decays by emitting three alpha particles to form $^{214}_{83}Bi$ what is the atomic number and mass number T?

Atomic number - ..... (1 mark)

Mass number - ..... (1 mark)

21. (a) Using acidified potassium dichromate (VI) solution, describe how you would differentiate between sulphur (IV) oxide and hydrogen sulphide. (2 marks)

.....

.....

.....

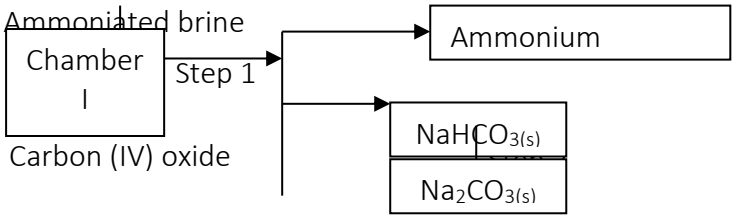
(b) Identify the catalyst preffered in contact process. Explain. (2 mark)

.....

.....

.....

22. Study the following part of the solvay process for the manufacture of sodium carbonate and answer the questions that follows:



(i) State the main source of Carbon (IV) oxide in the process. (1 mark)

.....

(ii) Write down the overall equation for the reaction in chamber I. (1 mark)

.....

(iii) Name process in step 1. (1 mark)

.....

23. (a) The following equation involve hydrochloric acid.

$MnO_{2(s)} + 4HCl_{(aq)} \longrightarrow MnCl_{2(aq)} + 2H_2O_{(l)} + Cl_{2(g)}$

State the type of reaction taking place in the reaction. (1 mark)

.....

(b) State ***two*** contrasting chemical properties of hydrogen and chlorine. (2 marks)

.....

.....

.....

24. (a) An element O has two isotopes $^{16}_{8}O$ containing 90% and Isotope $^{18}_{8}O$.

(i) What are isotopes? (1 mark)

.....

.....

.....

(ii) Find the R.A.M of O. (2 marks)

25. (a) When a hydrocarbon is completely burnt in oxygen 4.2g of Carbon (IV) oxide and 1.71g of water were formed.

(a) Determine the empirical formular of the hydrocarbon. (3 marks)

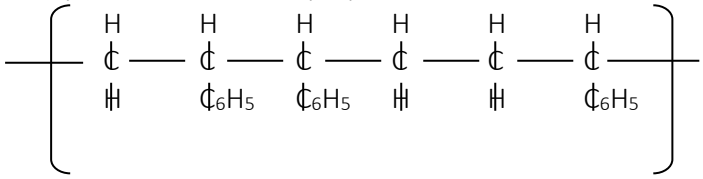
(b) Given that formula mass of compound above is 28. Find the molecular formular. (1 mark)

26. (a) Name the ***two*** types of polymerization. (1 mark)

.....

.....

(b) Study the section of the polymer below and answer the questions that follow.



(i) Give the name of the polymer above. (1 mark)

.....

CHEMISTRY
233/2
THEORY
2 Hours

KASSU JOINT EVALUATION TEST

INSTRUCTIONS TO CANDIDATES:

- *Write your **name** and **index number** in the spaces provided above.*
- ***Sign** and write the **date** of examination in the spaces provided.*
- *Answer **all** the questions in the spaces provided.*
- *All working **must** be clearly shown where necessary.*
- *Mathematical tables and electronic calculators may be used.*

For Examiner's Use Only:

Question	Maximum score	Candidate's score
1	12	
2	12	
3	14	
4	08	
5	13	
6	10	
7	11	
Total	80	

This paper consists of 13 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters do not represent actual symbols.

						S	U	V
P	R					T	X	W
Q								

(a)Which of the elements has the highest atomic radius? Explain. (2 marks)

……

……

……

……

……

……

(b)Identify the most reactive Oxidizing agent. Explain. (2 marks)

……

……

……

……

……

……

(c) Compare the atomic radius of P and R. Explain (2 marks)

……

……

……

……

……

(d)Give the formula of one stable ion with an electron arrangement of 2.8 which is:

(i) A Negatively charged divalent ion. (2marks)

……

……

(ii) A Positively charged monovalent.

……

……

(e)Given that the mass number of W is 40. Write down the composition of its nucleus.

(2 marks)

……

……

……

……

……

……

(f)Write the formula of the compounds formed between.

(i)Element R and X. (1 mark)

……

……

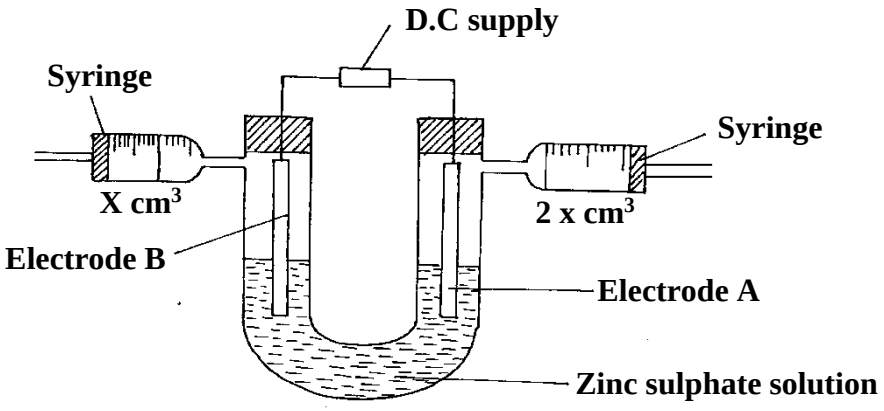
(ii)Give one property of the structure formed when R and X bond. (1 mark)

……

……

.....

2. An aqueous solution of zinc sulphate is electrolysed using platinum electrodes as shown in the set up below.



(a) (i) Write a half equation for the reaction taking place at electrode **A.** (1mark)

……

……

……(ii) Identify electrodes A and B

(2 marks)

……

……

……

(iii) State and explain the observation at electrode **B** if copper plate was used instead of platinum electrode.

(2marks)

……..……

….

……

……

……

……

……

……

……

(b) 0.22g of metal **Q** is deposited by electrolysis when a current of 0.06A flows for 99 minutes.

(RAM of **Q** = 184, 1F = 96500c)

(i) Find the number of moles of **Q** deposited. (1mark)

……

……

……

……

……

……

(ii) Determine the value of n in the metallic ion $\mathbf{Q^{n+}}$ (3marks)

……

……

……

……

……

……

……(c) Determine oxidation number of chlorine in ClO_3^-

(1mark)

……

……

……

……

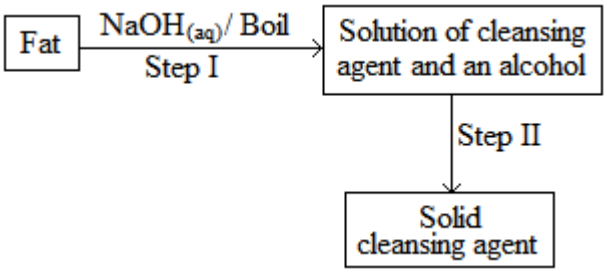
……

……

……

(d) An iron spoon is to be electroplated with silver. Draw a labelled diagram to represent the set-up that could be used to carryout this process. (2marks)

3. (a)The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(i)What name is given to the type of cleansing agent prepared by the method above?

(1mark)

……
……

(ii)Name one chemical substance added in step II

(1mark)

……
……

(iii)What is the purpose of adding the chemical substance named in a (ii) above?

(1mark)

……
……
……

(iv)Name any other suitable substance that can be used in step I

(1mark)

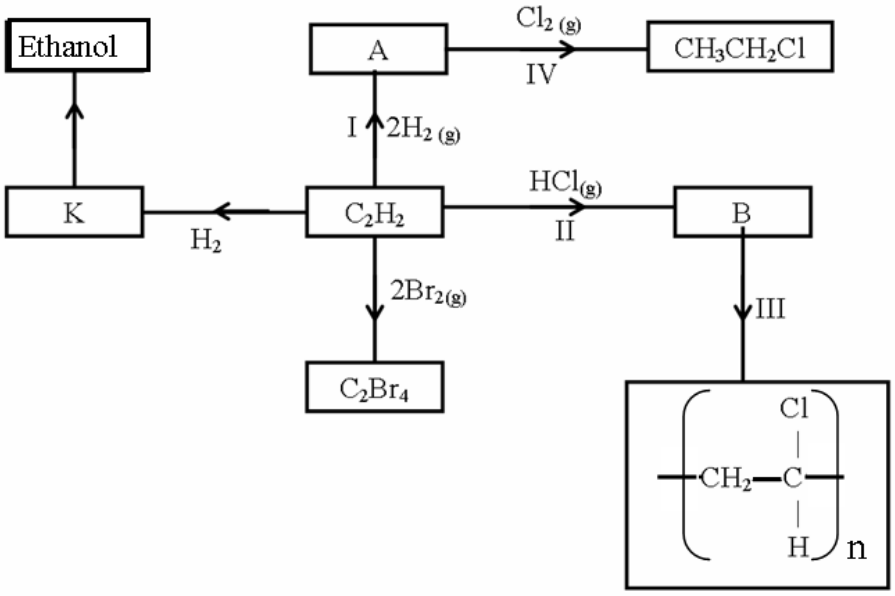
……
……

(v)Explain how an aqueous solution of the cleansing agent removes oil during washing

(2marks)

……
……
……
……
……
……

(b).Study the scheme below and answer the questions that follow.



(i)Identify the catalyst used in step I (1mark)

……

……

(ii)Name the compounds A and B (2 marks)

A…….B……..……

…

(iii)Give one disadvantage of compound formed in step III (1mark)

……

……

……

……(iv)Name the reactions taking place at steps:

(1mark)

I……IV.....

.....

(v)Describe how substance K is converted to ethanol (2marks)

……

……

……

……..

……

……

4. (a) State the Hess' law. (1 mark)

……

……

……

……..……

……..(b) The enthalpies of combustion of calcium, carbon and decomposition of calcium carbonate are indicated below;

$C(s) + \frac{1}{2}O_2(g) \longrightarrow CaO(s)$: $\Delta H = -635\ kJmol^{-1}$

$C(s) + O_2(g) \longrightarrow CO_2(g)$ $\Delta H = -394\ kJmol^{-1}$

Enthalpy of decomposition of $CaCO_3 = +178\ kJmol^{-1}$

(i)Draw an energy cycle diagram that links the enthalpy of formation of calcium carbonate to enthalpies of combustion of calcium, carbon and decomposition of calcium carbonate.

……(2 marks)

……

……

……

……

……

……

……..……..

(ii)Determine the enthalpy of formation of calcium carbonate. (2 marks)

……

……

……

……

……

(c)Some average bond energies are given below.

Bond	Energy in kJ mol^{-1}
C – C	348
C – H	414
Cl – Cl	243
C – Cl	432
H – Cl	340

Calculate the energy change for the reaction below. (3 mks)

$C_2H_{6\,(g)} + Cl_{2\,(g)} \longrightarrow CH_3CH_2Cl_{(g)} + HCl_{(g)}$

……

……

……

……

……

……

……

5.(a) Define the term solubility. (1 mark)

……

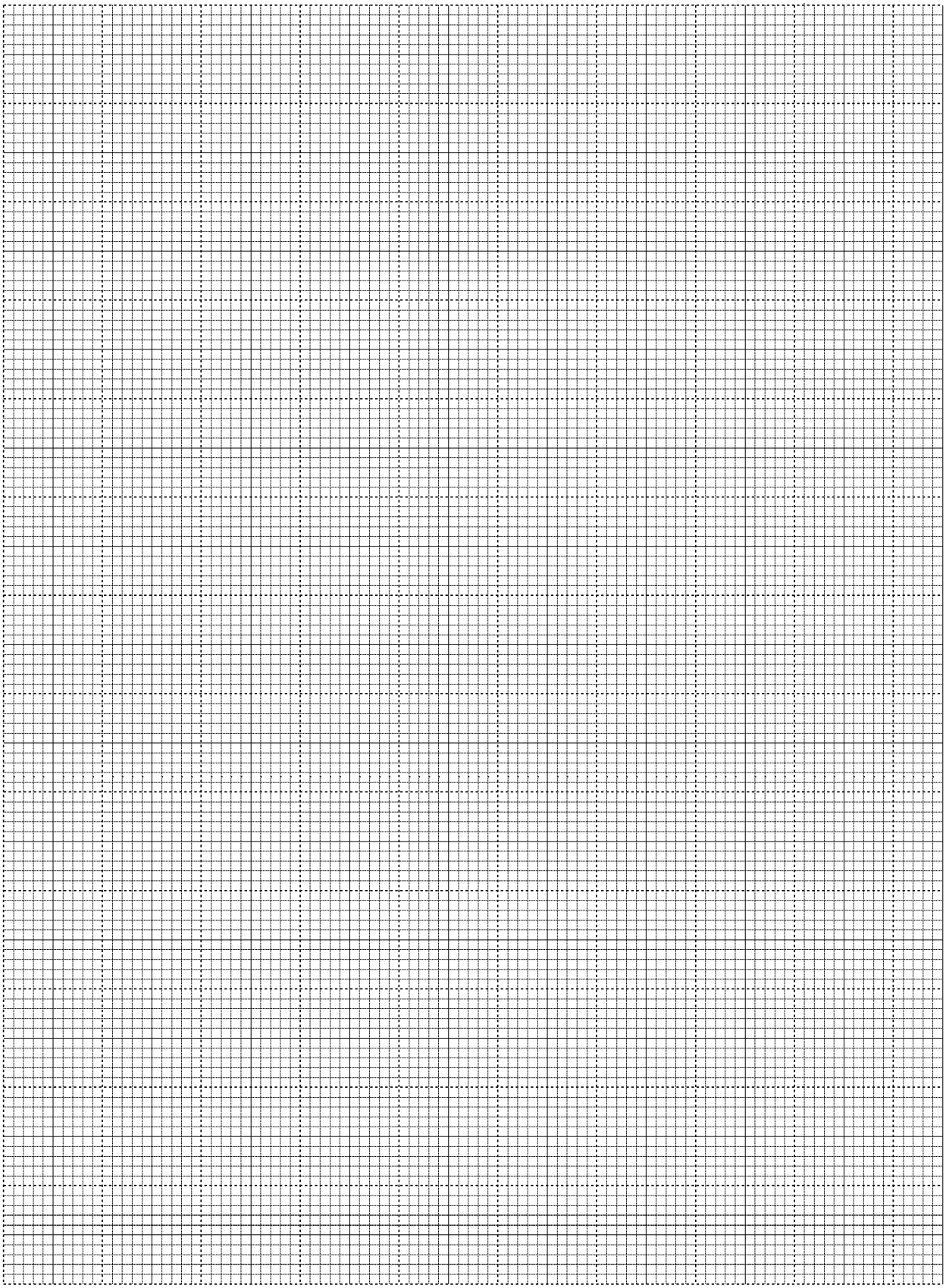
……

……

……(b)In an experiment to determine the solubilities of two salts X and Y at different temperatures, a candidate recorded her observations as shown below.

Temperature (^oC)	0	10	20	30	40	50	60	70	80	90
Solubility of X in g/100 g of H_2O	14.3	17.4	20.7	25.0	28.5	33.3	40.0	47.0	55.0	64.0
Solubility of Y in g/100 g of H_2O	25.0	27.5	30.0	32.5	35.0	37.6	40.1	42.4	45.0	48.0

(a)On the same axes plot the solubility curves of X and Y. (4 marks)



(b)From your graph to determine;

(i)The solubility of X and Y at 47 ^{o}C

Solubility of X (1 mark)

……

…..Solubility of Y (1 mark)

……

……(ii)The temperature at which the two salts are soluble in water. (1 mark)

……

……

(c)If 60g of X is dissolved in 100 g of water and heated to 90^{o}C, calculate the amount of salt that crystallized out if cooled to 20 ^{o}C.(1 mark)

……

……

……

……

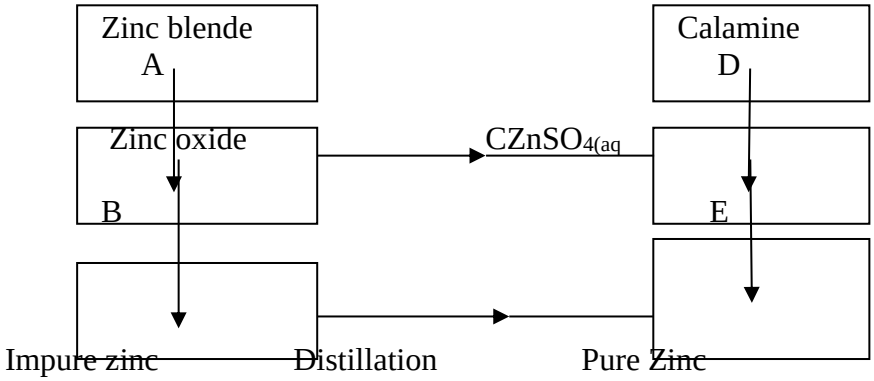
(d)State what would happen if a mixture salt X in 100 g of water and 30 g of Y in 100 g of water were cooled from 90 ^{o}C to 70 ^{o}C. (3 marks)

(e)State one application of solubility.(1 mark)

……

……

6. The flow chart below shows some processes in the extraction of zinc. Study it and answer the questions that follow.



(a) Name the processes represented by A and E. (2 marks)

A……

…

E……

…….

(b) State the reagents required for processes B, C and D. (3marks)

B……

……C……

…….D……

…….(c) Write a chemical equation of the reaction that occurs in process B.

(1mark)

……

……

……(d) With an aid of a diagram, explain how you would obtain a pure sample of zinc by process E

(3 marks)

……

……

……

……

……

……

(e) State two commercial uses of zinc metal. (1 mark)

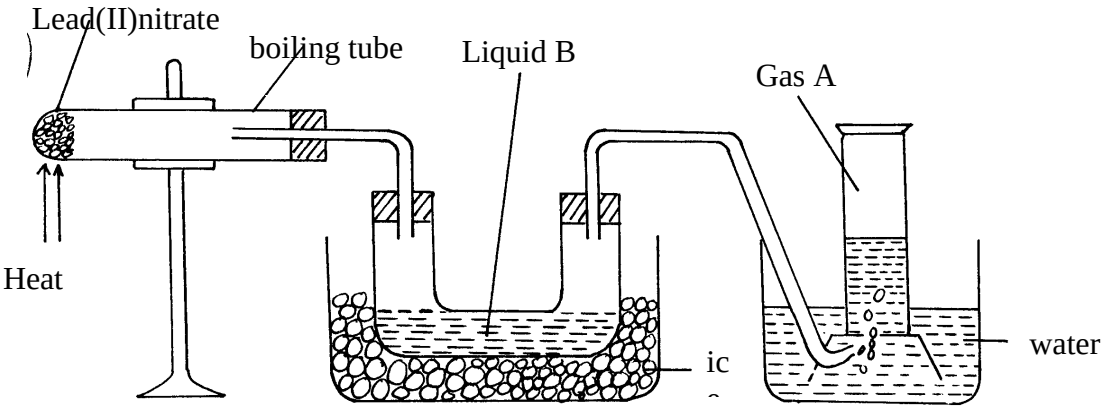
……

……

……

……

7. The diagram below shows a set-up of apparatus that can be used to prepare nitrogen (IV) oxide. Study it and use it to answer the questions that follow



(a) (i) Write the equation for the reaction that takes place in the boiling tube. (1 mark)

……

……

(ii) State the observations made in the boiling tube. (2 marks)

……

……

……

……

……

……

……

…… (iii) Explain why lead (II) nitrate is preferred over other metal nitrates in this experiment.

(1 mark)

……

……

……

……

(iv) Describe how gas A can be identified. (1 mark)

……

……

……

(b) (i)Name liquid B (1 mark)

……

……

(ii) Write a chemical equation to show how liquid B is formed in this experiment.

(1mark)

(c) (i) In another experiment, excess aqueous lead (II) nitrate solution was reacted with a solution which contained 2.34g of sodium chloride. Calculate the mass of precipitate formed in this reaction. (Pb = 207, Cl = 35.5, Na = 23) (3 marks)

……

……

……

……

……

……

……

(ii) Write an ionic equation for the reaction that takes place when nitrogen (IV) oxide reacts with aqueous sodium hydroxide. (1 mark)

CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

(i) Write your **name** and **index number** in the spaces provided **above**.
(ii) **Sign** and write the **date** of examination in the spaces provided **above**.
(iii) Answer **ALL** the questions in the spaces provided.
(iv) Mathematical tables and silent electronic calculators **may be** used.
(v) All working **must be** clearly shown where necessary.
(vi) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

For Examiner's Use Only

Questions	Maximum Score	Candidate's Score
1 – 29	**80**	

This paper consists of **12** printed pages. Candidates should check to ascertain that
all the pages are printed as indicated and that no questions are missing.

1. Name the most suitable method you can use to separate;

(a) Xanthophyll and chlorophyll in green leaves.
(1 mark)

……
……

(b) Oil from simsim seeds.
(1 mark)

……
……

2. The table below shows atomic numbers of four elements **W**, **X**, **Y** and **Z**.

Element	W	X	Y	Z
Atomic number	20	17	19	9

(a) Write electron arrangement of the ion of **Z**.
(1 mark)

……
……

(b) (i) Write the formula of the compound formed between **W** and **X**. (1 mark)

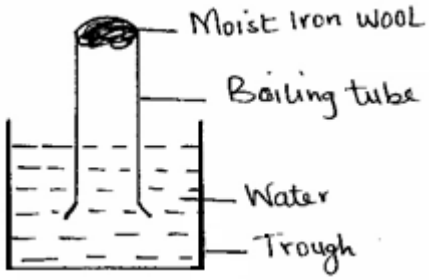
……
…

(ii) Name the bond(s) and structure of the compound in (i) above. (1 mark)

……
…

……
……

3. A student set-up an experiment as shown below. Moist iron wool was placed in a
boiling tube and inverted over water.



(a) What was observed after two days?
(1 mark)

……
…….

……
…….

(b) Explain the observations.
(1 mark)

……
…….

(c) What would be observed if a large piece of iron wool was used?
(1 mark)

……
…….

……
…….

4. Element X is found in period 3 group (IV) it consists of two isotopes 28_X and Q_X.

A sample of X was found to consist of 90% of 28_X if the relative atomic mass of X
is 28.3, work out the number of neutrons in Q_X.
(3 marks)

……
……

……
……

……
……

……
……

……
……

5. Study the table below and answer the questions that follow:

Element	Atomic radius (nm)	Ionic radius (nm)
P	0.168	0.095
Q	0.094	0.133
R	0.124	0.156
S	0.146	0.086

(i) State the elements which are metals.
(1 mark)

……
……

(ii) Identify the strongest reducing agent. Give a reason.
(2 marks)

……
……

……
……

……
……

6. The diagram below represents an apparatus found in a chemistry laboratory.
Give its name.
(1 mark)

……
……

7. Given the following bond energies.

C – C	(347kJ mol^{-1})
C – H	(413kJ mol^{-1})
C = C	(612kJ mol^{-1})
H – H	(435.9kJ mol^{-1})

Calculate the enthalpy change of hydrogenation of ethene.
(3 marks)

……
……

……
……

……
……

……
……

……
……

8. When hydrogen gas was passed over heated lead (II) oxide in a combustion tube and
the gaseous products cooled, a colourless liquid was obtained.

(i) Which chemical test would you use to confirm the colourless liquid above?
(1 mark)

……
……..

……
……..

……
……..

(ii) What observations were made in the combustion tube?
(1 mark)

……
……..

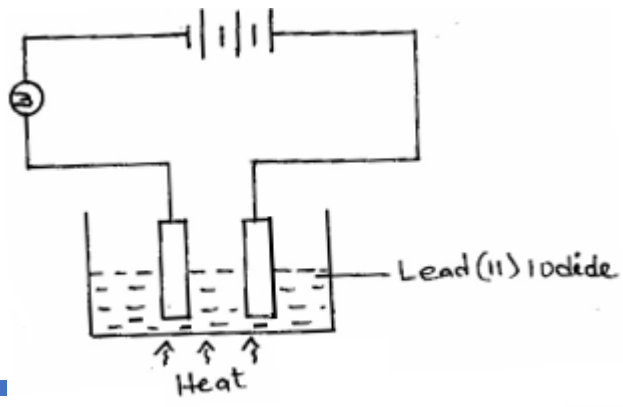
……
……..

……
……..

(iii) Write an equation for the reaction between hydrogen and lead (II) oxide. (1 mark)

……
……..

9. The diagram below shows an experiment for investigating electrical conductivity in
lead (II) iodide. Study it and answer the questions that follow.



(a) On the diagram;

(i) Label the cathode.
(1 mark)

(ii) Show the direction of movement of electrons.
(1 mark)

(b) Write an equation for the reaction that takes place at the anode.
(1 mark)

……
……..

……
……..

10. (a) State the Graham's law of diffusion.
(1 mark)

……
……..

……
……..

……
……..

(b) Two gases A and B diffuse in the ratio 2: 1 if the molecular mass of gas A is
16g, find the molecular mass of B.
(2 marks)

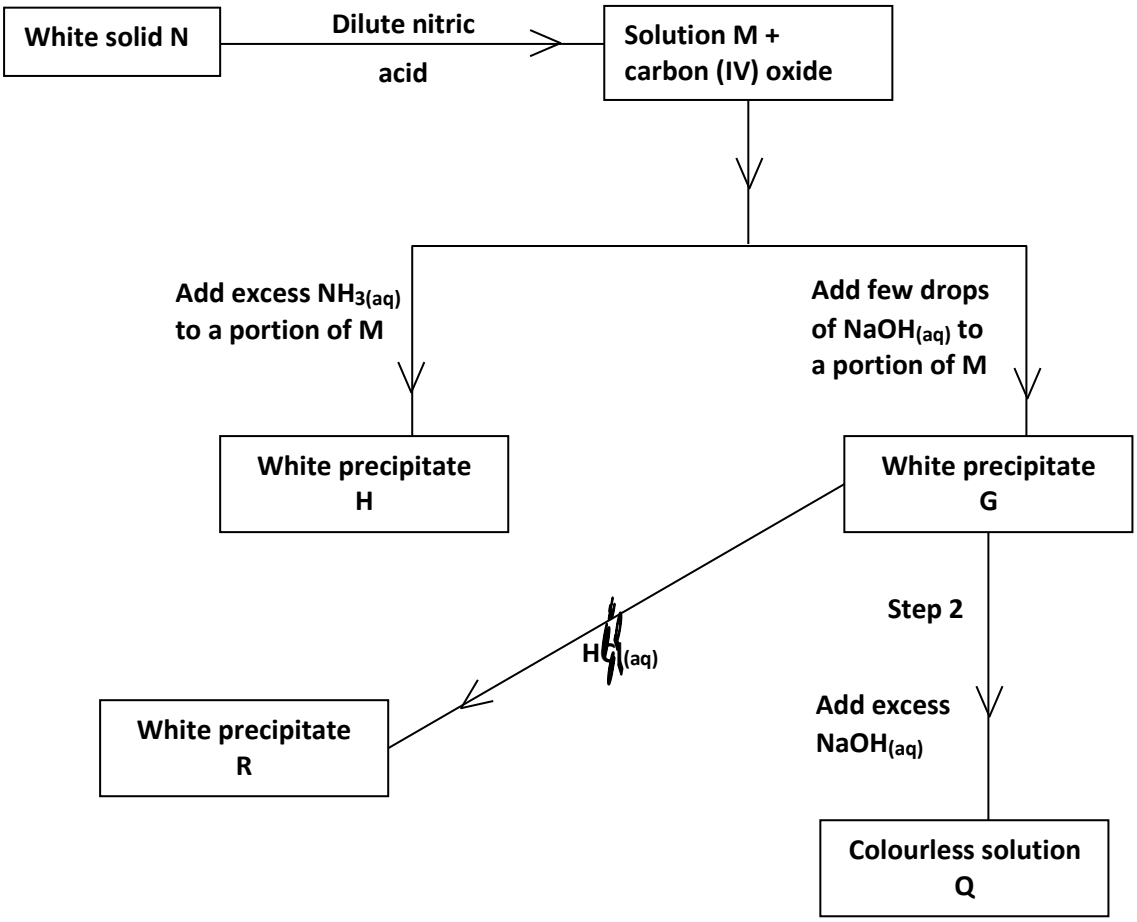
……
……..

……
……..

……
……..

……

11. Study the flow chart below and answer the questions that follow.



(a) Identify solid **N**.
(1 mark)

……
……

(b) Write down the equation for the reaction that leads to the formation of
solution **Q** from the white precipitate **G**.
(1 mark)

……
……

……
……

(c) State the property of precipitate **G** that is demonstrated by Step **1** and **2**. (1 mark)

……
……

……

12. The basic raw material for extraction of aluminium is bauxite.

(a) Name the method that is used to extract aluminium from bauxite. (1 mark)

……
……

(b) Cryolite is used in the extraction of aluminium from bauxite. State its role.
(1 mark)

……
……

……
……

……
……

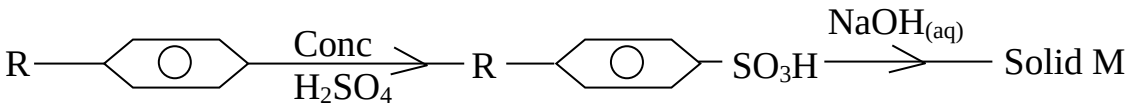
(c) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation.
(1 mark)

……
……

……
……

……
……

13. The scheme below represents the manufacture of a cleansing agent M.



(a) (i) Draw the structure of **M**.
(1 mark)

(ii) To which type of cleansing agent does **M** belong?
(1 mark)

……..

14. If chlorine gas is passed over heated iron fillings and the product dissolved in water,
a yellow solution is formed.
(i) Identify the yellow solution.
(1 mark)

……
……

(ii) What would be observed if aqueous sodium hydroxide solution was added to
the yellow solution?
(1 mark)

……
……

(iii) Write an ionic equation for the reaction between the yellow solution and sodium hydroxide.
(1 mark)

……
……

……
……

15. Using excess zinc powder and dilute sulphuric (VI) acid describe how a sample of dry zinc sulphate crystals can be prepared.
(3 marks)

……
……

……
……

16. An organic compound Y was analysed and found to contain carbon, hydrogen and oxygen only. 1.29g of Y on complete combustion gave 2.64g of carbon (IV) oxide
and 0.81g of water. Find the empricial formula of Y. (C = 12, H = 1, O = 16). (3 marks)

……
……

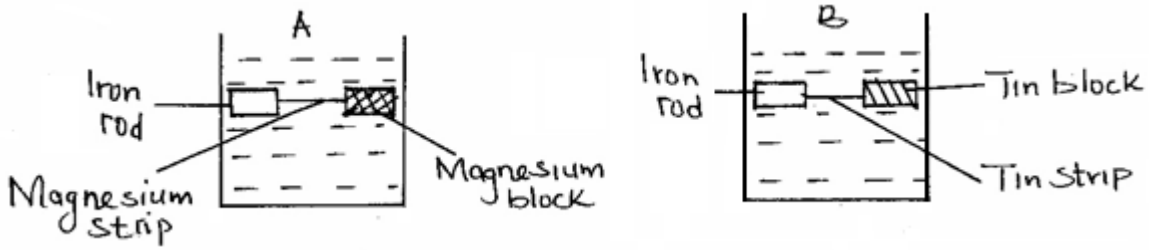
……
……

……
……

……
……

……
……

17. The diagrams below were set up by form 4 students to investigate methods of preventing rusting.



(i) It was observed that rusting occurred in set up B and not in set up A. Explain.
(2 marks)

……
……

……
……

……
……

……
……

(ii) State **one** other method of preventing rusting in iron.
(1 mark)

……
……

……
……

18. An equilibrium exists between the reactants and products as shown in the equation below.

$$Br_{2(aq)} + H_2O_{(l)} \rightleftharpoons OBr^-_{(aq)} + Br^-_{(aq)} + 2Hr^+_{(aq)}$$

(Orange + yellow) (Colourless)

(i) Select the species that acts as an acid. Explain.
(1 mark)

……
……..

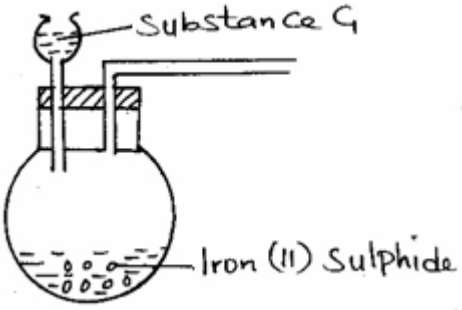
……
……..

(ii) State and explain the observations made when aqueous sodium hydroxide solution is added to the above equilibrium.
(1 mark)

……
……..

……
……..

19. The apparatus shown below were set-up to prepare and collect hydrogen sulphide gas.



(a) Name substance **G**.
(1 mark)

……
……..

(b) Complete the set up to show how a dry sample of hydrogen sulphide gas is collected.
(2 marks)

20. The boiling points of some compounds of hydrogen and some elements in group (IV) and (VI) of the periodic table are given below.

Compound	Boiling point (ºC)	Compound	Boiling point (ºC)
CH_4	-174.0	H_2O	100
SiH_4	-112.0	H_2S	-61

(a) Which of the compounds CH_4 and SiH_4 has stronger intermolecular forces.
Give a reason.
(1 mark)

……
……..

……
……..

……
……..

(b) Explain why the boiling points of H_2O and H_2S show different trends from that
of CH_4 and SiH_4.
(4 marks)

……
……..

……
……..

……

21. Radon $^{222}_{84}Ra$ undergoes alpha decay to form lead, taking 15 days for the original
mass to reduce to 6.25%.

(a) Write the nuclear equation for the reaction.
(1 mark)

……
……..

……

(b) Calculate the half-life of radon.
(2 marks)

……
……..

……
……..

……
……..

……
……..

22. Ethanol and pentane are miscible liquids. Explain how water can be used to separate
a mixture of ethanol and pentane.
(2 marks)

……
……..

……

……
……..

……
……..

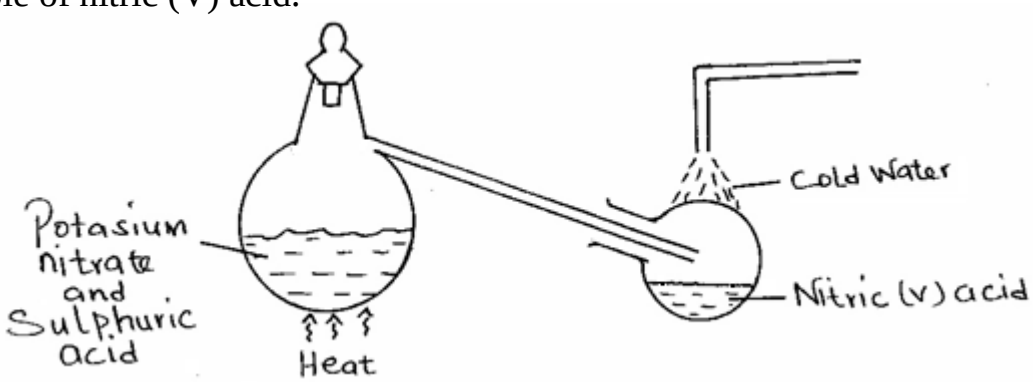
23. Illustrate bonding in carbon (II) oxide using dot (•) and cross (x) (C – 6, O – 8).

(2 marks)

……
……..

……
……..

24. The diagram below shows a set-up that was used to prepare and collect a sample of nitric (V) acid.



(a) Give a reason why it is possible to separate nitric (V) acid from sulphuric (VI) acid in the set up.
(1 mark)

……
…….

……

(b) Name another substance that can be used instead of potassium nitrate. (1 mark)

……
…….

(c) Give **one** use of nitric (V) acid.
(1 mark)

……
……

……
……

25. A mixture of kerosene and water was shaken and left to stand, ammonia gas was then bubbled into the mixture followed by a few drops of phenolphthalein indicator. State and explain the observations made.
(2 marks)

……
……..

……
……..

……
……..

26. Trona is a double salt of sodium with formula Na_2CO_3. $NaHCO_3$. $2H_2O$. Trona is collected, dried and heated to convert it to sodium carbonate.

(i) Write an equation for the decomposition of trona by heat.
(1 mark)

……
……

……
……

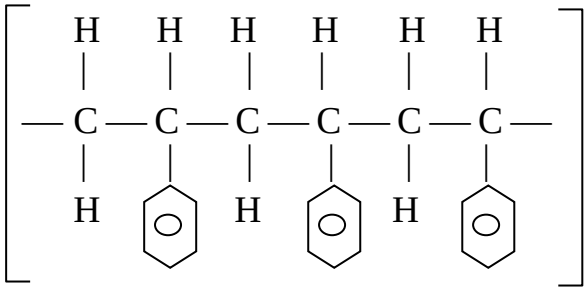
(ii) State **two** uses of sodium carbonate.
(2 marks)

……
……

……
……

……
……

27. Below is part of a synthetic polymer. Study it and answer the questions that follow.



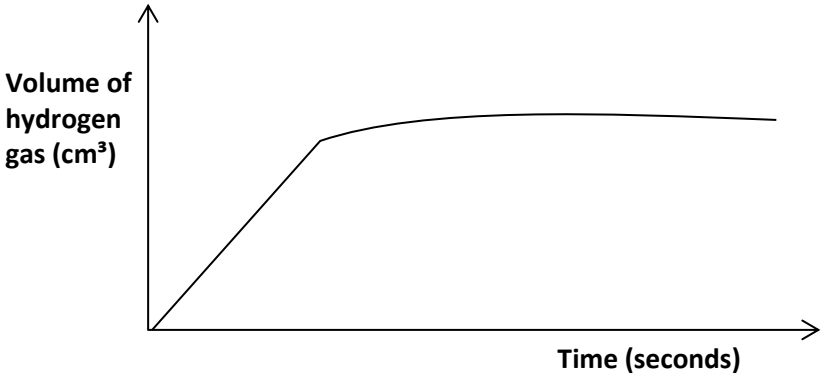
(j) Draw the structure of its monomer. (1 mark

(k)

(ii) Determine the number of monomers making the above compound if its relative molecular mass is 104,000. The benzene ring has six carbon atoms and five hydrogen atoms (C = 12, H = 1).
(2 marks)

……
……...

28. In an experiment to prepare hydrogen gas using magnesium ribbon and dilute hydrochloric acid, a student plotted volume of hydrogen gas against time as shown
in the sketch below.



(a) (i) On the same axes, sketch the curve that would be obtained if a few

crystals of copper (II) sulphate are added and label it curve C. (1 mark)

(ii) What would be the function of copper (II) sulphate in the reaction?

……
(1 mark)

29. 1g of element T was completely converted to its chloride, TCl_2. The mass of the chloride formed was 3.96g. Calculate the relative atomic mass of element T.
(Cl = 35.5).
(3 marks)

……
……

……
……

……
……

……
……

……
……

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

(iii) Write your **name** and **index number** in the spaces provided **above**.
(iv) **Sign** and write the **date** of examination in the spaces provided **above**.
(v) Answer **ALL** the questions in the spaces provided.
(iv) All working **must be** clearly shown where necessary.
(v) Mathematical tables and silent electronic calculators **may be** used.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	14	
3	13	
4	11	
5	10	
6	10	
7	10	
Total Score	80	

This paper consists of **12** printed pages. Candidates should check to ascertain that
all the pages are printed as indicated and that no questions are missing.

1. The table below gives some elements of the periodic table (not actual symbols) and their atomic masses, atomic numbers and melting points.

Element	B	C	D	E	F	G	H	I	J	K
Atomic Nº	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Mpt (ºC)	-	-	63.7	44	-272	-223	Vary	113	669	98

(a) Select **two** elements with oxidation states of -3.
(1 mark)

……
……

(b) Which elements represents:-
(i) the most powerful reducing agent.
(½ mark)

……
……

(ii) the most powerful oxidizing agent.
(½ mark)

……
……

(c) Which metallic element has the highest first ionization energy?
(1 mark)

……
……...

(d) Select **two** elements which when reacted form a compound that conducts electricity in both molten and aqueous state.

(1 mark)

……
……...

……
……...

(e) Select any **two** elements which when reacted form a compound that dissolves in water to form an acidic solution.

(1 mark)

……
……...

……
……...

……
……...

(f) Using dots (•) and crosses (x) to represent valency electrons, draw diagrams to show bonding between **B** and **J**.

(2 marks)

(g) Explain why for some elements the atomic mass is not twice the atomic number.

(1 mark)

……

(h) Explain why the melting point of element K is higher than that of element D.
(1 mark)

……
……..

……
……..

……
……..

(i) Describe how a solid mixture of the sulphate of element K and lead (II) sulphate can be separated.
(3 marks)

……
……...

……
……...

……
……..

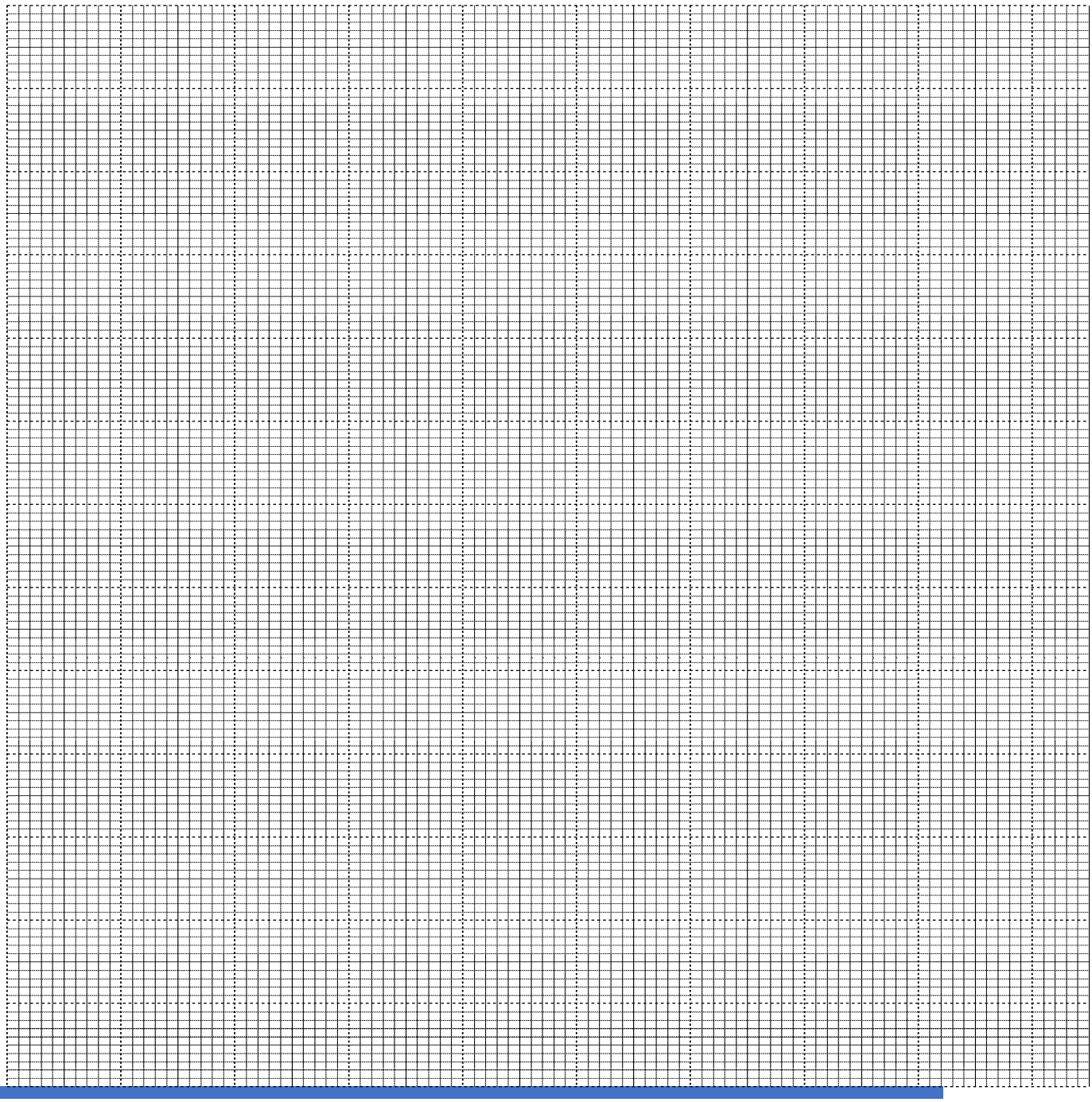
……
……..

……
……..

2. The solubilities of two salts D and E are given in the following table in each case the solubility is expressed as grammes per 100g of water.

Temperature (°C)	10	20	30	40	50	60	70	80
Solubility of D	17	21	24	29	34	40	47	56
Solubility of E	35.8	36	36.2	36.5	36.8	37.3	37.6	38.0

(a) Using these data plot solubility curves for D and E on the same grid. (5 marks)



(b) Use your graph to answer the following questions:

(i) At what temperature are the solubilities of the two salts equal? (1 mark)

……
……

(ii) Estimate the solubility of salt D at OºC.
(1 mark)

……
……

(iii) A saturated solution of E in 50g of water at 25ºC was evaporated to dryness. What was the mass of the residue?
(1 mark)

……
……

……
……

(iv) Two separate 100g of water are saturated at 75ºC, one with D and the other with E. What is the difference in mass between the two solutions? (2 marks)

……
……

……
……

……
……

……
……

(v) The saturated solution obtained were each cooled to 20ºC.

I Calculate the total mass of the two salts precipitated.
(2 marks)

……
……

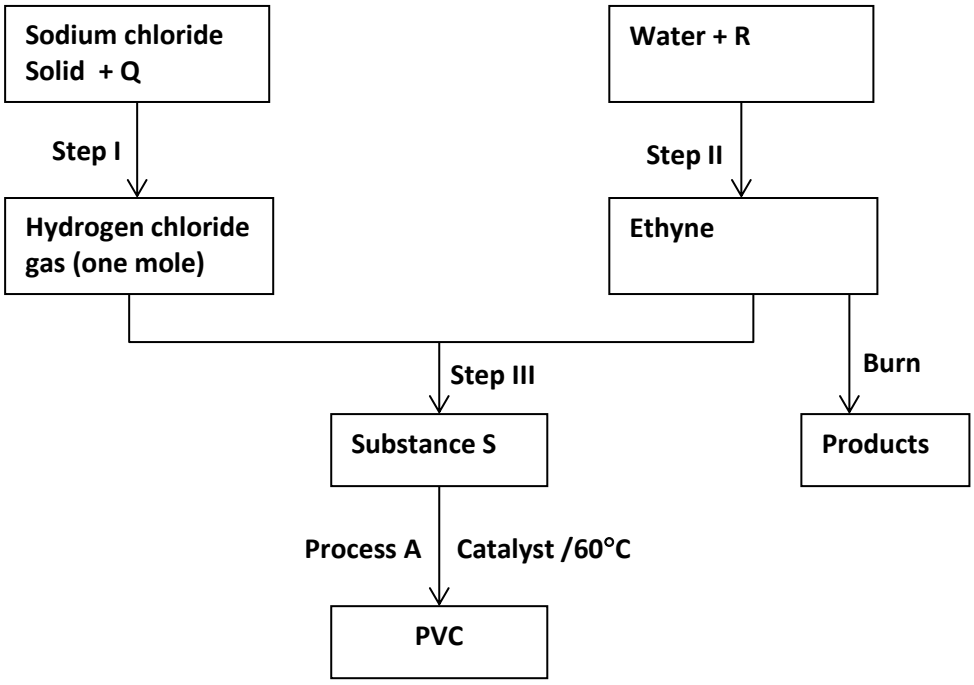
……

II Calculate the mass of each salt dissolved at saturation in 20g of water at
20ºC.
(2 marks)

……
……

……

3. (i) Study the flow chart below and answer the questions that follow.



(i) Identify substances **Q** and **R**.
(2 marks)

Q …… **R**

……

(ii) Using a chemical equation, show how **R** reacts with water.
(1 mark)

……
…

……
…

(iii) Name and draw the structures of substance **S**.
(2 marks)

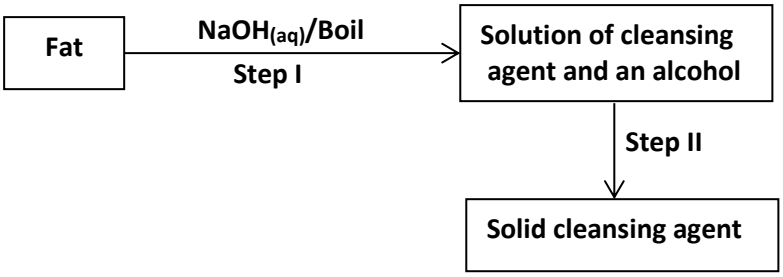
(iv) Name process **A**.
(1 mark)

……
…

(v) State **two** uses of PVC.
(1 mark)

……
…

(b) The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(i) What name is given to the type of cleansing agent prepared by the method above?
(1 mark)

……
……..

(ii) Name **one** chemical substance added in Step **II**.
(1 mark)

……
……..

(iii) What is the purpose of adding the chemical named in b(ii) above. (1 mark)

……
……..

(iv) Name any other suitable substance that can be used in Step **I**.
(1 mark)

……
……..

(v) Explain how an aqueous solution of the cleansing agent removes oil during washing.
(2 marks)

……
……..

……
……..

4. (a) The standard reduction potentials for five half cells are shown in the table below.

Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

			E^{θ}(V)
$A_{2(aq)} + 2e^-$	$\rightarrow$	$2A^-_{(aq)}$	$+1.09$
$Q^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$Q_{(s)}$	-0.13
$R^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$R_{(s)}$	-2.37
$Y^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$Y_{(s)}$	$+0.34$
$25^{+}_{(aq)} + 2e^-$	$\rightarrow$	$S_{2(g)}$	0.00

(i) With a reason identify the strongest reducing agent.
(1 mark)

……
……..

……
……..

(ii) Which element is likely to be hydrogen. Explain.
(1 mark

……
……..

……
……..

……
……..

(iii) Write an equation for the cell formed when Q and Y half cells are joined.
(1 mark)

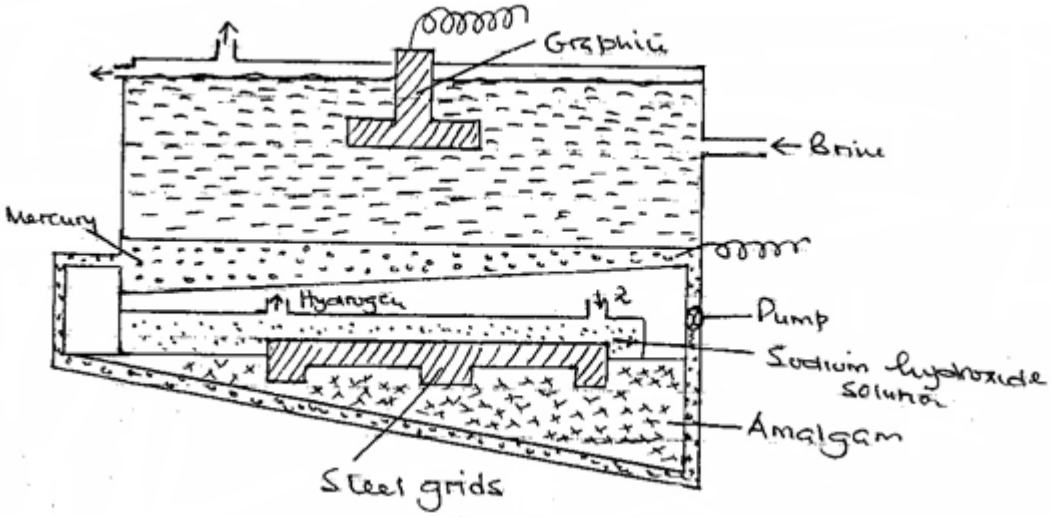
……
……..

……
……..

(iv) Calculate the e.m.f of the cell in (iii) above.
(1 mark)

……
……..

(b) The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow.



(i) Name raw material introduced at **2**.
(½ mark)

……
……..

(ii) Name another material that can be used in the cell instead of graphite.

……
… (½ mark)

(iii) Write an equation for the reaction.
I that occurs at the anode.
(1 mark)

……

II In which sodium hydroxide is produced.
(1 mark)

……
.

……
.

(iv) Give **two** reasons why mercury is recycled.
(1 mark)

……
……

……
……

……
……

……
(iv) A current of 100 amperes was passed through the cell for five (5) hours. Calculate the mass of sodium hydroxide that was produced.
(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500C).
(3 marks)

……
……

……
……

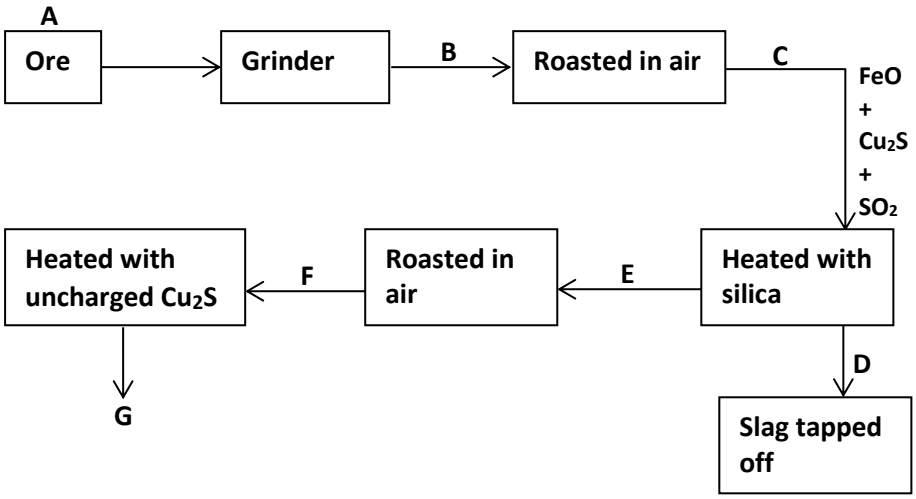
……
……

……
……

……

……

5. Study the flow diagram below and answer the questions that follow.



(a) Give the names of the two ores that can be used in the above process in Stage **A**.

……
. (1 mark)

(b) What process takes place in Stage **B**?
(1 mark)

……
…….

(c) Give the equation for the formation of the slag that is tapped of in Stage **D**.

What is the name of the slag?
(2 marks)

……
…….

……
…….

……
……

(d) What are the names of the products formed in Stage **G**?
(1 mark)

……
……

(e) What are the main impurities that are contained in the copper obtained in
Stage **G**.
(1 mark)

……
……

(f) Draw a well labelled diagram of the set-up of apparatus that would be used to purify the copper obtained in Stage **G**.
(2 marks)

(g) State **two** uses of copper.
(1 mark)

……
……

……
……

(h) What environmental problems would be associated with copper mining? (1 mark)

……
…….

……
…….

……

6. (a) Methanol is manufactured from carbon (IV) oxide and hydrogen gas according to the equation.

$$CO_{2(g)} + 3H_{2(g)} \rightleftharpoons CH_3OH_{(g)} + H_2O_{(g)} \qquad \Delta H = -ve$$

The reaction is carried out in the presence of a chromium catalyst at 400ºC and 30Kpa under these conditions, an equilibrium is reached when 2% of the carbon (IV) oxide is converted to methanol.

(i) Explain how the yield of methanol would be affected if; the manufacturing process above is carried out at, 200ºC and a pressure of 30Kpa. (2 marks)

……
……

……
……

……
……

……
……

(ii) A more efficient catalyst is used. (2 marks)

……
……

(b) In an experiment to determine the molar heat of reaction when zinc displaces copper, 0.4g of zinc powder were added to 25.0cm^3 of 2.0M copper (II) sulphate solution. The temperature of copper (II) sulphate solution was 24ºC, while that of the mixture was 36ºC.

(i) Other than increase in temperature, state and explain the observations which were made during the reaction.
(3 marks)

……
……

……
……

……
……

……
……

(ii) Calculate the heat change during the reaction. (Specific heat capacity of the solution = 4.2Jg^{-1}K^{-1} and the density of the solution = 1g/cm^3. (1 mark)

……
……

……
……

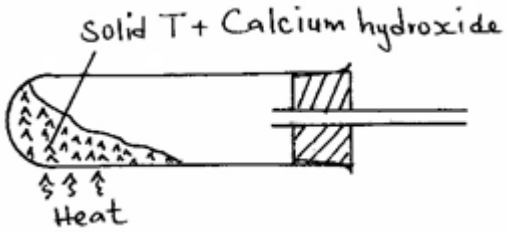
……
……

(iii) Determine the molar heat of displacement of copper by zinc. (Zn = 65).
(2 marks)

……
……

……
……

7. (a) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas.



(i) Name solid **T**.
(1 mark)

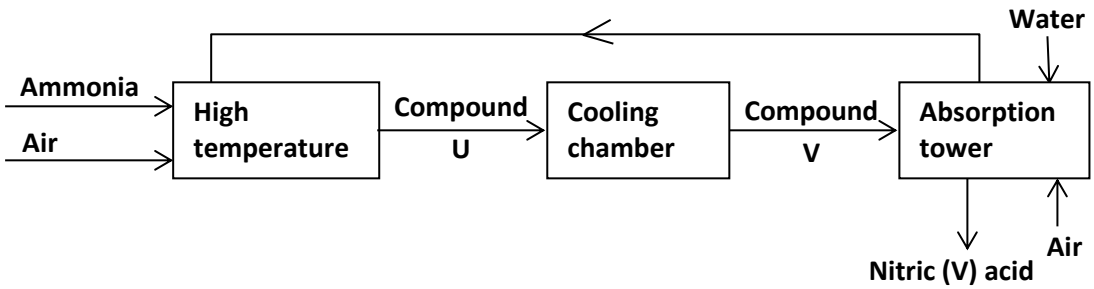
……
……

(ii) Write an equation for the reaction that occurred when a mixture of solid **T** and calcium hydroxide was heated.
(1 mark)

……
……

(iii) Complete the diagram to show how a dry sample of ammonia gas can be collected.
(3 marks)

(b) Ammonia gas is used to manufacture nitric (V) acid as shown below.



(i) Name the catalyst used in the above process.
(½ mark)

……
……

(ii) Identify compound **U**.
(½ mark)

……
……

(iii) Write the equation for the reaction that took place in the absorption tower.

(1 mark)

……
……

……
……

(iv) Ammonia and nitric (V) acid are used in the manufacture of ammonium nitrate fertilizer, calculate the amount of the fertilizer manufactured per day, if the daily consumption of ammonia is 2400kg. Assume that the factory is 100% efficient. (N = 14, H = 1, O = 16). (3 marks)

……
……

……
……

……

……
……

233/1
CHEMISTRY
PAPER 1
JULY/AUGUST, 2016
TIME: 2 HOURS

KIRINYAGA EAST SUB-COUNTY

CENTRAL ZONE STRATEGIC ALLIANCE EXAMINATIONS 2016

(Kenya Certificate of Secondary Education –K.C.S.E)

CHEMISTRY
PAPER 1
JULY/AUGUST, 2016
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Write your name and index N./Adm.No. in the spaces provided.
2. Sign and write the date of the examination in the spaces provided.
3. Answer all the questions in the spaces provided.
4. All working must be clearly shown where necessary.

FOR EXAMINER USE ONLY

Questions	Maximum score	Candidate's score

This paper consists of 12 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. Study the reactions shown below

I. $NH_4CI(S) \longrightarrow NH_3(g)+HCI(g)$

II. $I_2(g) \longrightarrow l_2(s)$

- What name is used to refer equation?

I……

……. (1mk)

II……

…….(1mk)

2. You're given the following list of gases;

Nitrogen (IV) oxide

Ammonia

Hydrogen

Sulphur (IV) oxide

a) Draw a diagram to show how dry sample of nitrogen (IV) oxide is collected.

(1mk)

b) Name a suitable drying agent for ammonia gas.

(½ mk)

……

…….

c) Write a balanced chemical equation for oxidation of sulphur (IV) oxide in air.

(1mk)

……

…….

d) Choose the lightest gas

(½mk)

……

…….

3. State the method that can be used to separate

i) Sulphur and Iron powder

(1mk)

……
……

ii) Iron (II) sulphide and Iron (II) sulphate.

(1mk)

……
……

4. Generally molecular substances have low melting point and boiling point. Explain why this is so.

(2mks)

……
……
……
……

5. The atomic number of an element X is 14.

a) In which period of the periodic table is element X? Explain.

(2mks)

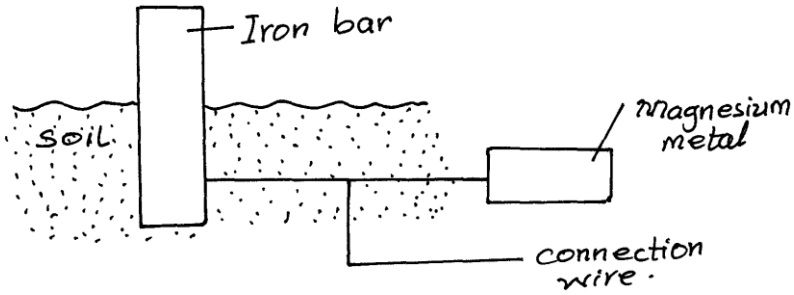
……
……

b) Write the electron arrangement of element X.

(1mk)

……
……

6. The diagram below shows an iron bar which supports a bridge. The iron bar is connected to a piece of magnesium metal.



Explain
why it's necessary to connect the piece of magnesium to the iron bar. (2mks)

……

……

……

……

7. When gas x was passed over heated copper metal the metal changed its colour to black. Identify

i) Gas x

(1mk)

……

……

ii) Name the black substance formed
(1mk)

……

……

8. Explain why;

i) Aluminium has a high melting point compared to magnesium
(2mks)

……

……

……

……

……

……

ii) Aluminium has a higher electrical conductivity compared to magnesium.
(1mk)

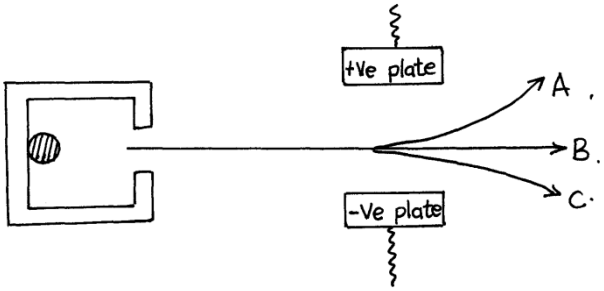
……

……

……

……

9. Study the diagram below and answer the questions that follow



a) Name particles A and B (2mks)

A……
……..
B……
…….

10. Study the equation below and answer the questions that follow

$2\ NO_2\ (g)$ $N_20_4(g)$ H = -ye

Brown yellow

a) State and explain the observation made when a mixture at equilibrium is heated. (2mks)

……

……

……

……

……

……

b) If pressure is exerted at the mixture at equilibrium, what observation will be made? (1mk)

……

……

……

……

11. A student dipped an iron nail into a solution of 0.5M copper (II) sulphate solution and allowed to remain in the solution for 5 minutes

i) What observation was made on the iron nail? Explain
(2mks)

……

…….

……

…….

……

……

ii) Write an ionic equation for the reaction that occurred.
(1mk)

……

…….

12. Below are standard enthalpies. Use them to answer the question below

$C_2H_2 + O_2 \longrightarrow 2CO_2 + H_2O$ $\Delta Hc = -1300KJ\ Mol^{-1}$

$H_2(g) + ½\ O_2(g) \longrightarrow H_2O$ $\Delta Hc = -286\ KJ\ mol^{-1}$

$C(s) + O_2 \longrightarrow CO_2(g)$ $\Delta Hc = -394\ KJ\ mol^{-1}$

Calculate enthalpy formation of ethyne from its constituent elements.
(2mks)

13. Iron (II) chloride can be prepared in the laboratory by passing dry chlorine gas over hot steel wool.

a) Name the above method of preparing salts.
(1mk)

……

…….

b) Why should we prepare the salt in a dry environment?
(1mk)

……

…….

……

…….

c) A solution of Iron (III) chloride in water changes a blue litmus paper to red. Explain. (1mk)

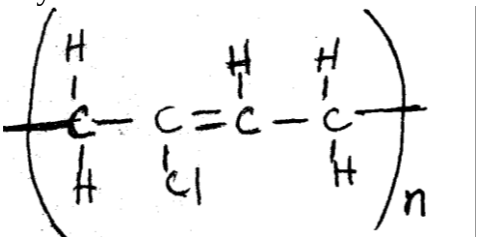
……

…….

……

…….

14. The structure of a synthetic rubber is shown below



a) i) Determine the relative molecular mass of the monomer. (1mk)

ii.) Determine mass of a polymer that is made when 250 monomers polumerise. (1mk)

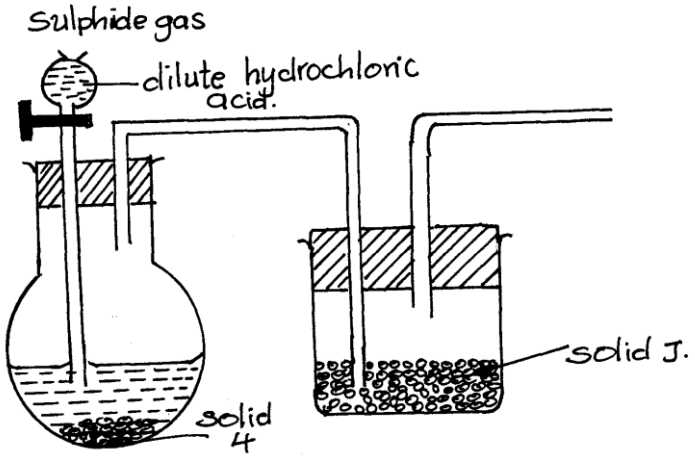
b) Give one advantage of natural polymers over synthetic ones. (1mk)

……

…….

……

15. The setup below was used to prepare dry sample or hydrogen sulphide gas.



a) Complete the diagram to show how the gas was collected. (1mk)

b) Identify the following solids;

i) H

(1mk)

……

……

ii) J

(1mk)

……

……

16. The table below shows the observations made when an aqueous salt P was reacted with ammonia

Test	**Observation**
P^+ A few drops of aqueous Ammonia	Blue precipitate forms
P^+ Excess aqueous ammonia	Blue precipitate dissolves to form a deep blue solution

a) Identify the cation present in aqueous salt P.
(1mk)

……

……

b) Write the formula of the ion formed when the blue precipitate dissolves in excess aqueous ammonia.
(1mk)

……

……

c) Explain why aqueous ammonia is said to be a weak base.

(1mk)

……

…….

……

…….

17. Ethene gas can be manufactured industrially starting with a certain hydrocarbon CH as shown below

C_xH_y $C_2H_4+C_4H_{10}+H_2$

(Ethene)

a) Name the type of reaction shown above.

(1mk)

……

…….

b) Name the hydrocarbon which is used to manufacture ethane in the reaction shown above (½mk)

……

…….

c) Give one industrial use of ethene

(½mk)

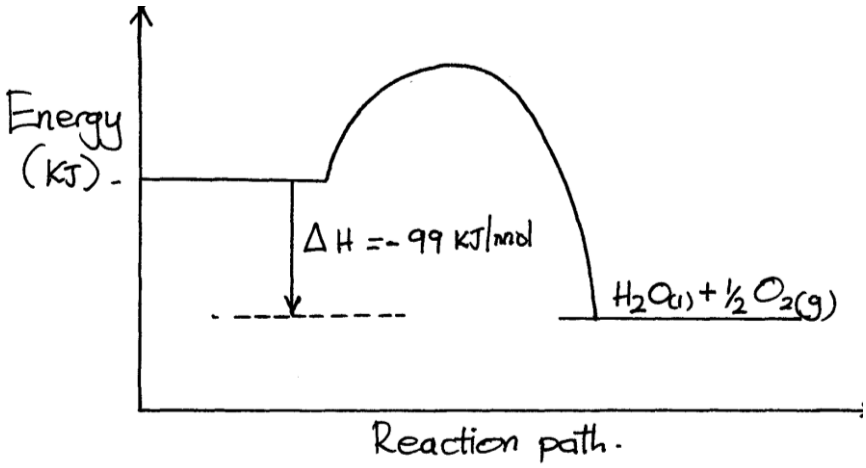
……

…….

……

…….

18. The axis below shows an energy level diagram for the reaction producing oxygen gas from hydrogen peroxide.



a)

Using a dotted line, sketch the curve of the reaction if manganese (IV) oxide was added. Explain the shape of your sketch.

(2mks)

……

……

……

……

b) The reaction between Zinc powder and hydrochloric acid evolves hydrogen gas faster than when zinc granules are used. Explain.

(2mks)

……

……

……

……

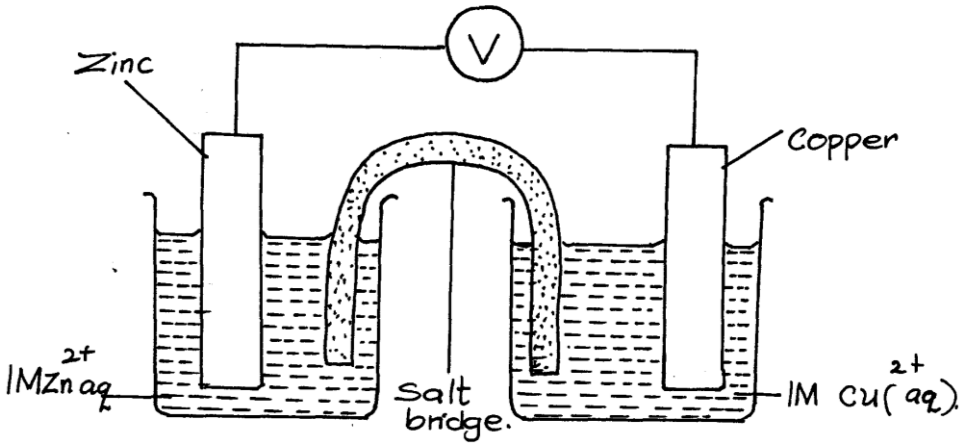
19. a) What is the maximum mass of a gas that would be produced when 0.36g of magnesium reacted with excess hydrochloric acid.(Mg=24; H=1) (2mks)

b) What volume would the gas in (a) above occupy at room temperature and pressure. (r.t.p)

(1 mole of a gas at r.t.p occupies 24 litres)

(1mk)

20. Study the following electrochemical cell, then answer the questions that follow.



a) Write down the half-cell equation for reactions occurring at each electrode. (2mks)

……

……

……

……

b) Show on the diagram the direction of flow of electrons. (1mk)

21. Using equations explain the effect of heat on the following;

a) Sodium nitrate (1mk)

……

……

……

……

b) Lead (ii) hydroxide

(1mk)

……

……

……

……

c) Ammonium carbonate

(1mk)

……

……

……

……

22. A certain mass of sulphur (IV) oxide occupied 400cm^3 at 30°c and 750mmHg pressure. Calculate the volume occupied by the same gas if pressure is lowered to 300mmHg and temperature raised to 60°c.

(2mks)

23. The table below shows atomic and ionic radii of some elements by letters U, V,W and X not the actual symbols) Study it and answer the questions that follow.

Element	Atomic Radius (nm)	Ionic radius (nm)
U	0.174	0.099
V	0.203	0.133
W	0.099	0.181
X	0.136	0.065

a) Classify X as a metal or non-metal. Explain (1mk)

……

……

……

b) Identify the element which is the strongest reducing agent. (1mk)

……

……

……

c) Which element forms an anion?

(1mk)

……

……

……

24. Ethanol has important uses in our daily lives. For each use, state the property that makes ethanol suitable as;

a) Fuel

(1mk)

……

……

…… b) Solvent

(1mk)

……

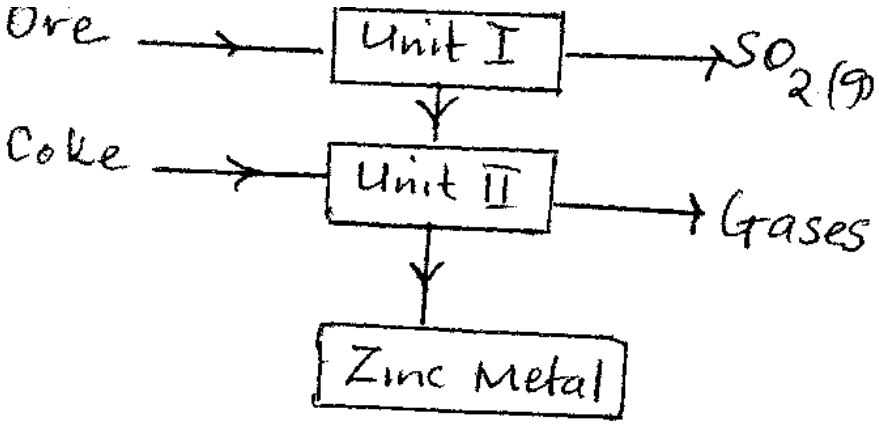
……

……

c) Draw the structural formula of ethanol

(1mk)

25. The flow chart below shows some processes involved in the industrial extraction of zinc metal.



a) Name one ore from which zinc is extracted.

(1mk)

……
…….

b) Write equation for the reaction taking place in unit II.

(1mk)

……
…….

c) State two uses of Zinc.

(1mk)

……
……
……
……

26. In a water purification plant, aluminium sulphate is added to coagulate small suspended particles

a) State the reason for chlorinating and adding lime in water purification plant

(2mks) Chlorinating

……
……
……

Adding lime

……
……
……

b) Name the compounds responsible for temporary hardness in water (1mk)

……
……
……

……
……

27. Commercial sulphuric (VI) acid has a density of 1.8gcm^3

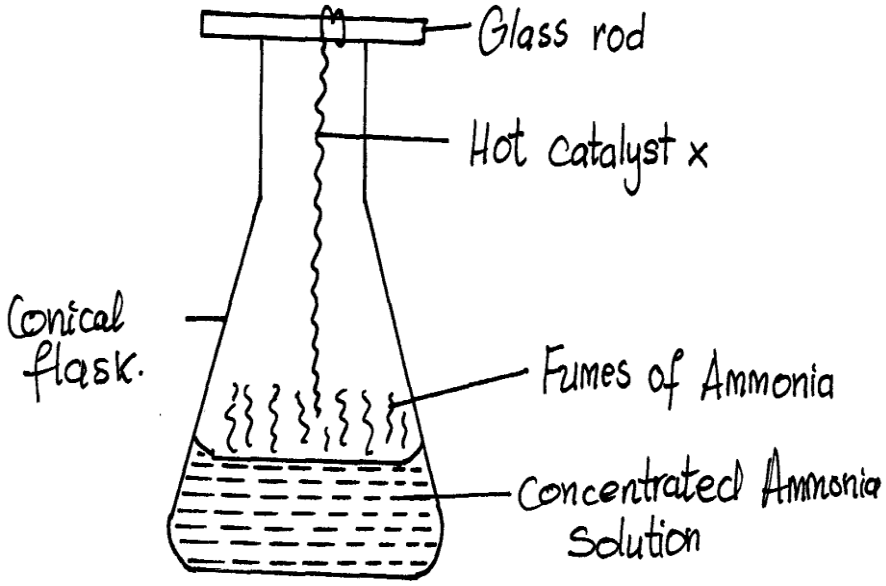
a) Calculate the molarity of the acid.

(2mks)

b) Determine the volume of the commercial acid in (a) above that can be used to prepare 500cm^3 of 0.2M sulphuric (VI) acid solution.

(2mks)

28. Study the diagram below and answer the question given below.



a) The reaction between ammonia and oxygen in the presence of a catalyst continue without further heating. Explain
(2mks)

……

……

……

……

b) Name catalyst X
(1mk)

……

……

29. Coloured flowers placed in a gas jar containing moist gas P immediately turned colourless, A solution of gas P formed a white precipitate with lead (ii) nitrate solution. On warming gently, the white precipitate dissolved.

a) What is the identity of gas P?
(1mk)

……

……

b) Name and write the chemical formula of the compound responsible for the decolourisation of the flower

233/2
CHEMISTRY
PAPER 2
JULY/AUGUST, 2016
TIME: 2 ½ HOURS

KIRINYAGA EAST SUB-COUNTY

CENTRAL ZONE STRATEGIC ALLIANCE EXAMINATIONS 2016

(Kenya Certificate of Secondary Education –K.C.S.E)

233/2
CHEMISTRY
PAPER 2

INSTRUCTIONS TO CANDIDATES

1. Write your name and index N./Adm.No. in the spaces provided
2. Sign and write the date of the examination in the spaces provided
3. Answer all the questions in the spaces provided
4. All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1 - 7		

This paper consists of 12 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. a) The table below gives information about the major constituents of crude oil. Study it and answer the questions that follow.

Constituents	**Boiling point (^{0}C)**
Gases	Below 40
Petrol	40 – 175
Kerosine	175 – 250
Diesesl oil	200 – 300
Lubricating oil	350 – 400
Bitumen	Above 400

i) Which one of the constituents of crude oil has molecules with the highest number of carbon atoms?

(1mk)

……

……

ii) Name the process you would use to separate a mixture of petrol and diesel. Explain how the separation takes place.

(2mks)

……

……

……

……

iii) State why it is possible to separate the constituents of crude oil.

(1mk)

……

……

……

……

iv) Name one gas that is likely to be a constituent of crude and write its formula.

(1mk)

……
……
……
……

b) i) What condition could cause a poisonous gas to be formed when Kerosene is burnt? Explain.

(2mks)

……
……
……
……
……
……

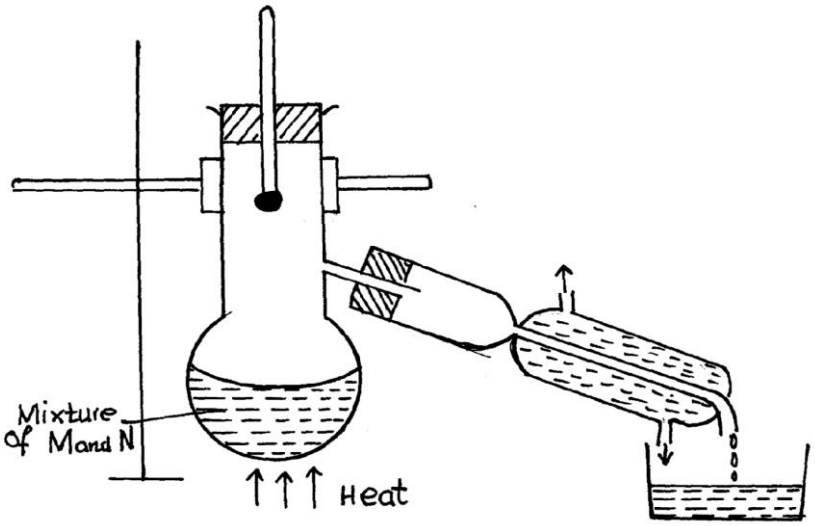
ii) Give one use of bitumen.

(1mk)

……
……
……
……

c) In an experiment to separate a mixture of two organic liquids, liquid M (b.p 56°c) and N

liquid (b.p 118°c), a student set up the apparatus shown below.



d) Identify two mistakes in the set-up. (2mks)

……

……

……

……

e) What method would the student use to test the purity of the distillates obtained? (1mk)

……

……

……

……

2. a) The elements nitrogen, phosphorous and potassium are essential for plant growth.

i) Potassium in fertilizers may be in the form of potassium nitrate. Describe how a sample of a fertilizer may be tested to find out if it contained nitrate ions. (2mks)

……

……

……

……

……

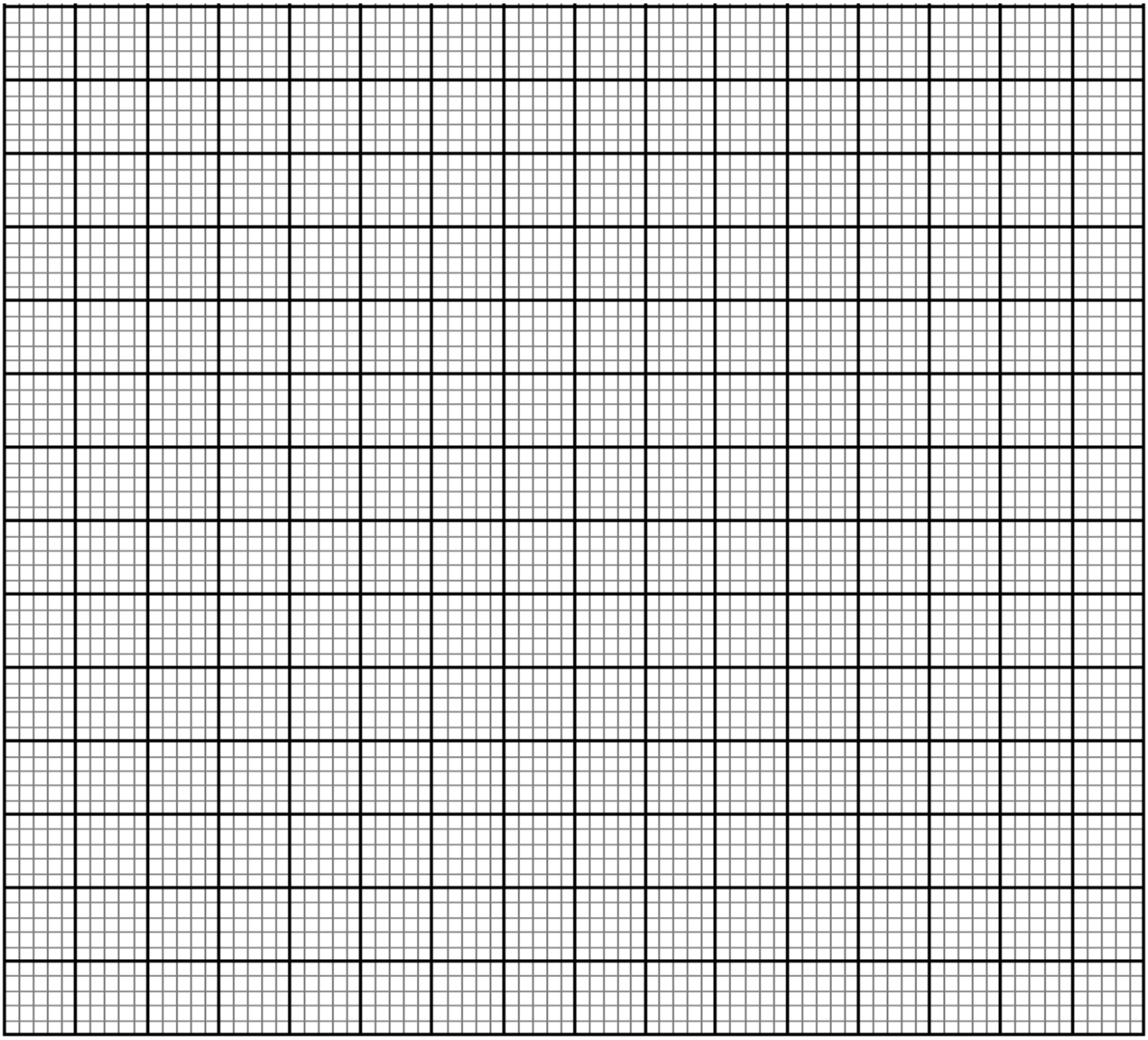
……

ii) Calculate the mass of nitrogen present if a 25kg bag contained pure ammonium phosphate, $(NH_4)_2HPO_4$.(N=14.0, H=1.0, P=31.0, O=16.0) (2mks)

b) The table below shows the solubility of ammonium phosphate in water at different temperatures.

Temperature (^{0}C)	**Solubility of ammonium phosphate in g/100g water**
10	63.0
20	69.0
30	75.0
40	82.0
50	89.0
60	97.0

i) On the grid provided, draw the solubility curve of ammonium phosphate.
(Temperature on x- axis) (3mks)



ii) Using the graph, determine the solubility of ammonium phosphate at 25°c. (1mk)

ii) 100g of a saturated solution of ammonium phosphate was prepared at 25°c.

I. What is meant by a saturated solution? (1mk)

……

……

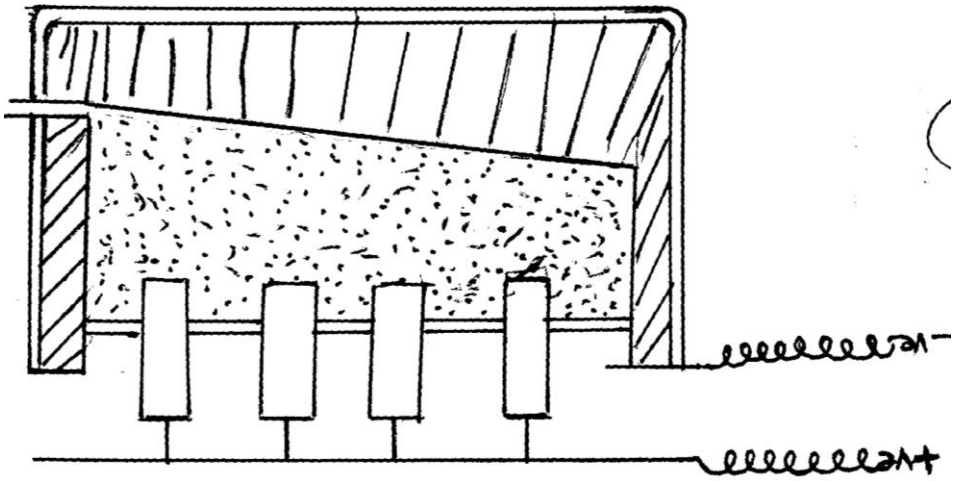
……

……

II. Calculate the mass of ammonium phosphate which was used to prepare the saturated solution.

(2mks)

3. The extraction of aluminium from its ore takes place in two stages, purification state and electrolysis stage. The diagram below shows the set-up for the electrolysis stage.



a) i) Name the ore from which aluminium is extracted.

(1mk)

……

……

ii) Name one impunity, which is removed at the purification stage.

(1mk)

……

……

b) I) Label on the diagram each of the following

i) Anode

(1mk)

ii) Cathode

(1mk)

iii) Region containing the electrolyte.

(1mk)

II) The melting point of aluminium oxide is 2054°c, but electrolysis is carried out between

800-900°c.

i. Why is the electrolysis not carried out at 2054^0c?

(1mk)

……

……

……

……

ii. What is done to lower the temperatures?

(1mk)

……

……

……

……

iii. The aluminium which is produced is tapped off as a liquid, what does this suggest about its melting point?

(1mk)

……

……

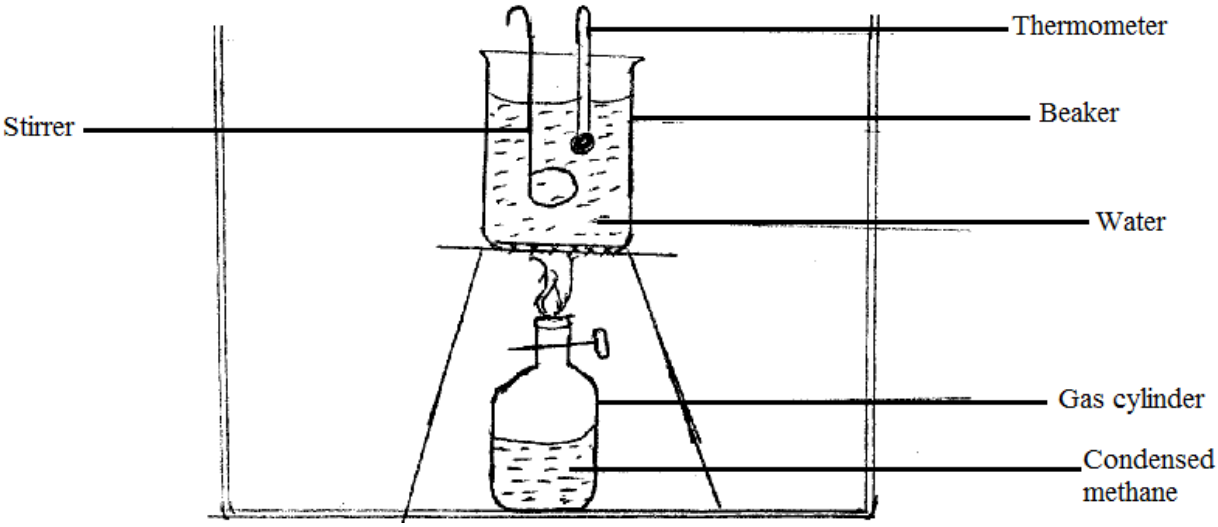
……

……

c) A typical electrolysis cell uses current of 40,000 amperes. Calculate the mass (in kilograms) of aluminium produced in one hour.

(3mks)

4. a) The apparatus set up shown above was used to determine molar heat of combustion of methane gas.



Results given below were obtained;

Mass of water in the beaker = 100g

Initial temperature of water = 20.7°c

Initial temperature of water = 51.1 ^{0}C

Initial mass of burner + methane = 27.16g

Initial mass of burner + methane = 26.92g

Given: Specific heat capacity of water = 4200J $Kg^{-1}K^{-1}$

a)

i) What is the mass of methane burnt?

(1mk)

ii) What is the rise in temperature.

(1mk)

iii) Calculate the amount of heat produced in KJ.

(2mks)

iv) Calculate the heat of combustion of one mole of methane, CH_4.

(2mks)

v) Write the equation for the combustion of methane showing the enthalpy changes.

(2mks)

……

……

……

……

vi) How would the value obtained in this experiment compared with theoretical values obtained in the data hook? Explain.

(2mks)

b) The table below shows heat of combustion of some alkanes.

Alkane	H combustion KJ/Mol
C_2H_6	-1560
C_3H_8	-2220
C_4H_{10}	-2877
C_5H_{12}	-3520
C_6H_{14}	

i) Predict Δcombustion (KJ/Mol.) for C_6H_{14}.

(1mk)

……

……

……
……

ii) Explain the trend.

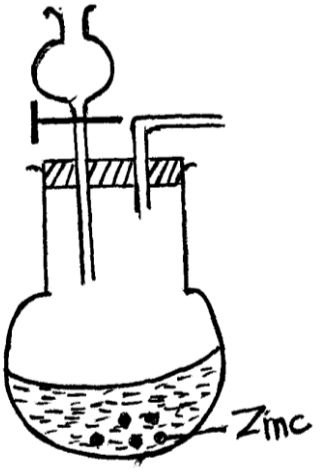
(1mk)

……
……
……
……

c) Enthalpy of neutralization is -57.3KJ/mol. Explain why the value obtained by reacting hydrochloric acid and ammonium hydroxide is always less than -57.3 KJ/mol. (1mk)

……
……
……
……

5. The diagram below represents an incomplete set up of apparatus used by a form one student in an attempt to prepare and collect dry hydrogen gas.



i) Complete the diagram for collection of a sample of dry hydrogen gas.

(3mks)

ii) Write an ionic equation for the production of hydrogen gas.

(1mk)

……
……

iii) In the preparation of hydrogen gas, if concentrated nitric (V) acid was used with zinc as reactants, no hydrogen gas is liberated. Explain why no hydrogen is liberated. (2mks)

……

……

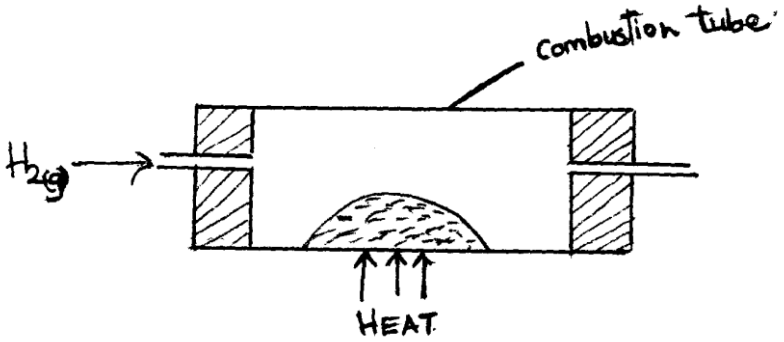
……

……

……

……

b) Hydrogen gas is passed over heated copper (II) oxide as shown on the diagram.



i) Show the observations made in the combustion tube.
(2mks)

……

……

……

……

……

……

Write the chemical equation for the reaction that took place in the combustion tube. (1mk)

……

……

……
……

c) 4g of N-13 decays by emitting a beta particle. The half life of N-13 is ten minutes

i) What is meant by half life?

(1mk)

……
……

……
……

ii) How many grams of the isotope will remain after the fourth half life?

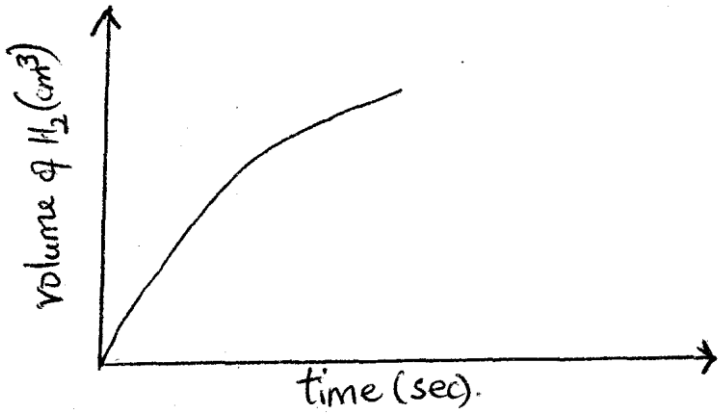
(2mks)

iii.) State two differences between nuclear and chemical reaction.

(2mks)

Nuclear reaction	**Chemical reaction**

6. The sketch graph below shows volume of carbon (IV) oxide evolved in a reaction between marble chips and dilute hydrochloric acid against time.



i) On the same grid sketch the curve for volume of carbon (IV) oxide, if powdered calcium carbonate was used instead of marble chips.
(1mk)

ii) Why is dilute sulphuric acid not used instead or dilute hydrochloric acid.
(1mk)

……
……

iii) Explain why carbon (IV) oxide is more suitable in extinguishing petrol flame than water.
(1mk)

……
……
……
……

b) X grams of anhydrous sodium carbonate, $Na2C_{03}(s)$ reacted completely with $30cm^3$ of dilute hydrochloric acid to produce $672cm^3$ of carbon (IV) oxide as at. s.t.p (1 mole of gas occupies $22400cm^3$ at s.t.p.)

i) Write an equation for the reaction
(1mk)

……
……
……
……

ii) Calculate the concentration of the acid in moles per litre.
(2mks)

iii.) Calculate the value of X.
(2mks)

c) Rain water falling and running over calcium salt rocks become hard.

i) What is hardness of water?

(1mk)

……

……

……

……

ii.) Explain how sodium carbonate can be used to soften water. (Use ionic equation)

(1mk)

……

……

……

……

7. The table below shows the atomic numbers and boiling points of elements U,V,W,X and Y (not their actual symbols). Study it and answer the questions that follow.

Element	**Atomic number**	**Boiling point (^{0}C)**
U	3	1330
V	13	2470
W	16	445
X	18	-186
Y	19	774

a) Select the elements which belong to the same

i) Group

(1mk)

……

……

……

……

ii) Period

(1mk)

……

……

……

……

b) Which elements;

i) Is gaseous at room temperature? Explain. (room temperature = 298K)

(2mks)

……

……

……

……

ii) Does not form an oxide

(1mk)

……

……

……

……

c) Write the

i) Formula of the sulphate of element V.

(1mk)

……

……

……

……

ii) Equation for the reaction between Y and W

(1mk)

……

……

……

……

d) What type of bond exists in the compound formed between U and W? Give a reason for your answer.

(2mks)

……

……

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

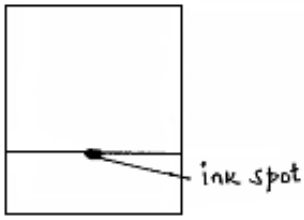
(vi) Write your **name** and **index number** in the spaces provided **above**.
(vii) **Sign** and write the **date** of examination in the spaces provided **above**.
(viii) Answer **ALL** the questions in the spaces provided.
(ix) Mathematical tables and silent electronic calculators **may be** used.
(x) All working **must be** clearly shown where necessary
(xi) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing
(xii) Candidates should answer the questions in English.

For Examiner's Use Only:

Questions	Maximum Score	Candidate's Score
1 – 28	80	

1. A given sample of ink is a mixture of red dye, blue dye and orange dye. The blue
dye is least absorbed than the rest and the red dye is most sticky.

(a) Complete the paper chromatogram below showing their separation. (1½mks)



(b) The above dyes are soluble in water. Describe how a pure sample of blue
dye can be obtained.
(1mk)

……
……..

……
……..

(c) Name the solvent used in paper chromatography.
(½mk)

……
……..

2. Excess iron was allowed to rust in 2dm³ of most air and the volume of air remaining was measured at 1 atmospheric pressure each day. The results were as follows.

Day	0	1	3	4	5	6	7	8
Volume (cm^3)	2000	1900	1720	1660	1620	1600	1600	1600

(i) Write an equation for the formation of rust.
(1mk)

……
……..

(ii) On which day was the reaction complete. Explain.
(1mk)

……
……..

……
……..

(iii) What is the percentage volume of oxygen in air. Show your working. (1mk)

……
……..

……
……..

……
……..

3. State **two** properties of copper that make it suitable for making ornaments. (2mks)

……
……

……
……

4. Give the IUPAC name of the following:
(1mk)

(i) $CH_3\ CH_2\ COOCH_2\ CH_3$

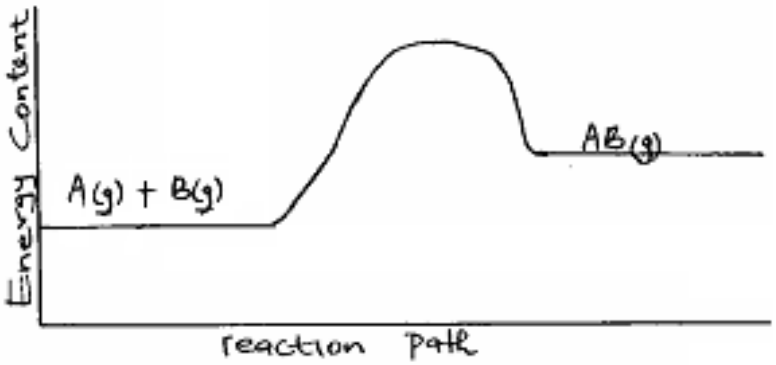
……
……..

(ii) Give the name of the homologous series to which the compound belongs. (1mk)

……
……..

(iii) Name and draw the alcohol that formed the compound in 4(i) above. (1mk)

5. Consider the following equation.



On the same axis, sketch the graph when a catalyst is added and label all the essential parts.
(2mks)

6. A radioactive isotopes of lead undergoes radioactive decay in two stages are shown below.

$$^{216}_{85}Pb \xrightarrow{(i)} {}^{212}_{83}X \xrightarrow{(ii)} {}^{212}_{84}Y$$

(a) Identify the particle emitted at each stage.
(2mks)

……
……..

(b) State **one** use of radioactive isotopes.
(1mk)

……
……..

7. Aluminium chloride solution changes blue litmus paper red. Explain this observations.

(2mks)

……
……

……

8. Nitric (V) acid may be prepared in the laboratory by the action of concentrated sulphuric (VI) acid on a suitable nitrate and distilling OFF the nitric (V) acid.

(a) Why is the apparatus consisting of glass desirable?
(1mk)

……
…….

……
…….

(b) Pure nitric (V) acid is colourless but the products in the laboratory preparation
is usually yellow. Explain.
(2mks)

……
…….

……
…….

……
…….

9. Describe how a solid sample of barium sulphate can be prepared starting with
copper (II) oxide.
(3mks)

……
…….

……
…….

10. The results of an experiment to determine the solubility of potassium chlorate in water at 30°C were as follows.
Mass of dish = 15.86g.
Mass of dish + saturated solution at 30°C = 26.8g.
Mass of dish + solid potassium chlorate after evaporation to dryness = 16.86g.
Calculate the mass of saturated solution containing 60g of water at 30°C. (3mks)

……
……

……
……

……
……

……
……

……

11. The melting point of phosphorous trichloride is -91°C while that of sodium chloride
is 801°C. In terms of structure and bonding explain the difference in the melting
point.
(3mks)

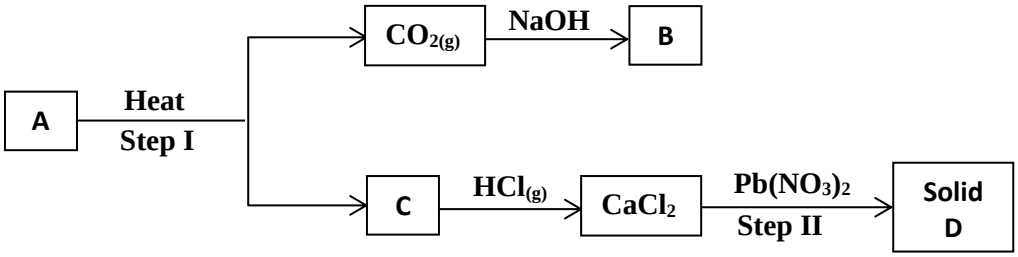
……
……

……
……

……
……

……
……

12. Study the reaction scheme below and answer the questions that follow.



(i) Identify substances.
(2mks)

A …… B ……...

C …… D ……...

(ii) Write chemical equation for the reaction taking place in Step **(II)**.
(1mk)

……
……...

13. (i) Explain why the ability of temporary hard water to conduct electricity falls
when water is boiled, but it does not fall when temporary hardness is removed
by addition of washing soda.
(2mks)

……
……...

……
……...

……
……...

……
……..

(ii) Name the ions that causes water hardness.
(1mk)

……
……..

14. (i) State the Gay-Lussac's Law.
(1mk)

……
……..

……
……..

……
……..

(ii) 15cm³ of a gaseous hydrocarbon reacted completely with 45cm³ of oxygen. 30cm³ of carbon (IV) oxide were formed. Determine the formula of the hydrocarbon given that all volumes of gases were measured under the same conditions of temperature and pressure.
(2mks)

……
……..

……
……..

……
……..

……
……..

……
……..

15. (i) State the observation made when hydrogen sulphide gas is bubbled through

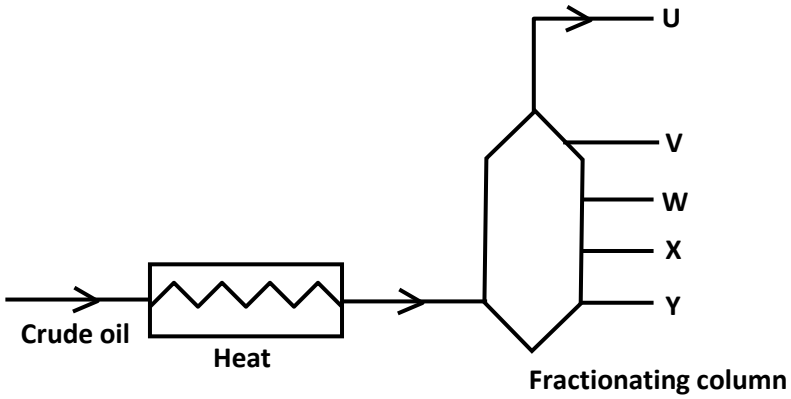
aqueous lead (II) nitrate solution.
(1mk)

……
……...

(ii) Write an ionic equation for the reaction above.
(1mk)

……
……...

16. Study the crude oil fractionating column in the diagram below.



(i) How would you expect the temperature to vary from U to Y?
(½mk)

……
……...

(ii) For each fraction given below, state at what position **U**, **V**, **W**, **Z** and **Y** it will
be collected.
(2½mks)

Compound with	Position collected
$C_{15} \rightarrow C_{25}$ atoms	
……	……

$C_4 \rightarrow C_{15}$ atoms

……

$C_{20} \rightarrow$ Upwards

……

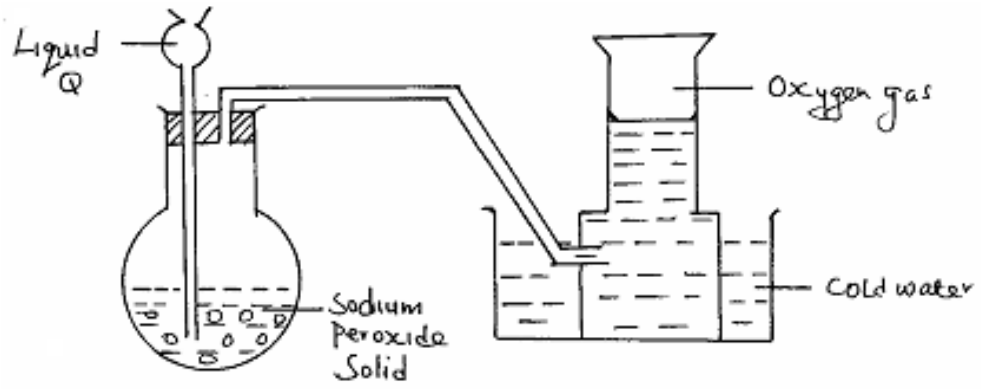
$C_8 \rightarrow C_{16}$ atoms

……

$C_1 \rightarrow C_4$ atoms

……

17. The apparatus below was set up for the preparation of oxygen gas in the laboratory.



(a) Name liquid **Q**.
(1mk)

……
……..

(b) Write a balanced chemicals equation for the reaction that takes place in the reaction flask.
(1mk)

……
……..

(c) Give a reason why it is preferred to use warm water to cold water when collecting oxygen gas.
(1mk)

……
……..

……
……..

18. 25cm³ of a solution of ammonium iron (II) sulphate $(NH_4)_2\ SO_4.\ FeSO_4\ nH_2O$ with concentration of 19.6g/l was titrated with 12.5cm³ of 0.02M acidified potassium manganate (VII). Given the equation.

$$5Fe^{2+}_{(aq)} + MnO^{-}_{4\,(aq)} + 8H^{+}_{(aq)} \rightarrow Mn^{2+}_{(aq)} + 5Fe^{3+}_{(aq)} + 4H_2O_{(l)}$$

Determine the value of n in the salt.
(3mks)

……
……

……
……

……
……

……
……

……
……

……
……

19. Sulphur (IV) oxide and nitrogen (IV) oxide reacts as shown in the equation below.

$SO_2 + NO_2 \rightarrow SO_{3(g)} + NO_{(g)}$

(a) Using oxidation numbers show that this is a redox reaction.
(2mks)

……
……..

……
……..

……
……..

……
……..

(b) Identify the reducing agent.
(1mk)

……
……..

20. Zinc can be extracted through reduction then purified by electrolytic process.

(i) Name **two** ores from which zinc can be extracted.
(1mk)

……
……..

……
……..

(ii) Name a substance that can be used as reducing agent in the furnace during extraction of zinc by reduction.
(1mk)

……
……...

21. A student was provided with 1.5g of XCO_3. He reacted it with $50cm^3$ of 1M HCl
which was excess. Determine the volume of CO_2 produced at S.T.P.
(R.F.M of x CO_3 = 100) molar gas volume at S.T.P = $22400cm^3$.
(2mks)

……
……

……
……

……
……

……
……

……
……

22. Explain how a catalyst affects the following in a chemical reaction.
(i) The enthalpy change.
(1mk)

……
……...

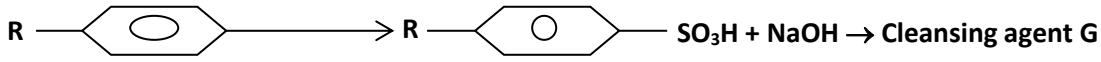
(ii) The activation energy.
(1mk)

……
……...

(iii) Chemical equilibrium.
(1mk)

……
……...

23. The scheme below represents the manufacture of a cleansing agent G.



(i) Draw the structure of G and state the type of cleansing agent in which **G**
belongs.
(2mks)

(ii) State **one** advantage of using G is as cleansing agent.
(1mk)

……
……...

……
……...

24. The equation below represent equilibrium reaction between chromate ions and
dichromate ions.

$$2CrO_4^- + 2H^+ \rightleftharpoons Cr_2O^{2-}_{7(aq)} + H_2O$$

(Yellow) (Orange)

(a) What is meant by the term dynamic equilibrium?
(1mk)

……
……...

……
……...

……
……...

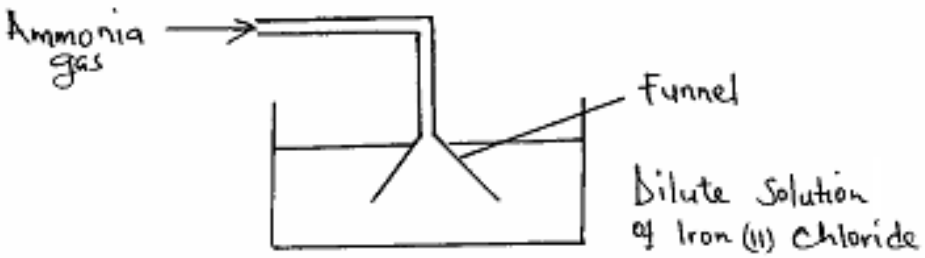
(b) State and explain the observation made if dilute sulphuric (VI) acid is added to
the equilibrium mixture.
(2mks)

……
……...

……
……...

……
……...

25. Below is a set up of apparatus used to react ammonia gas with iron (II) chloride?



(a) State observation made in the beaker.
(1mk)

……
……...

(b) Give a reason for using a funnel to deliver the ammonia into the beaker. (2mks)

……
……...

……
……...

……
……...

……
……...

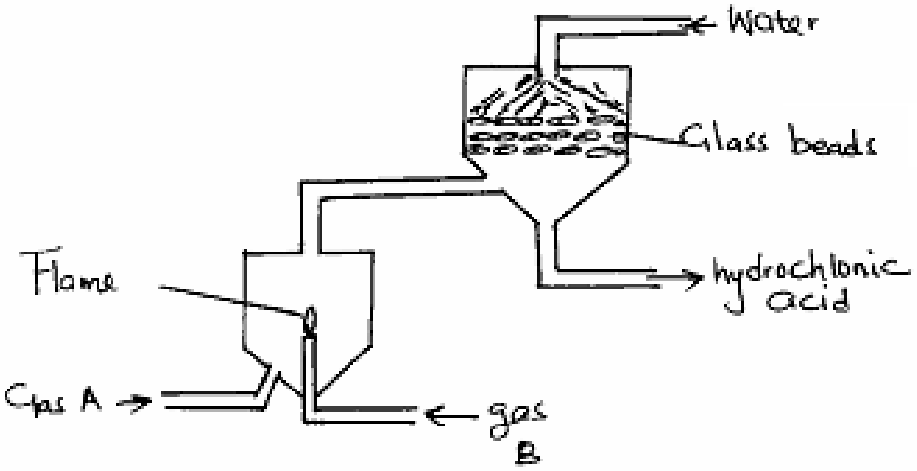
26. Your lab technician noted that the reagent bottles of sodium carbonate, sodium
chloride and sugar have lost their labels. Your chemistry teacher requested you
to prepare and test aqueous solutions of each sample as shown below.

Bottle	**PH**	**Electrical conductivity**	
1	7	Conducts	
2	7	Does not conduct	
3	10	Conducts	

Complete the table by filling the correct label for each bottle.
(3mks)

27. The diagram below represent large scale manufacture of hydrochloric acid.

Study it and answer the questions that follow.



(a) Identify.
(1mk)

(i) Gas **A**

……

(ii) Gas **B**

……

(b) Write the chemical equation for the reaction between gas **A** and **B**.
(1mk)

……
……..

(c) State the role of glass beads in the process.
(1mk)

……
……..

……
……..

……
……..

28. (a) Using electrons in the outermost energy level, draw (•) and cross (x) diagram
for H_3O^+ and C_2H_4 (H = 1, C = 6, O = 16)

(i) C_2H_4
(1mk)

(ii) H_3O^+
(1mk)

(b) What would be the effect of dipping litmus paper in aqueous solution of H_3O^+?

(1mk)

……
……..

233/2
CHEMISTRY
PAPER 2
DATE……
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

(xiii) Write your **name** and **index number** in the spaces provided **above**.
(xiv) **Sign** and write the **date** of examination in the spaces provided **above**.
(iii) Answer **ALL** the questions in the spaces provided.
(iv) Mathematical tables and silent electronic calculators **may be** used.
(v) All working **must be** clearly shown where necessary.

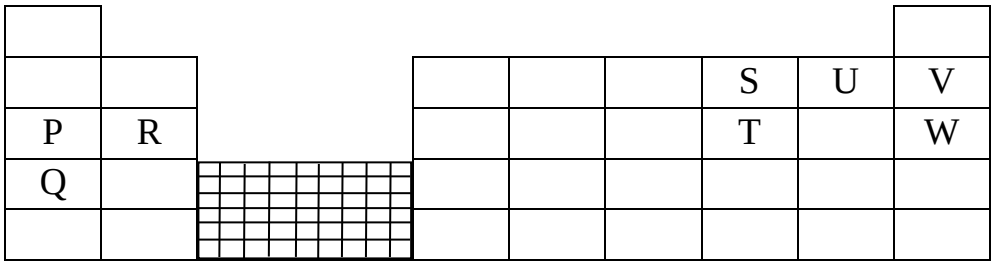
FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	12	
3	14	
4	10	
5	10	
6	11	
7	11	

Total Score	**80**	

This paper consists of **11** printed pages.
Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

1. The grid below shows part of the periodic table. Use it to answer questions that follow. The letters do not represent the actual symbols of the elements.



(a) (i) Which of the element has the lowest ionization energy?
(1mk)

……
……

(ii) Explain your answer in a(i) above.
(1mk)

……
……

……
……

(b) (i) Identify the most reactive non-metal.
(1mk)

……
……

(ii) Explain your answer in b(i) above.
(1mk)

……
……

……
……

(c) Give the electronic configuration of element.

(i) **S**
……..
(½mk)

(ii) **Q**
……..
(½mk)

(d) Compare the atomic radius of **P** and **R**. Explain.
(2mks)

……
……..

……
……..

(e) The mass number of W is 40. Write down the composition of its nucleus. (1mk)

……
……..

……
……..

(f) Write formula of oxides of P.
(1mk)

……
……..

(g) (i) What is the name given to elements found in the shaded region. (1mk)

……
……

(ii) Which elements can be used to provide an inert environment? (1mk)

……
……

2. (a) In which homologous series do the following compounds belong.

(i) CH_3 CCH.
…… (1mk)

(ii) CH_3 CH_2 COOH
……... (1mk)

(b) Raw rubber is heated with sulphur in the manufacture of natural rubber.

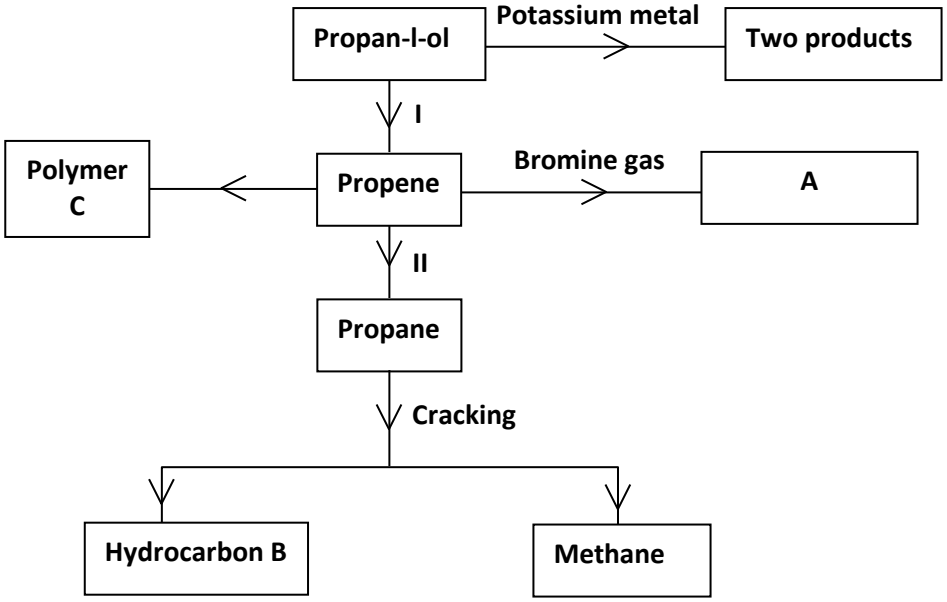
(i) What name is given to the process?
(1mk)

……
……

(ii) Why is the process necessary?
(1mk)

……
……

(c) Study the scheme given below and answer the questions that follow.



(i) Write an equation for the reaction between propan-l-ol and potassium metal.
(1mk)

……
……

(ii) Name process **I** and **II**.

I
……
(1mk)

II
……
(1mk)

(iii) Identify the products **A** and **B**.

A
……
(1mk)

B

……
(1mk)

(iv) Name **one** catalyst used in Process **II**.
(1mk)

……..

(v) Draw the structural formula of the repeating unit in the polymer **C**. (1mk)

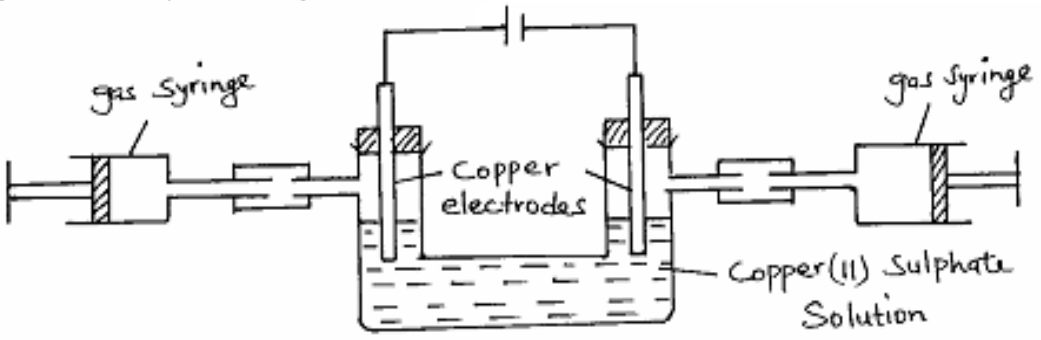
(d) State **two** industrial uses of methane.
(1mk)

……
……...

……
……...

(e) Write the structural formula of 2, 3-dichloropropene.
(1mk)

3. Aqueous copper (II) sulphate was electrolysed using the set up represented by the diagram below.



(a) Apart from copper (II) ions and sulphate ions identify the ions in copper (II) sulphate solutions.
(1mk)

……
……

(b) Write an equation for the reaction at the:

(i) Anode
…….. (1mk)

(ii) Cathode
…….. (1mk)

(c) Using an arrow (→) indicate the direction of flow of electrons on the diagram.
(1mk)

(d) If in the above set up copper electrodes were replaced with inert electrodes. Write an equation for the reaction which would occur at the anode.(1mk)

……
……

(e) An iron spoon was to be electroplates with silver. Draw a well labelled diagram of the set up of apparatus that could be used to carry out the process. (3mks)

(f) The table below shows ammeter readings obtained where different electrolytes
of the same concentration were tested.

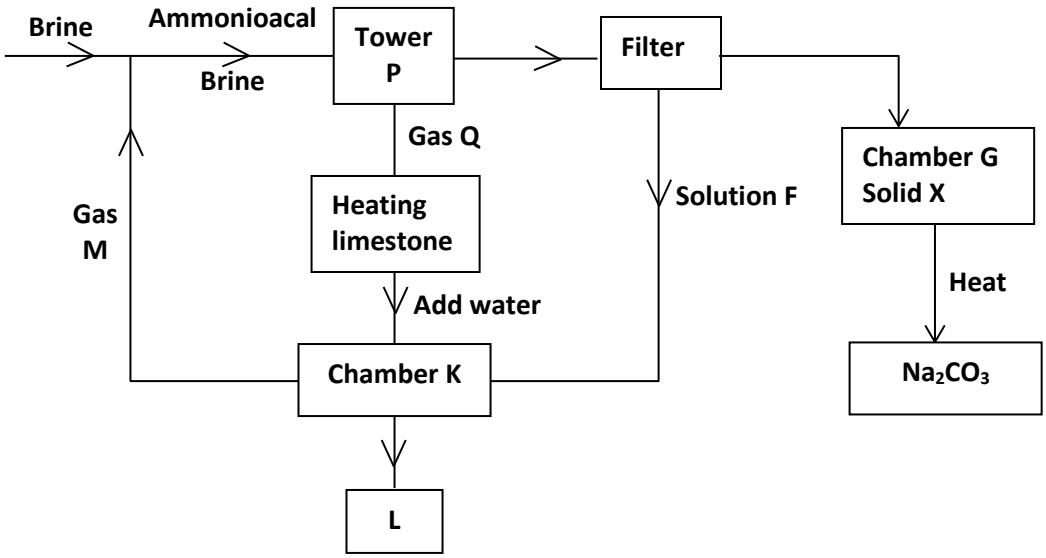
Electrolyte	**Ammeter reading**
Copper (II) sulphate solution	4.4
Ethanoic acid	1.2

Explain why ethanoic acid gave a lower ammeter reading the copper (II)
sulphate solution.
(2mks)

……
……

……

4. I The flow chart below is for the manufacture of sodium carbonate using Solvay
process. Use it to answer the questions that follow.



(a) Name:

(i) Gas

M……

(1mk)

(ii) Solution **F**

……..…….…. (1mk)

(iii) Solid X

……..… (1mk)

(iv) The product

L…… (1mk)

(b) Write an equation for the reaction in chamber **K**. (1mk)

……
……..

(c) Name **two** raw materials used in Solvay process. (2mks)

……
……

(d) (i) Name **one** substance recycled in Solvay process.

……
……..

……
……..

……
……..

(ii) Give **two** reasons why carbon (IV) oxide is used as fire extinguisher.
(2mks)

……
……..

……
……..

(iii) Explain why lead carbonate is not reacted with dil. H_2SO_4 in preparation of carbon (IV) oxide in the laboratory. (2mks)

……
……..

……
……..

……
……..

5. In order to determine the molar heat of neutralization of 1M potassium hydroxide, 200cm³ of 1M hydrochloric acid both at the same temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 30 seconds until the highest temperature of the solution was attained.

(a) (i) Why was it necessary to stir the mixture of the two solutions? (1mk)

……
…

……
…

……
…

(ii) Define the term molar heat of neutralisation.
(1mk)

……
…

……
…

……
…

(iii) Write an ionic equation for the reaction.
(1mk)

……
…

(b) The initial temperature for both solution was 24.5°C and the highest temperature attained by the mixture was 30.9°C. Calculate the

(i) heat change for the reaction.
(Specific heat capacity of the solution is 4.2$Jg^{-1}K^{-1}$, Density of the
solution is 1.0gcm^{-3}). The volume of KOH used was 200cm^3. (2mks)

……
…

……
…

……

(ii) molar heat of the neutralisation.
(2mks)

……
…

……
…

……
…

(c) If ammonium hydroxide was used instead of potassium hydroxide the heat of neutralization would be different from the one obtained in b(ii) above.
Explain the difference.
(3mks)

……
…….

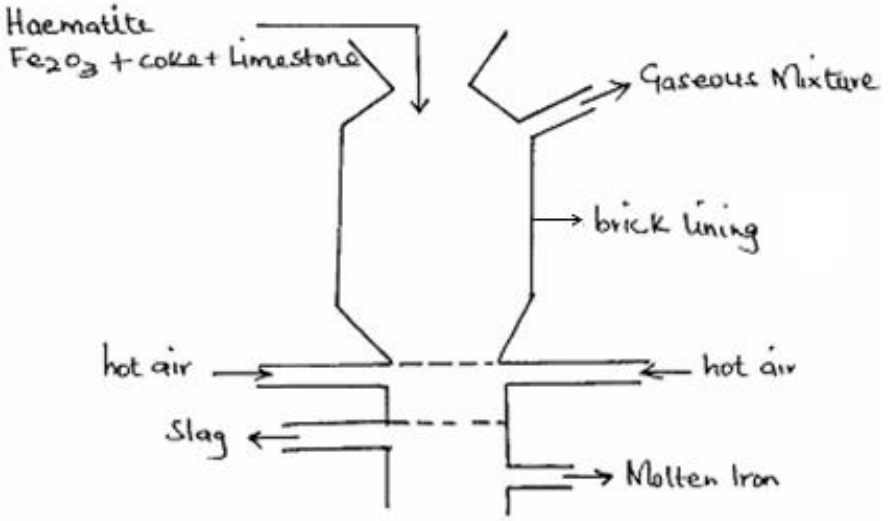
……
…….

(d) Draw an energy level diagram for the reaction between potassium hydroxide
and hydrochloric acid.
(3mks)

6. I The extraction of iron from its ores takes place in the blast furnace. Below

is a simplified diagram of a blast furnace. Study it and answer the questions

that follow.



(a) Name

(i) **One** substance in the slag.

……
……..

(ii) Another iron ore material used in the blast furnace.

……
……..

……
……..

(b) Describe the processes which lead to the formation of iron in the blast furnace.

(3mks)

……
……

……
……

……
……

(c) What is the use of limestone in the blast furnace?
(1mk)

……
……

……
……

(d) Give a reason why the melting point of the iron obtained from blast furnace is 1200°C while that of pure iron is 1535°C.
(1mk)

……
……

……
……

(e) State **two** uses of steel.
(1mk)

……
……

……
……

II (a) Write the formula of compound formed when iron reacts with dil hydrochloric acid.

……
……

(b) Name a compound of iron which sublimes on heating.
(½mk)

……
……

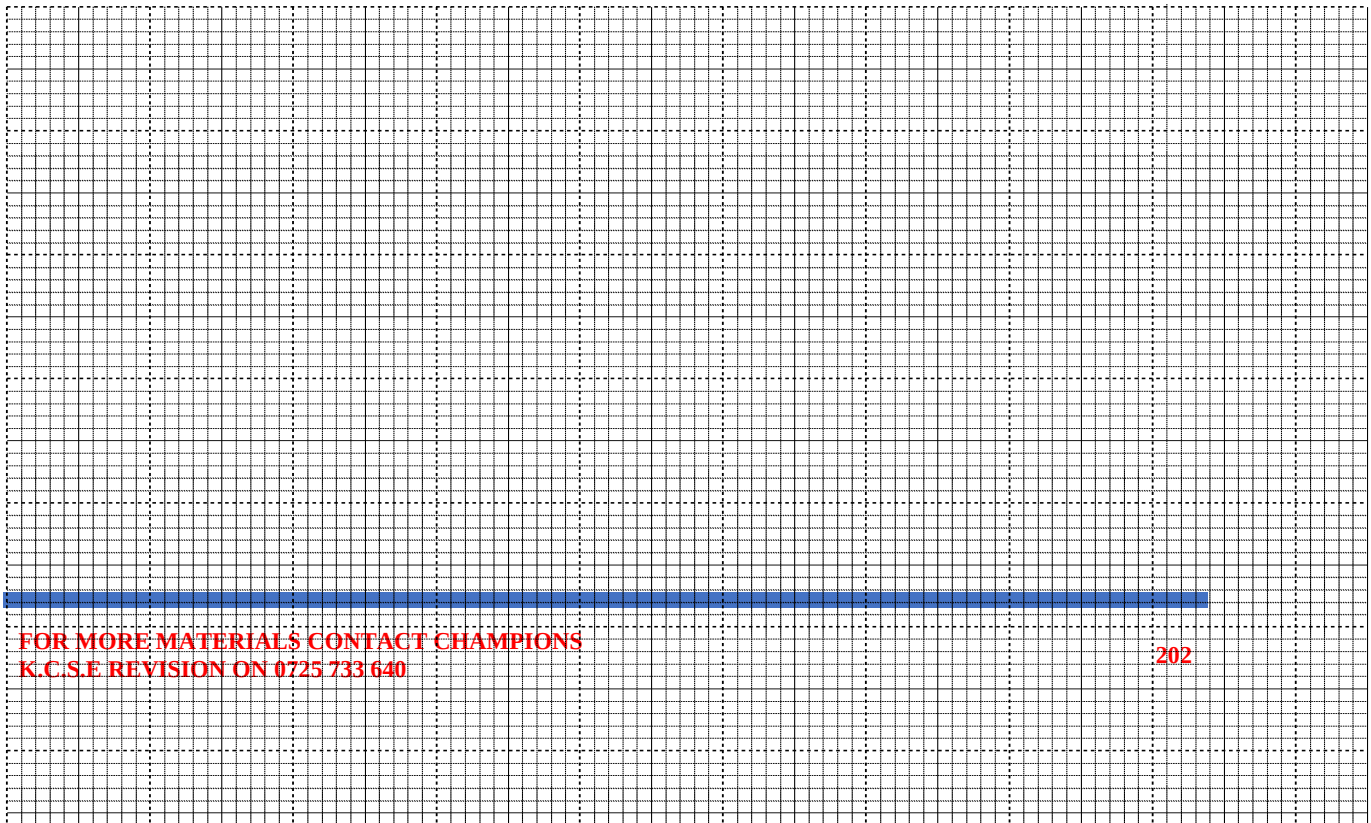
7. The table below gives the volumes of the gas produced when different volumes of
2M hydrochloric acid were reacted with 0.6g of magnesium powder at room temperature.

Volume of 2M HCl (cm^3)	Volume of the gas (cm^3)
0	0
10	240
20	480
30	600
40	600
50	600

(a) Write an equation for the reaction between magnesium and hydrochloric acid.
(½mk)

……
……..

(b) On the grid provided plot a graph of the volume of the gas produced
(vertical axis) against volume of acid added. (Note that before the reaction comes to completion, the volume of gas produced is directly proportional
to the acid added.
(3mks)



(c) From the graph, determine

(i) the volume of gas produced if 12.5cm³ of 2M HCl had been used. (½mk)

……
…

(ii) The volume of 2M HCl acid which reacted completely with 0.6g of magnesium powder.
(1mk)

……
…

(d) State and explain the effect on the rate of production of the gas if

(i) 0.6g of magnesium ribbon was used.
(2mks)

……
…

……
…

……
…

(ii) 2M hydrochloric acid at 15°C was used instead of room temperature.

(2mks)

……
…

(e) Given that one mole of the gas occupies 24000cm³ at room temperature.
Calculate the relative atomic mass of magnesium.
(3mks)

……
……..

……
……..

……
……..

……
……..

……
……..

233/1
CHEMISTRY
Paper 1
(THEORY)
July/August 2016
TIME 2 HOURS

THE NAKURU SUB-COUNTY SEC. SCHOOLS TRIAL EXAMINATIONS - 2016

Kenya Certificate of Secondary Education (K.C.S.E)

233/1
CHEMISTRY
Paper 1
(THEORY)
July/August 2016
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your name and Index Number in the spaces provided above.
- Sign and write date of examination in the spaces provided above.
- Answer **ALL** questions in the spaces provided.
- Mathematical tables and electronic calculators may be used.
- All workings **MUST** be clearly shown where necessary.

For Examiners' use only

Questions	Maximum Score	Candidate's Score
1-29	**80**	

1. Explain why burning magnesium continues to burn in a gas jar full of sulphur (IV) oxide while a burning splint would be extinguished.
(3 marks)

……
……

……
……

……
……

2. Calculate the heat of formation of carbon (II) oxide from the following data.
(2 marks)

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} \quad \Delta H_1 = -394$ kJ/mol
$CO_{(g)} + ½ O_{2(g)} \longrightarrow CO_{2(g)} \quad \Delta H_2 = -285.6$ kJ/mol^{-1}

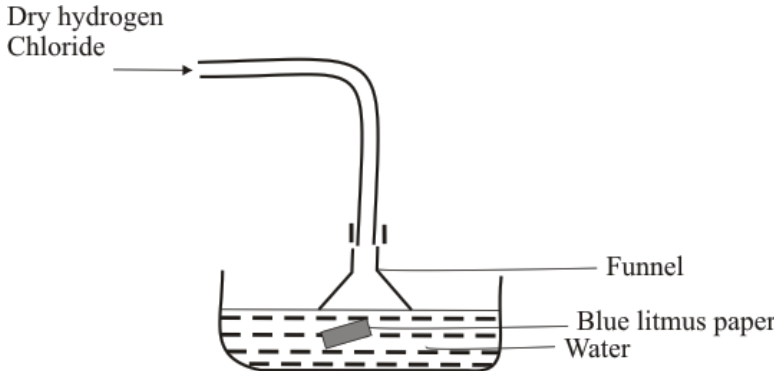
……
……

……
……

……
……

……
……

3. Dry Hydrogen chloride gas was made to dissolve in water using the set of apparatus shown below



(a) What is the use of the inverted funnel?
(1 mark)

……
……

(b) State and explain the observations made on the litmus paper (1 mark)

……
……

……
……

(c) State and explain the observation made on the litmus paper if methylbenzene is used instead of water in the above set up.
(1 mark)

……
……

……
……

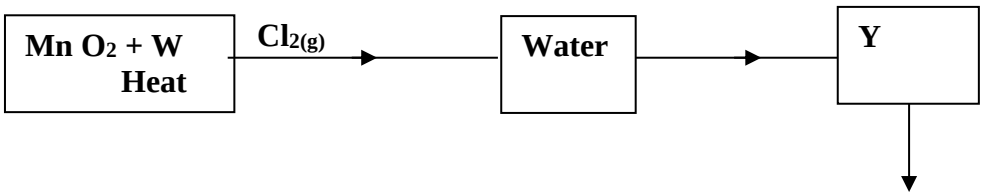
4. Using sodium hydroxide solution, describe a chemical test that can be used to distinguish between copper (II) ions and iron (II) ions
(2 marks)

……
……

……
……

……
……

5. The flow chart below shows laboratory preparation of chlorine gas. Study it and answer the questions that follow:
(2 marks)



(a) Name substances

W……
……

Y……
……

(b) What is the function of water in the above set up? (1 mark)

……
……

……
……

6. An unknown mass of anhydrous potassium carbonate was dissolved in water and the solution made up to 200cm^3. 25cm^3 of this solution neutralized 18.0cm^3 of 0.22M nitric (v) acid. Calculate the unknown mass of potassium carbonate (**K**=39, **C**=12, **O**=1) (3 marks)

……
……

……
……

……
……

……
……

7. The following are some half cell electrode potentials with respect to copper

	E/V
$K^+_{(aq)} + e^- \longrightarrow K_{(s)}$	-2.99
$Na^+_{(aq)} + e^- \longrightarrow Na_{(s)}$	-2.75
$Ca^{2+}_{(aq)} + 2e^- \longrightarrow Ca_{(s)}$	-2.86
$Cu^{2+}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$	0.00
$Hg^{2+}_{(aq)} + 2e^- \longrightarrow Hg_{(l)}$	+0.87
$Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}$	+0.79

(a) Explain why the electrode potential of copper is zero
(1 mark)

……
……

……
……

(b) Identify the weakest oxidizing agent
(1 mark)

……
……

(c) Work out the e.m.f of a cell represented
(1 mark)

$$Na_{(s)} \mid Na^+_{(aq)} \,//\, Ag^+_{(aq)} \mid Ag_{(s)}$$

……
……

……
……

……

8. Below is a sample of the periodic table

(a) Give the family name to which elements **M** and **N** belong (1 mark)

……

(b) Compare the reactivity of elements **I** and **K**. Give a reason (1 mark)

……

……

……

(c) Write the formular of the compound formed when **P r**eacts with **Q** **(1 mark)**

……

……

I						Q	M		
	J						N		
K	L		P						

……

……

9. Study the reaction equation given below

$H_{2(g)} + Br_{2(g)} \rightleftharpoons 2HBr(g) \quad \Delta H = -74.4k\ J$

C (g)

(a) Draw an energy level diagram showing the catalysed and uncatalysed reaction (2 marks)

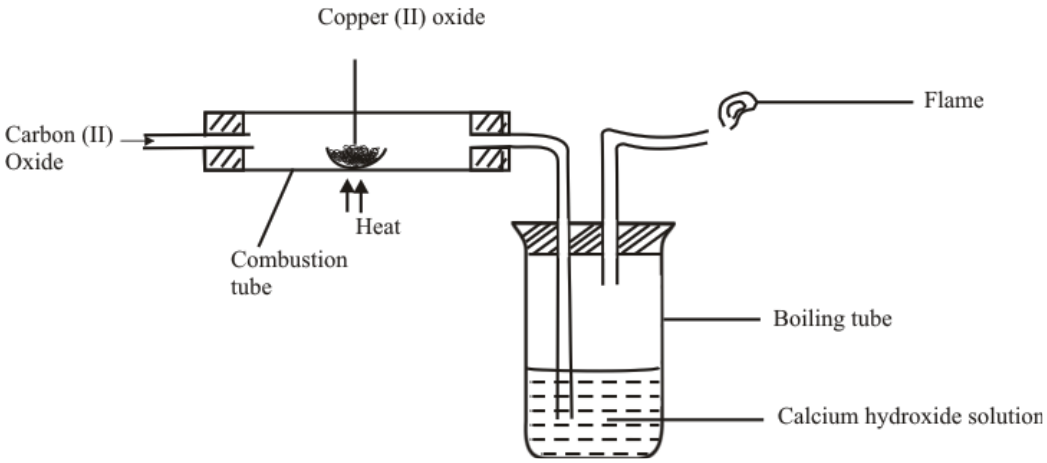
(b) State the effect on formation of hydrogen bromide if pressure was increased in the reaction above. Explain
(2 marks)

……
……

……
……

……
……

10. Study the experimental set up of apparatus shown below.



(i) State two observations made in the set up as the experiment progressed (2 marks)
……
……

……
……

(ii) Using an equation, explain the change that occurred in the boiling tube (1 mark)
……
……

(iii) Why was the gas burned in the flame? (1 mark)

……
……

11. (a) What is half-life? (1 mark)

……
……

……
……

(b) If a radioactive isotope has a half-life of 2.5 hours, how long will it take for its mass to reduce to ⅛
(2 marks)

……
……

……
……

……
……

12. Calculate the solubility of sugar in water at 40^{o}C from the following information.(3 marks)

Mass of evaporating dish	=23.0g
Mass of evaporating dish + saturated solution	=192.0g
Mass of evaporating dish + solid after evaporation of solution	=142.0g

……
……

……
……

……
……

……

13. Painting, oiling, galvanizing and tin plating are methods of rust prevention.

(a) Explain the similarity of these methods in the way they prevent rusting (1 mark)

……
……

……
……

(b) Explain why galvanized iron objects are better protected even when scratched (1mark)

……
……

……
……

14. The chemical equations below are the main reactions in large scale manufacture of sodium carbonate.

$NH_{3(g)} + CO_{2(g)} + H_2O_{(l)} \longrightarrow NH_4HCO_{3(aq)}$

$NH_4HCO_{3(aq)} + NaCl_{(aq)} \longrightarrow NaHCO_{3(s)} + NH_4Cl_{(aq)}$

(a) Explain how the two products $NaHCO_3$ and NH_4Cl are separated (1 mark)

……
……

……
……

(b)How sodium carbonate is finally obtained? (1 mark)

……
……

……
……

(c) Explain how ammonia is recovered in this process. (1 mark)

……
……

……

15. 80 cm^3 of oxygen gas diffused through a porous hole in 50 seconds. How long will it take 120cm^3 of Nitrogen (IV) oxide to diffuse through the same hole under the same conditions?
(N =14, O=16) (3 marks)

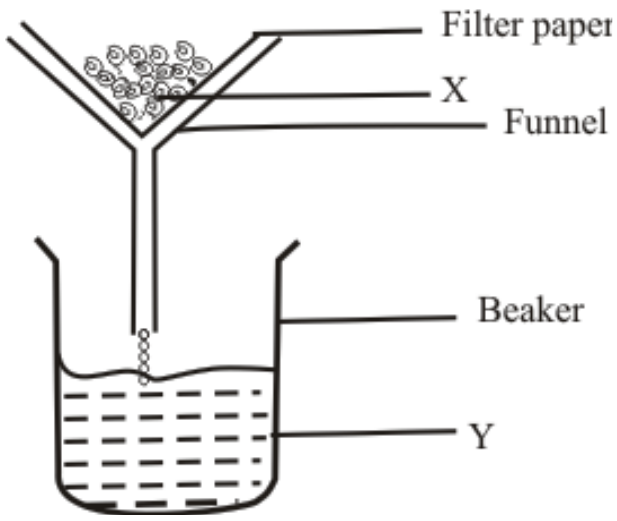
……
……

……
……

……
……

……
……..

16. Filtration is carried out in the apparatus shown



Name **X** …….. (1 mark)
Y…….. (1 mark)

17. Two carbonates **P** and **Q** are weighed before and after heating. The results are given in the table below.

Carbonate	Mass in grams	
	Before heating	After heating
P	15.0	15.0
Q	15.0	10.0

Which one is likely to be sodium carbonate? (2 marks)

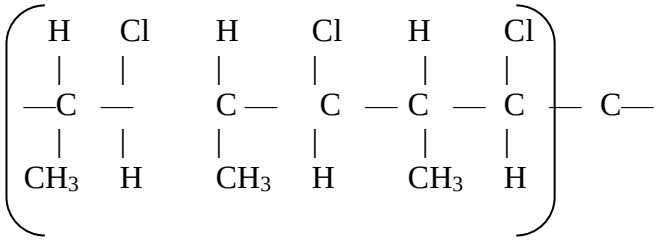
……

……

……

……

18. The structure given below is for a certain polymer



……

……

……

……

……

……

(b) Given that the molecular mass of the polymer is 4590, calculate the number of monomers present in the polymer (C=12.0, H=1.0. Cl=35.5)
(2 marks)

……

……

……

……

19. Describe how you would separate a solid mixture of lead(II) chloride and copper(II) oxide.(3 marks)

……

……

……

……

……

20. The general formula for a homologous series of organic compounds in $C_nH_{2n+1}OH$

(a) Give the name and structural formula of the fourth member of the series (2 marks)

(i)

Name……

……

(ii) Structural formula……

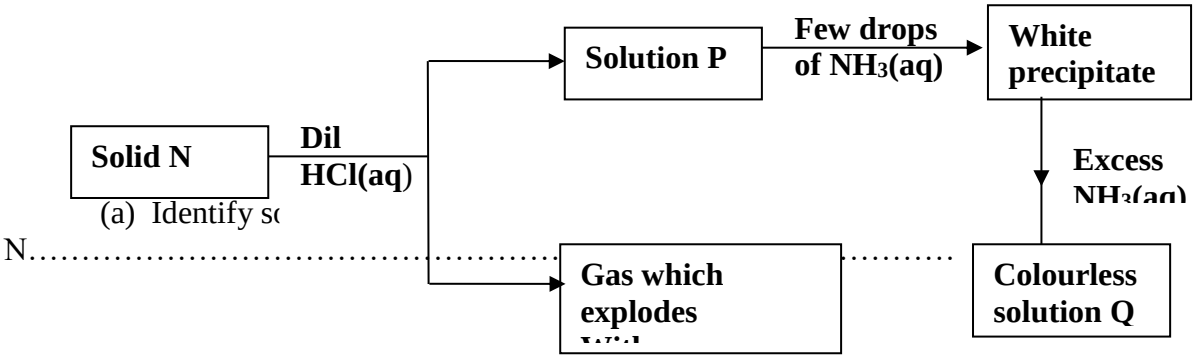
(b) Write an equation for the reaction between the molecule in (ii) above and propanoic acid.

(1mark)

……

……

21. The scheme below shows some reactions sequence starting with solid **N**. Study it and answer the questions that follow:



(a) Identify sc

N……

(b) Write the equation for the formation of the colourless solution Q (1 mark)

……

……

……

……

22. In an experiment, a gas jar containing moist sulphur (IV) oxide was inverted over another gas jar containing hydrogen sulphide gas.

(a) State and explain the observation that was made (2 marks)

……

……

……

……

(b) State the precautions that should be taken when carrying out this experiment (1 mark)

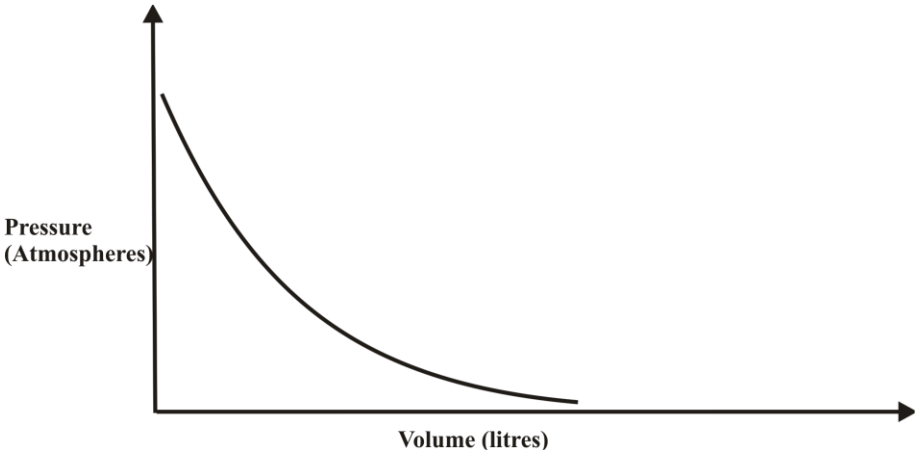
……

……

……

……

23. The graph below shows the behavior of a fixed mass of a gas at constant temperature



(a) What is the relationship between the volume and pressure of the gas? (1 mark)

……

……

……

……

(b) 3 litres of oxygen gas at one atmosphere pressure were compressed to two atmospheres at constant temperature. Calculate the new volume occupied by the oxygen gas. (2 marks)

……

……

……

……

……

……

24. The table below shows the relative atomic masses and percentages abundance of the isotopes **M_1** and **M_2** of element **M**

	Relative abundance	% abundance
M_1	**60.57**	**59.71**
M_2	**62.83**	**40.29**

Calculate the relative atomic mass of element **M**
(2 marks)

……
……

……
……

25. Study the information in the table below and answer the question that follows.

Bond	Bond energy ($kJmo1^{-1}$)
C-H	414
Cl – Cl	244
C – Cl	326
H – Cl	431

Calculate the enthalpy change of the reaction (3 marks)

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

……
……
……
……

……
……

26. In the redox reaction below.

$$2H^+_{(aq)} + Cr_2O_7^{2-}{}_{(aq)} + 3SO_{2(g)} \longrightarrow Cr^{3+}_{(aq)} + 3SO_4^{2-}{}_{(aq)} + H_2O_{(l)}$$

Identify the reducing agent, explain your answer (2 marks)

……
……

……
……

27. The table below shows the pH values of solutions **A,B,C** and **D**

solution	A	B	C	D
Ph	2	7	11	14

(a) Which solution is likely to be that of calcium hydroxide
(1 mark)

……
……

(b) Select the solution in which a sample of aluminum oxide is likely to dissolve. Give a reason for your answer
(1 mark)
……
……

……
……

28. Name one property of neon that makes it possible to be used in electric lamps.
(1mark)
……
……

……
……

29. Distinguish between ionic bond and covalent bond (2 marks)
……
……

……
……

30. Explain why the boiling point of ethanol is higher than that of hexane. (relative molecular mass of ethanol is **46** while that of hexane is **86**)
(2 marks)

……
……

……
……

31. When a student was stung by a nettle plant, a teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of pain. Explain
(2 marks)

……
……

……
……

233/3
CHEMISTRY
PRACTICAL
PAPER 3
JULY/AUGUST, 2016
TIME: 2¼ HOURS

NAKURU SUB COUNTY TRIAL EXAMINATIONS 2016
CHEMISTRY PAPER 3

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Answer ALL the questions in the spaces provided in the question paper.
- You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time it to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working MUST be clearly shown where necessary
- Mathematical tables and electronic calculators may be used.

FOR EXAMINER'S USE ONLY

QUESTION	MAX. SCORE	SCORE
1	21	
2	13	
3	6	
TOTAL SCORE	40	

You are provided with

- Solution **A**, hydrochloric acid.
- Solution **B**,0.5 M sodium hydroxide
- 8 cm magnesium ribbon

You are required to ;-

- Determine the heat of reaction between hydrochloric acid and magnesium
- Mass of magnesium per cm
- The molarity of hydrochloric acid solution **A**

Procedure 1

1. Using a 100cm^3 measuring cylinder, measure out carefully 50cm^{3}of hydrochloric acid and transfer into the 100ml plastic beaker
2. Place the cleaned magnesium ribbon next to a ruler making sure the magnesium ribbon is flat. Cut the magnesium ribbon into 4 pieces of 2cm each
3. Place a thermometer into the acid and record the temperature in your table
4. Add one 2 cm piece of magnesium ribbon to the acid making sure that it does not stick to the side of the beaker by stirring with the thermometer.
5. Monitor the temperature of the solution very carefully and record the highest temperature reached, record this in your table **1**
6. Repeat the above procedure with another 2 cm length of magnesium ribbon each time and complete table 1 below. **(Retain the solution for procedure II)**

Table 1

Length of magnesium cm	**Temperature(^{0}C)**
0	
2	
4	
6	
8	

(4marks)

Draw a graph of length of magnesium ribbon (vertical axis) against temperature (3marks)

a) From the graph determine the highest temperature change
(1mark)

……
……

……
……

b) Calculate

i) the heat change for the reaction (assume the specific heat capacity of the solution is $4.2Jg^{-1}K^{-1}$ and the density of solution is $1.0gcm^{-3}$
(1mark)

……
……
……

……

……

.....

.....

ii) Moles of magnesium, given that the enthalpy change of this reaction is -323kJ mol^{-1}. (1mark)

.....
.....
.....
.....
.....
.....
.....
....

iii) Mass of magnesium used in the reaction (Mg=24)
(1mark)

.....
.....
.....
.....
.....
.....

iv) Mass of magnesium per cm
(1mark)

.....
.....
.....
.....

Procedure II

Transfer the contents obtained in **procedure I** into a 250 ml volumetric flask .Rinse the beaker with distilled water and pour the contents into conical flask and add distilled water to make up to the mark. Label this as solution **C**. Using a pipette and a pipette filler, transfer 25cm^3 of this solution into a conical flask add 2-3 drops of phenolphthalein indicator .Fill the burette with solution **B** and titrate with solution C .Record your results in **table 2** below. Repeat the titration two more times to complete the table.

Table 2

	I	II	III
Final burette reading(cm^3)			
Initial burette reading(cm^3)			
Volume of solution **B** used (cm^3)			

(4 marks)

(c) Determine the average volume of solution **B** used. (1 mark)

……
……
……
……

Calculate

i) Moles of solution **B** in the average titre
(1mark)

……
……
……
……..

ii) Moles of acid in the acid solution **C** in 25 cm^3
(1mark)

……
……
……
……
……
……..

iii) Moles of acid solution **A** in 50 cm^3 of solution
(1mark)

……
……
……
……
……
……

vi) Molarity of solution **A**.(1mk)

……
……
……
……
……
……

2 You are provided with solid **D**. perform the following test and write the observations and inferences.

(a) Place solid **D** into a boiling tube and add 10cm^3 of distilled water. Shake the boiling tube and filter. Keep the residue for test (b). Divide the filtrate into four portions.

(i)To the first portion, add sodium hydroxide dropwise until in excess.

Observation	**Inferences**

(1mk)	(1mk)

(ii) To the second portion, add ammonia solution dropwise until in excess

Observation	**Inferences**
(1mk)	(1mk)

(iii)To the third portion, add a few drops of Lead(II) nitrate solution

Observation	**Inferences**
(½ mk)	(½ mk)

(iv)To the fourth portion, add 5 $cm^3$2 M sodium hydroxide solution, followed by the aluminium foil.

Observation	**Inferences**
(1 mk)	(1mk)

Heat the mixture and test for any gases with red litmus paper

(b) Place the residue into a test tube and add 10cm^3 of dilute nitric (v) acid and shake until the solid dissolves.

Observation	**Inferences**
(½ mk)	(½ mk)

(i) To the first portion, add sodium hydroxide dropwise until in excess

Observation	Inferences
(1 mk)	(1mk)

(ii) To the second portion, add ammonia solution dropwise until in excess

Observation	Inferences
(1 mk)	(1 mk)

(iii) To the third portion, add a few drops of sodium sulphate solution

Observation	Inferences
(½ mk)	(½ mk)

3. You are provided with solid **L.** Carry out the tests below and record your observations and inferences in the spaces provided.

(i) Place the solid in a test-tube. Add about $6cm^3$ of distilled water and shake the mixture well. Divide the solution into 3 portions.

Observation	Inference
(½mk)	(½mk)

(ii) To about $2cm^3$ of the solution, add all the solid **K,** sodium hydrogen carbonate.

Observation	Inference
(1mk)	(1mk)

(iii) To about $1cm^3$, add 3 drops of acidified potassium dichromate (VI) and warm.

Observation	Inferences
(1mk)	(1mk)

(iv) In another $2cm^3$, add 2 drops of acidified potassium manganate (vii)

Observation	Inferences
(½mk)	(½mk)

233/1
CHEMISTRY
PAPER 1
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS

NYANDARUA COUNTY MID – YEAR EXAM – 2016

Kenya Certificate of Secondary Education (K.C.S.E)

233/1
CHEMISTRY
PAPER 1
(THEORY)

INSTRUCTIONS TO CANDIDATES

a) Write your Name and Index number in the spaces provided above

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

c) Answer all the questions in the spaces provided.

d) KNEC mathematical tables and silent non-programmable calculators may be used.

e) All working MUST be clearly shown where necessary.

f) Candidates should answer the question in English.

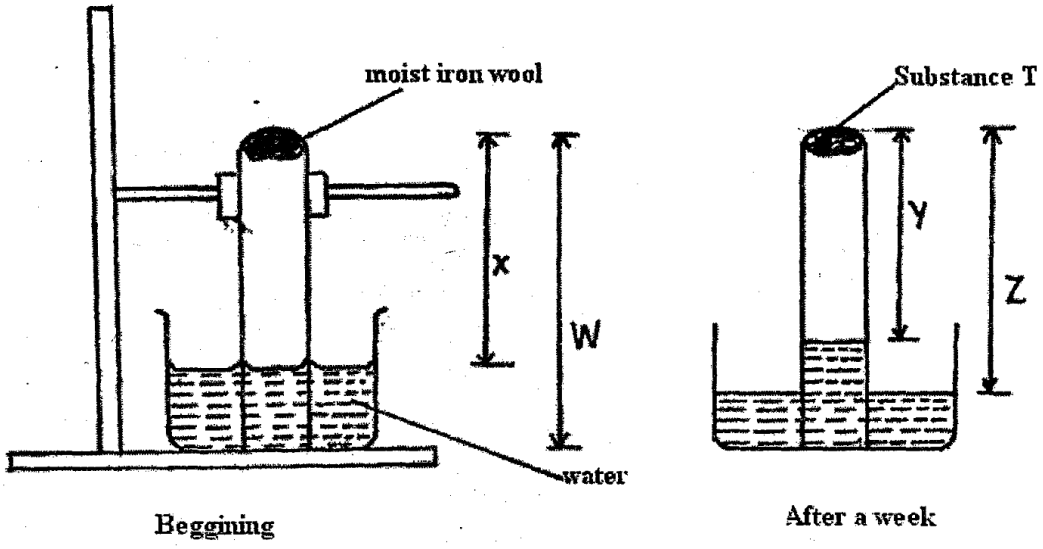
g) This paper consists of 12 printed pages. Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.

For examiners use only

Question	Maximum score	Candidates score
1-30	80	

1. A student set up the following apparatus in order to determine percentage of Oxygen by vc

i.



……
……

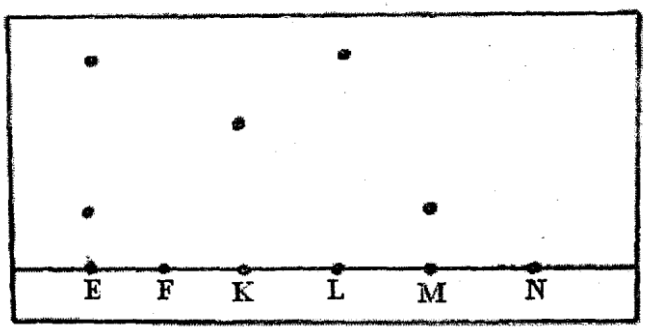
ii. Give the expression of the percentage of oxygen by volume in the air in terms of the letter X, W,Y and Z in the diagram.

……
……
……

iii. Write the formula of substance T.
(1mk)

……
……
……

2. The paper chromatography below shows the identification of unknown metal ion E and F. The reference ions are K,L,M and N are shown. The experiment was done in ascending method.



(i) Name the ions in the mixture E.
(1mk)

……

(ii) Mixture F contains all the three ions. On the diagram show the chromatogram of F.
(1mk)

……
……
……

(iii)Comment on the ion N in the diagram.
(1mk)

……
……
……

3. The following data gives PH values of solutions A, B and C.

Solution	A	B	C
PH	13.6	6.9	1.3

a) (i) Which solution named produce carbon (IV) oxide where reacted with a carbonate?
(1mk)

……
……
……

(ii) Write an ionic equation to show how the above reaction a(i) would be represented
(1mk)

……
……
……

b) What would be the colour of solution A after adding a few drops of phenolphthalein?
(1mk)

……
……
……

4. (a) Copper (ii) oxide is a basic oxide but does not turn red litmus paper blue. Explain.
(1mk)

……
……
……

(b) Sulphur(iv)oxide is one of the pollutants of the environment. What property of sulphur(iv) oxide cause it to corrode metals and limestone?
(1mk)

……
……
……

5. Study the table below.

Metal	Reaction with air	Reaction with water	Reaction with dilute acid
A	Reacts	Reacts slowly	Reacts
B	Does not react	Does not react	Does not react
C	Reacts	Reacts	Reacts vigorously

……
……
……

b) Which metal may be used as a cooking pot?
(1mk)

……
……
……

c) Arrange the metals in order of reacting starting with the most reactive.
(1mk)

……
……
……

6. An element Q has atomic number 3, relative atomic mass 6.94 and consists of two isotopes of mass 6.0 and 7.0.

(i) What is the mass number of the more abundant isotope of Q? Give a reason for your answer. (1mk)

……
……
……

(ii) Calculate the percentage abundant of the isotope which is more abundant.
(2mks)

7. An element Y has the electronic configuration of 2.8.5.

(a) Write the formula of the most stable anion formed when element Y ionises.
(1mk)

(b) Write the formula of the compound formed by X and Y if the ion of x is represented as X^{2+} (1mk)

(c) Explain the difference between the atomic radius of element Y and its ionic radius.
(1mk)

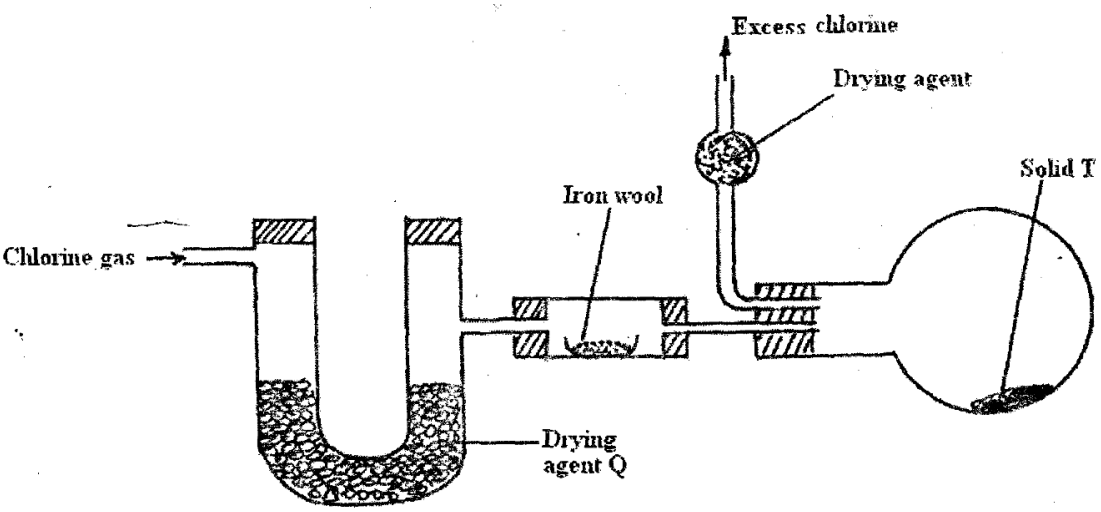
……
……
……
……
……

8. Using dots(.) and crosses (x) diagram show he bonding in the following compounds.

(a) Lithium oxide (Li= 3, O=8).
(1mk)

(b) Sulphur(IV) oxide (S=16, O=8)
(1mk)

9. The diagram below shows a set up that can be used for preparation of solid T in the laboratory.



b) Name the solid:

(i) Q……
……. (1 ½ mks)

(ii) T……
…… (1 ½ mks)

c) Why is it possible to collect T as shown.
(1mk)

……
……
……

10. Below is a table showing elements in group II of the periodic table. Study it and answer the questions that below.

Element	1st ionization energy (KJ/mol)	2nd ionization energy (KJ/mol)
Magnesium	900	1800
Beryllium	736	1450
Calcium	590	1150

……
……
……

(b) Explain why 2nd ionization energy of the elements is larger compared to 1st ionization. (2mks)

……
……
……

……
……

11. The melting point of phosphorus trichioride is 90°c while that of magnesium chloride in 715°c in
terms of structures and bonding explain the differences in their melting point.
(3mks)

……
……
……
……
……

12. (a) Name one property of Neon that makes it possible to be used in electric lamps.
(1mk)

……
……
……

(b) Name any other use of Argon other than in electric lamps.
(1mk)

……
……
……

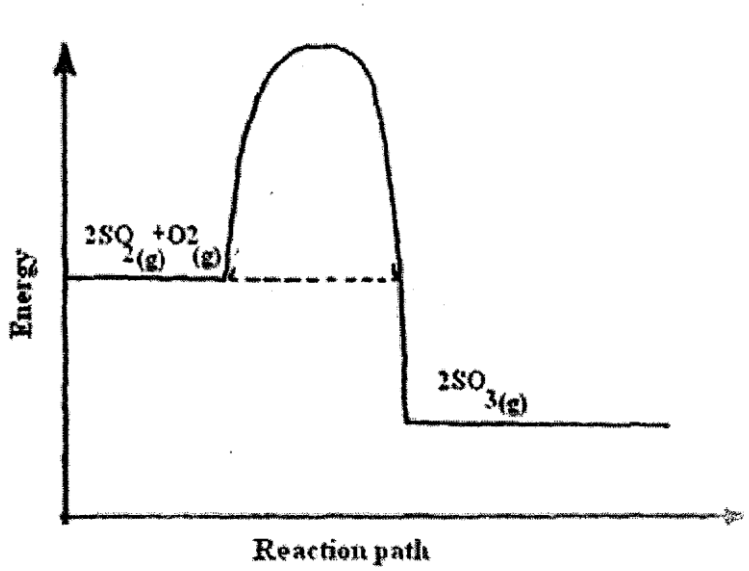
13. A compound with molecular C_2 H_6 O reacts with sodium metal forming a basic solution.
(a) Draw and name the structure of the compound.
(2mks)

(b) To which homologous series does the compound C_2 H_6 O belong?
(1mk)

……
……
……

14. Calculate the masses of copper and silver deposited by the same quantity of electricity that liberates $450cm^3$ of oxygen at s.t.p(1 mole of a gas occupies $22.4dm^3$, Cu = 63.5, Ag = 108) (3mks)

15. The diagram below shows the energy level diagram in the reaction between sulphur (iv) oxide and oxygen gas without a catalyst.



a) On the same axes, sketch a curve for the same reaction when a catalyst is used.
(1mk)

b) Write the equation of the reaction above showing the sign of the change of heat.
(1mk)

c) The reaction above is a reversible reaction; explain what happens when the temperature of the reaction is increased?
(1mk)

……
……
……
……

16. A sample of water is suspected to contain Zinc ions and chloride ions. Give a test on how you can identify the presence of the ions.
(3mks)

……
……
……
……
……
……
……

17. (a) Study the nuclear equation below and answer the questions that follow.

$$^{235}_{92}U + ^{1}_{0}n \rightarrow {}^{141}_{56}Ba + {}^{n}_{m}\text{Kr} + {}^{1}_{0}\text{n}$$

(i) Determine the values of:

n……

…….(½ mk)

m

……

……(½ mk)

(ii) State one useful application of this type of nuclear reaction.

(1mk)

……

……

……

(b) Write an equation to show how thorium nuclide $^{228}_{90}$ Th undergoes alpha decay to form another nuclide radium (Ra). (Clearly indicate the mass number and atomic number of radium). (1mk)

18. The mass of a solution of salt of sodium chloride is 70.0g. This solution has 10.0g of sodium chloride dissolved in it. The solubility of this salt 30g/l00g of water at 25°c. 6.0g of sodium chloride salt are added to the solution at 25°c. How much sodium chloride will remain undissolved. (3mks)

19. Explain the effect of adding a dilute acid to the following equilibrium mixture.

$$Cr_2O_7^{2-}{}_{(aq)} + 2OH^-_{(aq)} \rightleftharpoons 2\,CrO^-_{4(aq)} + H_2O_{(l)}$$

…… Orange yellow ……

……

……

……

……
……

20. When 23 .2g of a hydrocarbon whose empirical formula is $C_2 H_5$ was allowed to evaporate it occupied 9.6dm^3 at R.T.P what is its molecular formula? (molar gas volume= 24dm^3 at R.T.P) (3mks)

21. Study the information below and answer the questions that follow.

Number of carbon atoms for molecule	Relative molecular mass of hydrocarbon
2	26
3	40
4	54

(b) Predict the relative molecular mass of the hydrocarbon with 5 carbon atoms.
(½ mk)

(c) Determine the molecular formular of hydrocarbon in (b) and draw its structural formula(H= 1C=12).
(2mks)

22. X g of sodium hydroxide were dissolved in distilled water to make 100cm^3 of solution. 50cm^3 of this solution required 50cm^3 of 2M nitric(v) acid for complete neutralization. Calculate the mass x of sodium hydroxide dissolved. (Na = 23, O = 16, H=1)
(3mks)

23. When the oxide of element H was heated with powdered carbon, the mixture glowed and carbon(IV)oxide gas was formed. When the experiment was repeated using the oxide of element
J, there was no apparent reaction.

(a) Suggest one method that can be used to extract element J from its oxide.
(1mk))

……
……
……

(b) Arrange the elements H, J and carbon in the order of their decreasing reactivity.
(1mk)

……
……
……

24. When a sample of concentrated sulphuric (IV) acid was left in an open beaker in a room for two days the volume was found to have increased slightly.

(a) What property of concentrated sulphuric (IV) acid is shown by the above reaction?
(1mk)

……
……
……

(b) State one use of concentrated sulphuric(IV) acid that depends on the property named above. (1mk)

……
……
……

25. A certain student wanted to purify copper ore:

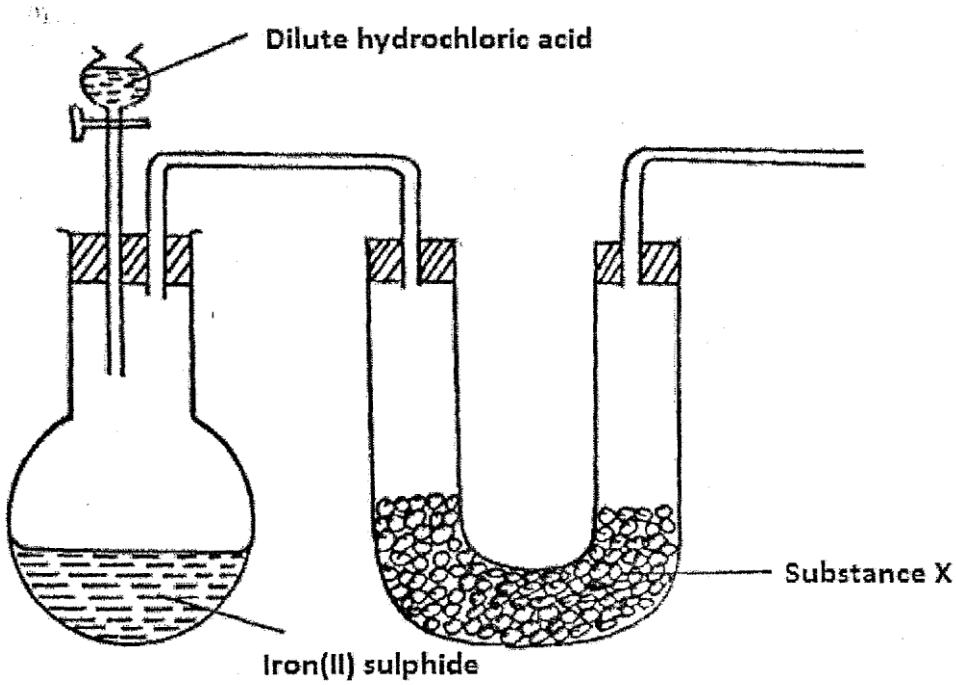
a) Which electrode should be the copper ore?
(1mk)

……
……
……

b) What should be the electrolyte in the above process?
(1mk)

……
……
……

26. The diagram below shows a set used to prepare gas Z.



a) Complete the diagram to show how gas z is collected.
(1mk)

b) Write an equation for the reaction between iron(II)sulphide and dilute hydrochloric acid. (1mk)

c) Name substance x.
(1mk)

……
……
……

27. A beaker contained 75.0cm3 of acqueous copper(ii) sulphate at 23.7^0c, when a scrap iron was added to the solution the temperature rose to 29.3^0c. if 5.83g of copper were deposited, calculate molar enthalpy change in kj/mol.(specific heat capacity of solution = $4.2Jg^{-1}k^{-1}$, density of solution = $1g/cm^3$, Cu = 64)
(2mks)

28. Butane burns in air according to the equation below.

$2C_4H_{10(g)} + l3O_{2(g)} \longrightarrow 8\ CO_{2(g)} + 10H_20_{(I)}$

What volume of butane must be burnt in oxygen to give 11 g of carbon (IV) oxide at r.t.p? (Molar gas volume at r.t.p= 24.01; C= 12; 0= 16; H=1.0)

(3mks)

29. Acids A and B both of the same concentration were added to magnesium ribbon separately. The magnesium ribbon in acid B disappeared long after the ribbon in acid A had disappeared. Explain.

(2mks)

……
……
……
……
……

30. When magnesium ribbon is burnt in air, two compounds were formed, one of which is magnesium oxide:

(i) Name the other compound.

(1mk)

……
……
……

(ii) Describe an experiment to identify the solid you have named in (i) above.

(1mk)

……
……
……
……
……
……
……
……
……
……

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST 2016
TIME: 2 HOURS

NYANDARUA COUNTY MID – YEAR EXAM – 2016

Kenya Certificate of Secondary Education (K.C.S.E)

233/2
CHEMISTRY
PAPER 2
(THEORY)

INSTRUCTIONS TO CANDIDATES

h) Write your Name and Index number in the spaces provided above

i) Sign and write the date of examination in the spaces provided.

j) Answer all the questions in the spaces provided.

k) KNEC mathematical tables and silent non-programmable calculators may be used.

l) All working MUST be clearly shown where necessary.

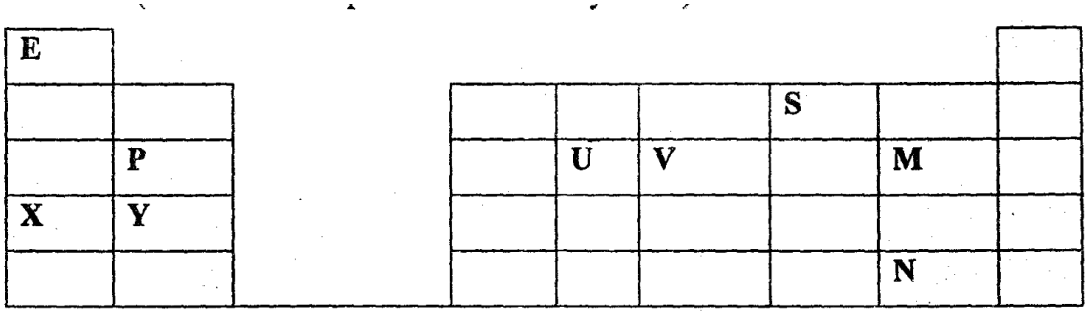
m) Candidates should answer the question in English.

n) This paper consists of 12 printed pages. Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.

For examiners use only

Question	Maximum score	Candidates score
1	13	
2	14	
3	11	
4	11	
5	10	
6	11	
7	10	
TOTAL		

1. (a)The grid below shows part of the periodic table. Study it and answer the questions that follow (letters do not represent the actual symbols)



(ii) Name the type of structure that the chloride of y would have. Explain.
(2mks)

……
……
……

(iii)How does the reactivity of M compare with that of N. Explain,
(2mks)

……
……
……
……
……

(iv)1.3g of P completely burns in chlorine and consumes 1.2 litres of the gas.

(i). Write an equation for the reaction between element P and chlorine.
(1mk)

(ii). Determine the relative atomic mass of P.
(3mks)

(b) State and explain how you would expect the following to compare.

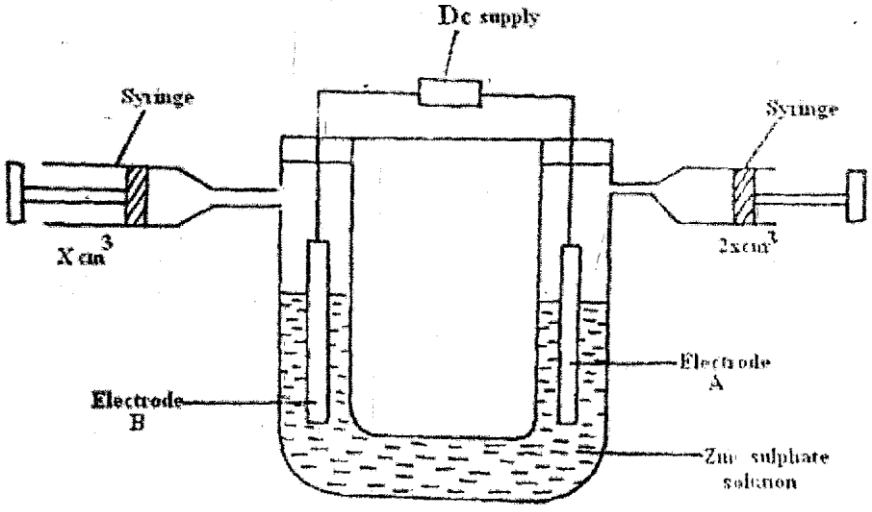
(i) Atomic radii of E and X.
(2mks)

……
……
……
……
……

(ii) pH values of aqueous oxides Y and V.
(2mks)

……
……
……
……
……

2. (a) An aqueous solution of Zinc sulphate is electrolyzed using platinum electrodes as shown in the set up below.



Using the
(i) Write

(ii) Identi
(1mk)

……
……
……

(b) Use standard electrode potentials for element V, W, X, Y and given below to answer the questions that follow.

	E Ø (volts)
$V^{2+}_{(aq)} + 2e^- \rightleftharpoons V_{(s)}$	-2.90
$W^{2+}_{(aq)} + 2e^- \rightleftharpoons W_{(s)}$	-2.38
$X^{+}_{(aq)} + e^- \rightleftharpoons \frac{1}{2} X_{(g)}$	0.00
$Y^{2+}_{(aq)} + 2e^- \rightleftharpoons Y_{(s)}$	+0.34
$\frac{1}{2} Z_{(g)} + e^- \rightleftharpoons Z^-_{(aq)}$	+2.87

(i) swer.

(ii) What is the E^{θ} value of the strongest reducing agent.
(1mk)

……
……
……

(iii)In the space provided draw a well labeled diagram of the electrochemical cell that would be obtained when half cells of W and Y are combined.
(3mks)

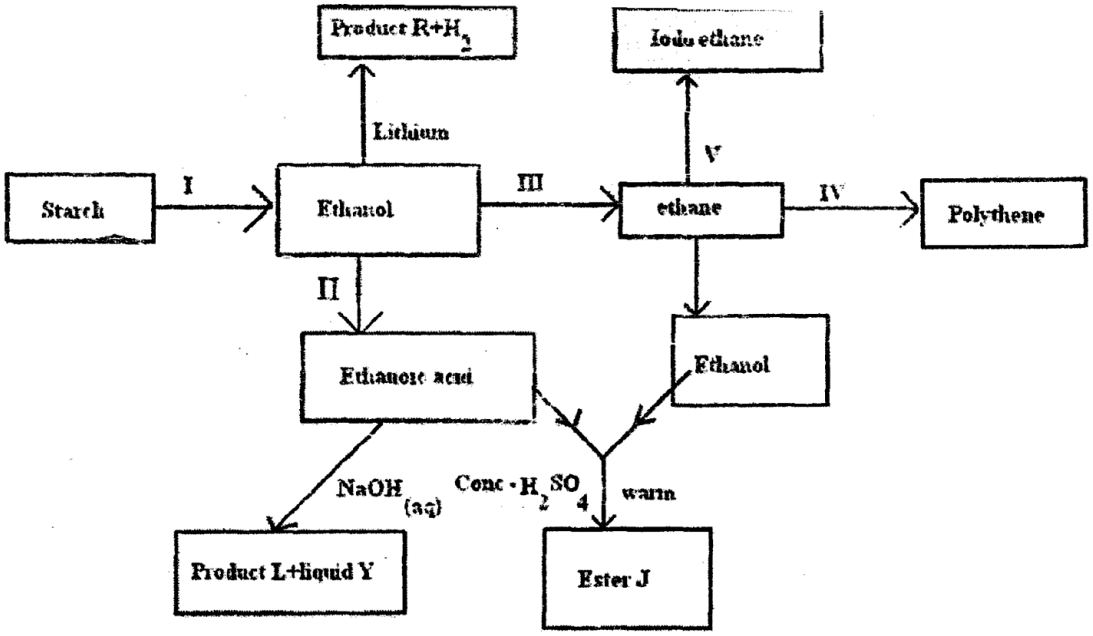
(iv) Calculate the E^{θ} value of the electrochemical cell constructed in (iii) above.
(2mks)

(c) During the electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2
amperes was passed through the cell or 3 hours.

(i) Write an ionic equation for the reaction that took place at the anode.
(1mk)

(ii) Determine the change in mass of the anode which occurred as a result of the electrolysis process. (Cu=63.5, 1 Farady 96500 coulombs)
(3mks)

3. (a) Study the flow chart below and use it to answer the questions that follow.



……

(1mk)

IV……

… (1mk)

(ii) Identify product R

(1mk)

……

……

(iii) Name the reagent and condition needed to effect process V.

(1mk)

……

……

(iv) Write an equation for the reaction between ethanoic acid and sodium hydroxide.

(2mks)

(v) Name ester J and draw its structure.

(2mks)

(b) When ethyne is ignited, it burns with a sooty flame. Explain.
(1mk)

……
……
……

4. (a) What is meant by molar heat of combustion.
(1mk)

……
……
……

(b) Use the thermo chemical equations below to answer the questions that follow.

I. $C_2H_{6(g)} + \frac{7}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ $\Delta H_1 = -1560kJ\ mol^{-1}$

II $C\ (graphite) + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H_2 = -394kJmol^{-1}$

III. $H_{2(g)} + ½\ O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H_3 = -286kJmol^{-1}$

(i) Name two types of heat changes represented by ΔH_3
(2mks)

……
……
……
……
……

(ii) Draw an energy level diagram for the reaction represented by equation I.
(2mks)

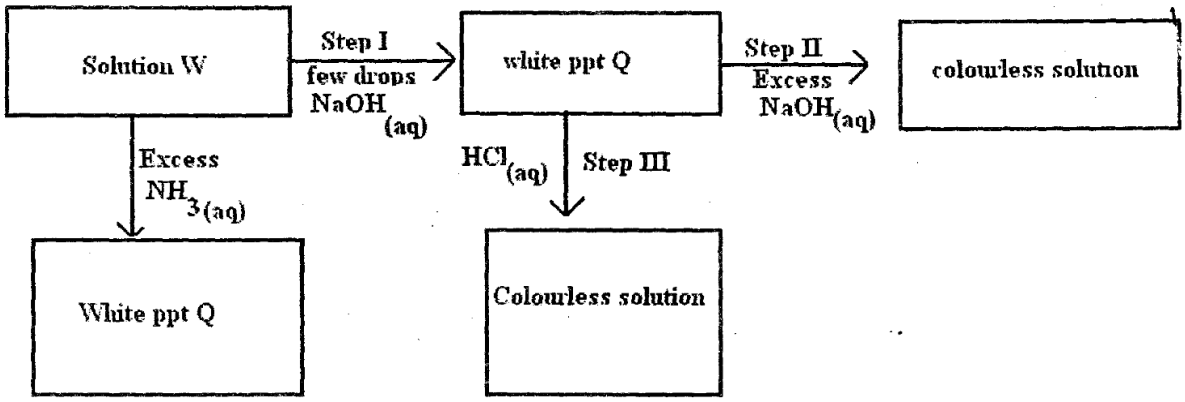
(iii)Calculate the standard heat of formation of ethane.
(2mks)

(iv)When a sample of ethane was burnt, the heat produced raised the temperature of 500g of water by 21.5k(specific heat capacity of water $4.2jg^{-1}\ k^{-1}$)
Calculate the;

I. Heat change for the reaction
(2mks)

II. Mass of ethane that was burnt. (Relative formular mass of ethene=30)
(2mks)

5. (a) Study the flow chart below and use it to answer the questions that follow.



(1mk)

……
……

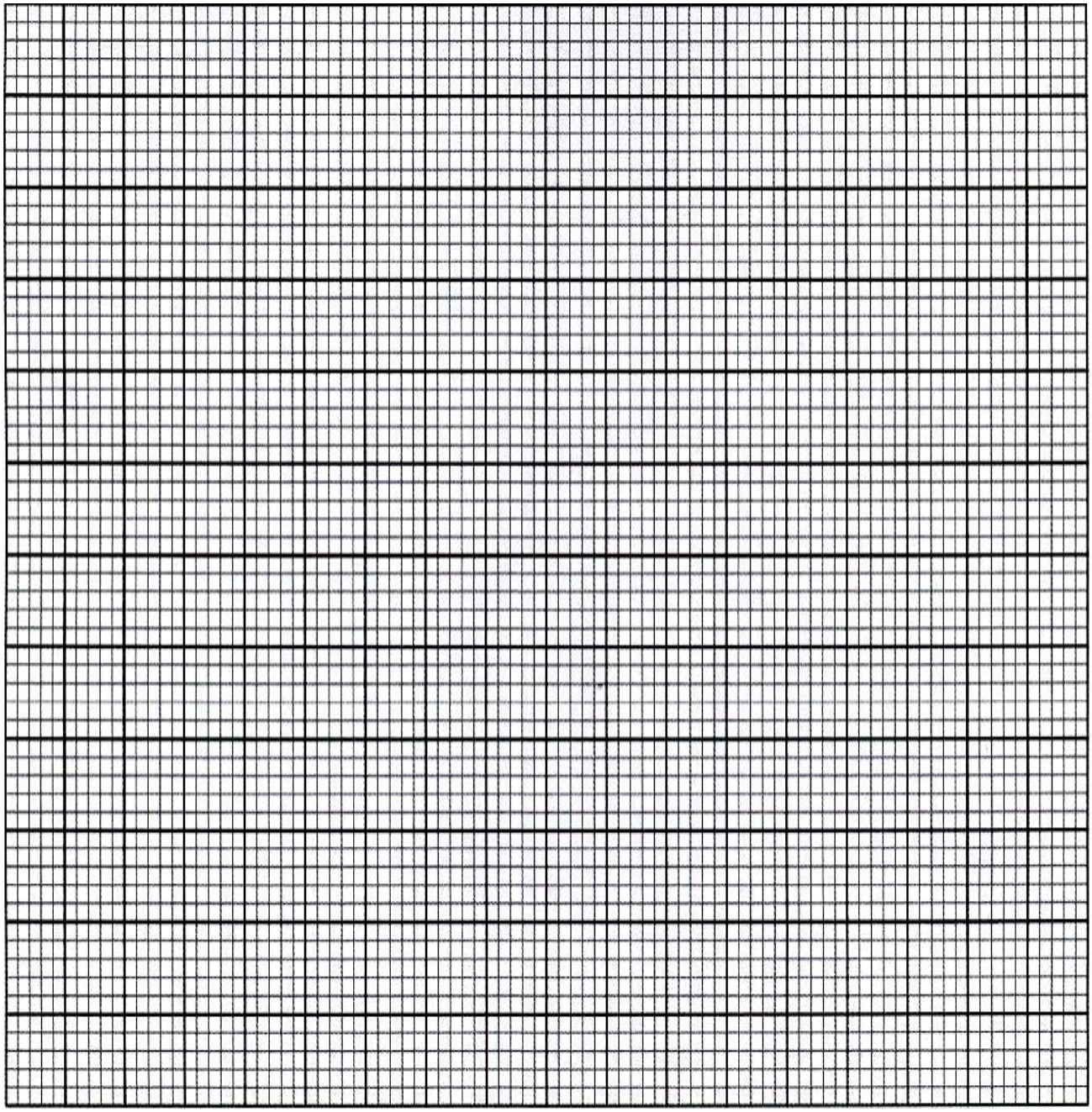
(iii)What property of the white precipitate is illustrated in steps II and III.
(1mk)

……
……
……

(b)The table below shows solubility in frame of sodium nitrate in 100g of water for various temperatures in °c.

Temperature °c	0	10	20	30	40	50	60	80	90	100
Solubility(g/100g)	73	80	88	96	104	114	124	148	162	180

(i) Draw a graph of solubility of sodium nitrate against temperature.
(3mks)



(ii) From the graph, determine the solubility of sodium nitrate at 70°c.
(1mk)

……

……

……

(iii)From the graph determine the amount of Sodium nitrate that would crystallize out if the
solution is coded from 65°c to 20°c.
(2mks)

……
……
……
……
……

(c) Define the term fractional crystallization of salts.
(1mk)

……
……
……

6. (a) What is a chemical equilibrium?
(1mk)

……
……
……

(b) Apart from concentration; list any two factors that affect equilibrium position in a chemical reaction.
(2mks)

……
……

(c) At 20°c, NO_2 and N_2O_4 gases exist in equilibrium as shown below in the equation below.

$$2NO_{2(g)} \rightleftharpoons N_2O_{4(g)} \qquad \Delta H = -ve$$

(Brown) (Pale Yellow)

State

(i) A s… cold water. (1½ mks)

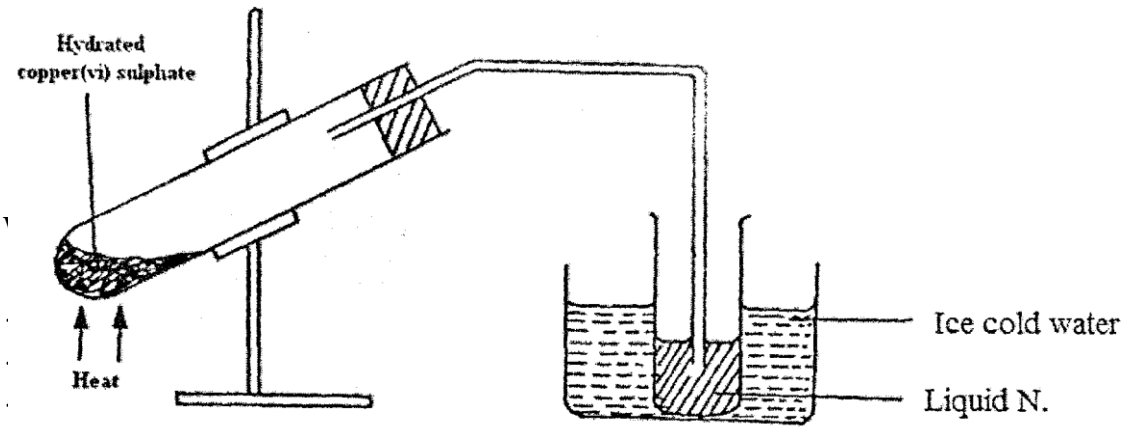
……
……

(ii) The volume of the gaseous mixture in the syringe is reduced. (1½ mks)

……
……

(d) A group of students in a certain school set up the experiment shown below. Study it and answer the questions that follow.

(i)



(ii) Give one chemical test that can be carried out to identify liquid N.
(1mk)

……
……
……

(iii)Give the criteria used to confirm purity of liquid N.
(1mk)

……
……
……

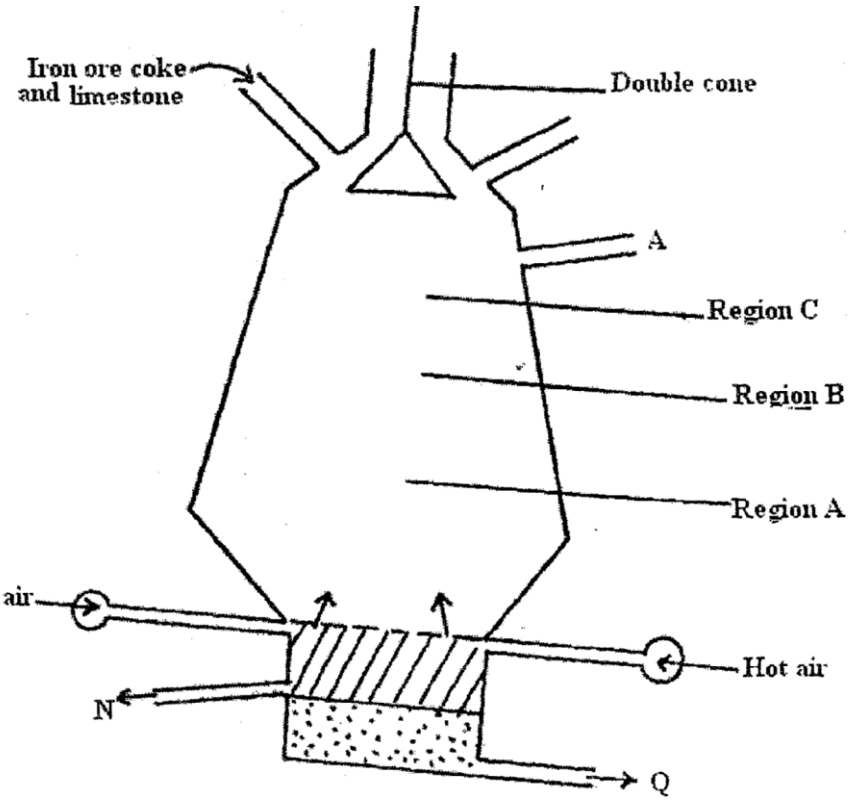
(iv)What is observed when liquid N is poured back to the residue.
(1mk)

……
……
……

7. (a) Give the name of any ore from which iron is extracted.
(1mk)

……
……
……

(b) Below is a figure of a blast furnace used in extraction of iron from its ores.



(i) W

…
…
…

……
……

(ii) Write chemical equations for the reactions taking place at regions.

A

(1mk)

……

……

……

B

(1mk)

……

……

……

C

(1mk)

……

……

……

(iii)Identify substance N and Q

N……

…….. (1mk)

Q……

……(1mk)

((c) (i) What is meant by half life

(1mk)

……

……

……

(ii) If 87.5% of a radioactive isotope decays in 66 years. What is its half life?

(2mks)

233/1
Chemistry
August/September
Paper 1
2 hours

RARIEDA SUB-COUNTY POST MOCK JOINT EXAMS 2016

Kenya Certificate of Secondary Education (K.C.S.E)

233/1
Chemistry
Paper 1
2 hours

INSTRUCTIONS TO CANDIDATES:

- *Write your**name** and **index number** in the spaces provided above.*
- *Sign and write the date of examination in the spaces provided above.*
- *Answer **All**the questions in the spaces provided below each question.*
- *Mathematical tables and electronic calculators may be used*
- *All working **MUST** be clearly shown where necessary.*

For Examiner's Use Only

Question	Maximum score	Candidate's score
1-30	80	

This paper consists of 10 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing

1. (a) Aluminium is used in making cooking vessels and overhead cables. State the property of aluminium that makes it suitable for the two uses separately.

Cooking vessels……

(½mk)

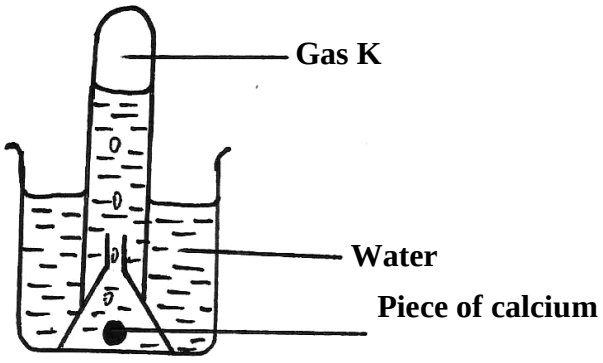
Overhead cables …….

(½mk)

(b) Explain why it is not advisable to clean surfaces of cooking vessels made of aluminium using wood –ash solution

(2mks)

2. The set-up below was used to prepare and collect gas L, produced by the reaction between water and calcium metal



(a) Name gas K

(1mk)

……

……

(b) At the end of the experiments, the solution in the beaker was found to have a PH of about 11, explain

(2mks)

(c) Write a balanced chemical equation for the reaction that occurs

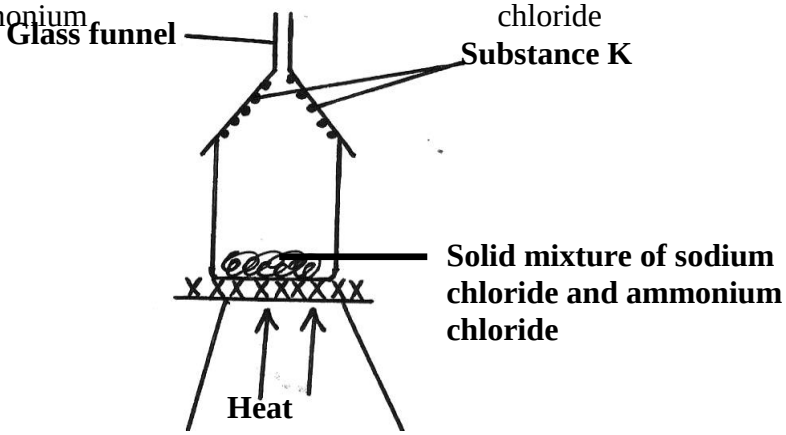
(1mk)

……

……

……

3. The following set-up shows the heating of a mixture of equal amounts of sodium chloride and ammonium chloride



(a) What is substance K?

(1mk)

……

……

(b) What is the process by which substance K is formed?

(1mk)

……

……

4. Differentiate between the terms atomic number and mass number

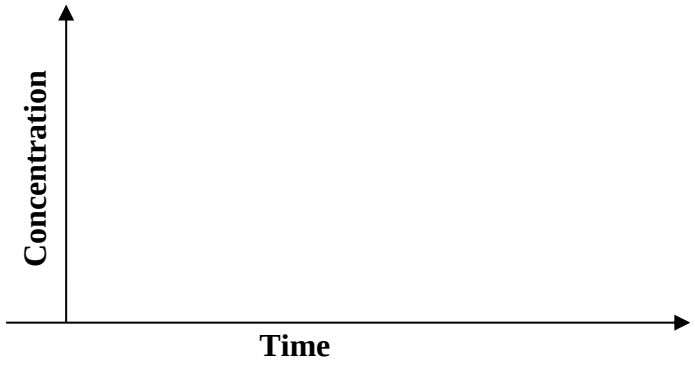
(2mks)

……

5. Study the equilibrium between gases

$E_{(g)} \rightleftharpoons F_{(g)}$

(i)Sketch a graph of the variation of the concentration of substance F with time, on the grid below



(ii) Explain the shape of the curve
(2mks)

……

……

……

……

……

6. Explain why very little carbon (IV) Oxide gas is evolved when dilute Sulphuric (VI) acid is added to Lead (II) carbonate
(2mks)

……

……

……

……

7. A crystal of Copper (II) Sulphate was placed in a beaker of water. The beaker was left standing for two days without shaking. State and explain the observations that were made (2mks)

……

……

……

……

……

8. Study the information in the table below and answer the questions that follows

Ions	Electron arrangement	Ionic radius
A+	2.8	0.95
B+	2.8.8	0.1333
C2+	2.8	0.065

Explain why the ionic radius of
(a) B+ is greater than A+
(1mk)

……

……

……

……

(b) C2+ is smaller than of A+

(2mks)

……

……

……

……

9. (a) State Graham's law of diffusion

(1mk)

……

……

……

……

(b) Gas D takes 110 seconds to diffuse through a porous partition. Gas D has a relative molecular mass of 34. How long will it take for the same amount of ammonia gas to diffuse under identical conditions? (H=1, N=14)

(2mks)

10. When reacting sulphur (VI) Oxide and Hydrogen Sulphides some traces of water vapour is required for the reaction to occur.

(a) State the role of water vapour

(1mk)

……

……

(b) Write an equation for the reaction that occurs

(1mk)

……

……

……

……

(c) Identify the reducing agent in the reaction in (b) above

(1mk)

……

……

11. State and explain observation made when Conc. Sulphuric (VI) acid was added to sugar

crystals

(2mks)

……

……

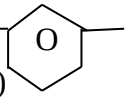
……

……

12. Name the class to which the following cleansing agents belongs

(i) $R\text{-}COO^{-}Na^{+}$ A

(½mk)

(ii) R  $O\text{-}SO^{-}_{3}\ Na^{+}$ B

(½mk)

(iii) Which cleansing agent is suitable for use in hard water?

(½mk)

……

……

(iv) Which cleansing agent above is not environmentally friendly?

(½mk)

……

……

13. (i) Nitrogen (I) Oxide supports combustion of burning charcoal. Write an equation to show

this reaction

(1mk)

……

……

(ii) Ammonium nitrate can be heated to give off Nitrogen (I) oxide. However a mixture of

NH_4Cl and $NaNO_3$ is preferred. Explain

(1mk)

……

……

……

……

(iii) State the physical test of Nitrogen (I) Oxide

(1mk)

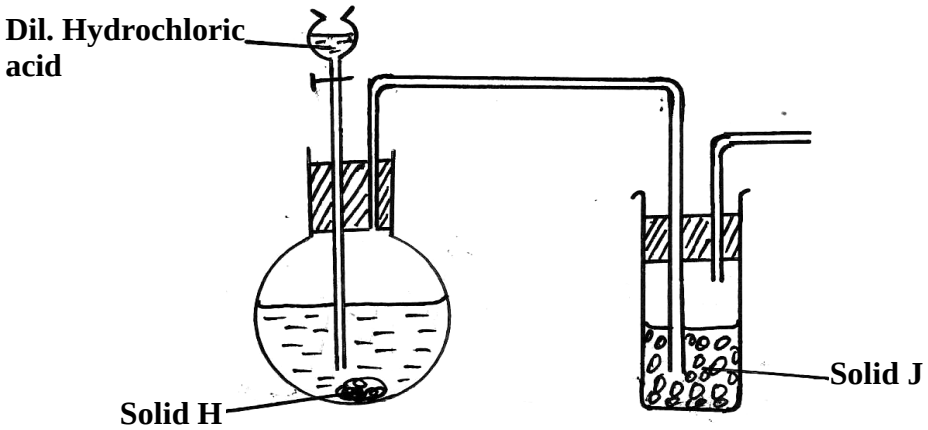
……

……

……

……

14. The set-up below was used to prepare dry sample of hydrogen Sulphide gas



(a)(i) Complete the diagram to show how the gas was collected

(2mks)

(ii) Identify the following

I: Solid H

(1mk)

……

……

II.Solid J

(1mk)

……

……

(b) Write an equation for the reaction that occurred in the flask between solid H and dilute hydrochloric acid

(1mk)

……

……

15. (a) Distinguish between nuclear fusion and fission

(2mks)

……

……

……

……

(b) Complete the nuclear equation below

$$^{230}_{90}Th \longrightarrow {}^{230}_{91}Pa + \_\_\_\_\_$$

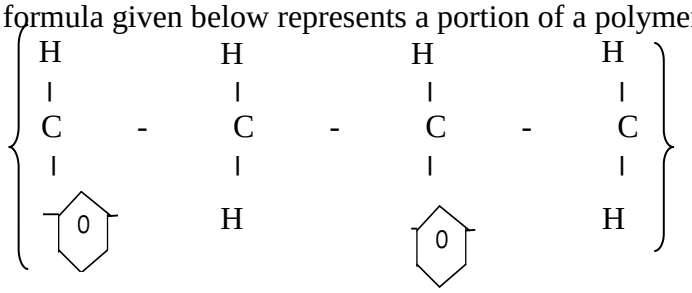
(c) Give one application of radioactivity in agriculture
(1mk)

……

……

……

16. The formula given below represents a portion of a polymer



(a) Give the name of the Polymer
(1mk)

……

……

(b) Draw the structure of the monomer used to manufacture the Polymer
(1mk)

17. Hydrogen chloride gas can be used to carry out fountain experiment. State the property of hydrogen chloride that make it suitable for this experiment
(1mk)

……

……

……

……

18. 0.92g of ethanol were found to burn in excess air producing a temperature rise of 32.5^{o}C in 200cm^{3} of water(C=12.0,H=1.0, O=16.0) Density of water is 1g/cm3, specific heat capacity of water is 42KjKg^{-1}K^{-1}

(a) Write the equation for the combustion of ethanol
(1mk)

……

……

……

……

(b) Determine the molar heat of combustion of ethanol
(2mks)

19. Iron is extracted from its ore by blast furnace form its ore by blast furnace process.
(a) Name one ore from which iron is extracted
(1mk)

……

……

(b) One of the impurities in iron is removed in the form of Calcium silicate. Write equations for the reaction in which calcium silicate is produced
(2mks)

……

……

……

……

20. Calculate the amount of Zinc in grams that would remain if 1.96g of the metal were reacted with $100cm^3$of 0.2M hydrochloric acid. (Zn=65.0, H=1.0, Cl=35.5)
(3mks)

……

……

……

……

21. (a) Starting with solid Magnesium Oxide, describe how a solid sample of Magnesium hydroxide an be prepared
(2mks)

……

……

……

……

(b) Give one use of Magnesium hydroxide
(1mk)

……

……

……

……

22. An oxide of element F has the following F2O5. Determine the oxidation state of F in the compound
(1mk)

……

……

……

……

23. A dynamie equilibrium is established when hydrogen and chlorine reacts as shown below

$Cl_{2(g)} + H_2 \rightleftharpoons 2HCl_{(g)}$

(a) What is meant by the term dynamic equilibrium?
(1mk)

……

……

……

……

(b) State and explain the effect of increasing pressure on the position of the equilibrium shown
in (a) above
(2mks)

……

……

……

……

24. An element X has a relative atomic mass of 44. When a current of 0.5 A was passed through the molten chloride of X for 32 minutes and 10 seconds, 0.22g of X were deposited at the cathode
Determine the charge on an ion of X (1F=96,500c)
(3mks)

……

……

……

……

……

……

……

25. (a) Differentiate between catalytic and thermal cracking of long chain organic compounds(2mks)

……

……

……

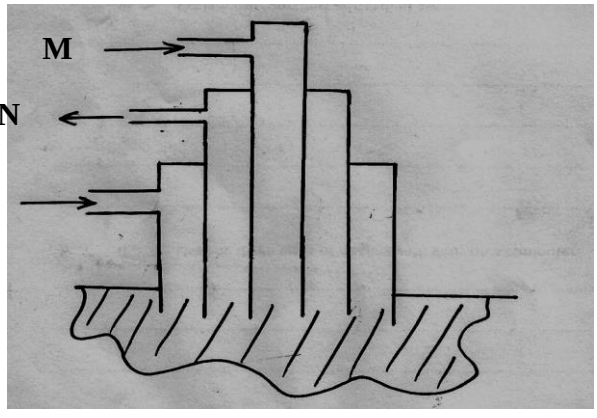
……

(b) State the disadvantage of C.F.C based compounds
(1mk)

……

……

26. The figure below shows a simple extraction process of Sulphur



(a) Give the name of the process shown in the diagram above

(1mk)

……

……

(b) What is the use of the superheated hot water?

(1mk)

……

……

……

……

(c) State two physical properties of Sulphur that make it possible to be extracted using water (2mks)

……

……

……

……

27. (a) Define molar latent heat of vaporization of a substance

(1mk)

……

……

……

……

(b) The Molar latent heat of vaporization of water at 100^{o}C is 41.1kJ/mol. Calculate the heat

change when 1.0g of water at 100^{o}C is converted into vapour at 100^{o}C (H=1, O=16)

(2mks)

……

……

……

……

……

……

……

28. Metals **Q** and **T** had their half-cells connected to a Zinc half-cell and the following reduction potentials were obtained fro each metal

Metal half-cell	Reduction potential (volts)
$Q^{2+}_{(aq)}$ Q (s)	-1.37v
T+(aq)/T(s)	-0.83v

(a) What name is given to the Zinc half-cell in these circumstances, and state its reduction

Potential
(1mk)

……

……

……

……

(b) Metals Q and T were connected to form an electrochemical full cell

(i) Write the equations for the half-cell reactions that occur at the Q and T electrodes
(1mk)

……

……

I. At electrode Q:

……

……

II. At electrode T:

……

……

(ii) Calculate the e.m.f of the electrochemical full cell in b(i) above
(1mk)

233/2
CHEMISTRY
PAPER 2
AUGUST/SEPTEMBER
(THEORY)
TIME: 2 HOURS

RARIEDA SUB-COUNTY POST MOCK JOINT EXAMS 2016

Kenya Certificate of Secondary Education (K.C.S.E)

233/2
Chemistry
Paper 2

INSTRUCTIONS TO CANDIDATES

- *Write your name and Index number in spaces provided above.*
- *Sign and write the date of examination in the spaces provided above*
- *Answer all the questions in the spaces provided above.*
- *KNEC Mathematical tables and silent electronic calculators may be used.*
- *All working must be clearly shown where necessary.*
- *Candidates should answer the questions in English.*

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidate's score
1	12	
2	11	
3	09	
4	12	
5	11	
6	12	
7	13	
Total score	**80**	

This paper consists of 11 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. The table below shows elements with their atomic numbers, mass numbers and their melting points. Study it and answer the questions that follow. Letters do not represent the actual symbols of the elements

Element	B	C	D	E	F	G	H	I	J	K
Atomic number	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	24	23
Melting point	-	-	637	44	-272	-223	vary	113	669	980

(a) Select two elements with oxidation state -2

(1mk)

……

……

……

……

(b) Which element represents

(i) the most powerful oxidizing agent?

(1mk)

……

……

(ii) the most powerful reducing agent?

(1mk)

……

……

(c) Which element has the highest ionization energy? Explain

(1mk)

……

……

(d) Select two elements, when reacted form a compound that conducts electricity in molten

and acqueous state

(1mk)

……

……

……

……

(e) Select two elements when reacted form a compound that dissolves in water to form acidic solution

(1mk)

……

……

……

……

(f) Using dot (•) and cross (x), draw the diagram that shows the bond between B and J

(2mks)

(g) Explain why the melting point of K is higher than that of D

(2mks)

……

……

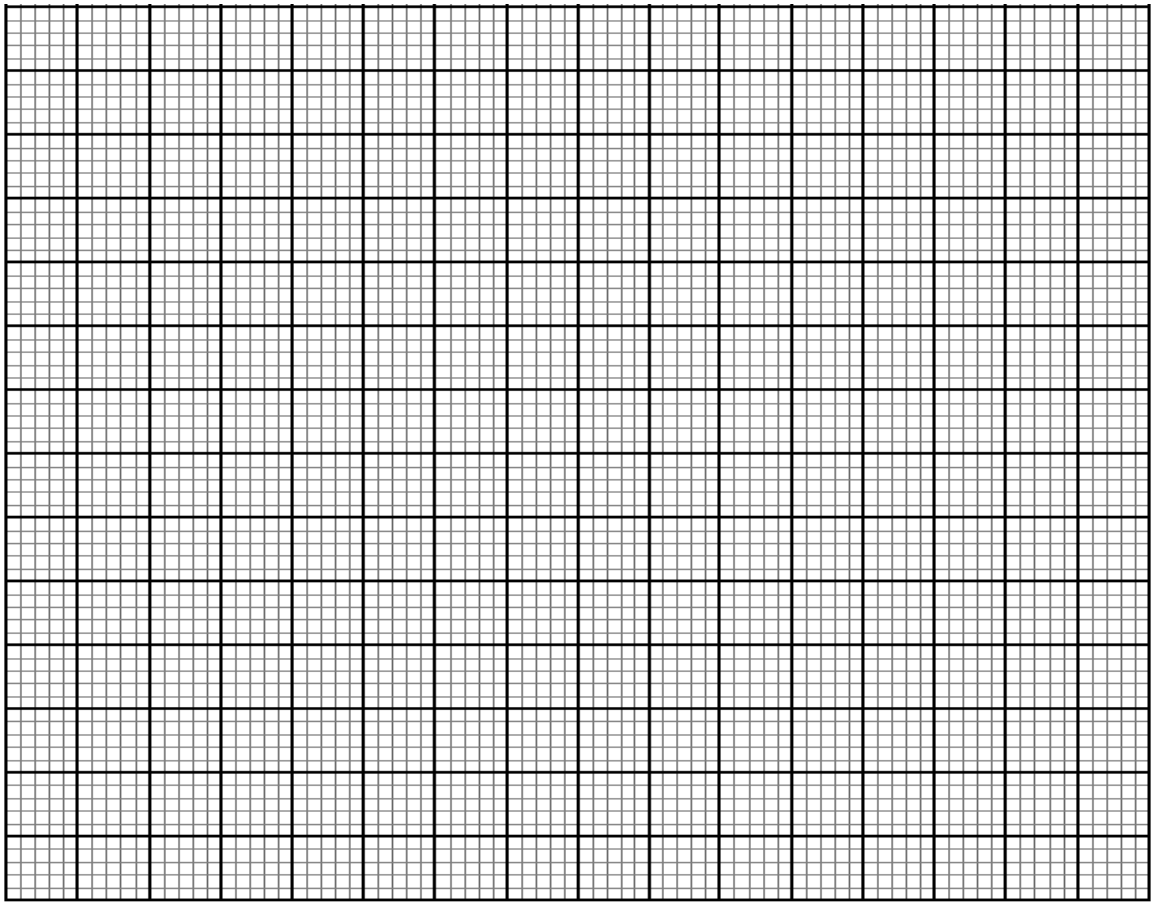
……

……

2. Pure Calcium Carbonate weighing 7.50g was placed in a flask with 50cm^3 of dilute hydrochloric acid. The flask was kept at constant temperature and the carbon (IV) oxide evolved was collected in a graduated vessel. The volume of carbon (IV) Oxide was recorded every 20 minutes intervals (some of calcium carbonate remained undissolved at the end of the experiment. The results of the experiment are given in the table; study it and answer the questions that follows

Time form at the start of reaction/min	Volume of Carbon (IV) Oxide formed at stp /cm^3
20	655
40	910
60	1065
80	1100
100	1120
120	1120

(i) On the grid provided, plot the graph of the volume of Carbon (IV) Oxide against



time (4mks)

(ii) From the graph determine the volume of the gas collected after 43 seconds

(1mk)

……

……

(iii) Determine the rate of reaction at the 25th minute

(2mks)

……

……

……

……

(iv) What mass of calcium carbonate will react with the acid after 100 seconds

(3mks)

……

……

……

……

(II) When dilute hydrochloric acid is added to a yellow solution of Pottassium Chromate (VI)

an orange solution of Pottassium dichromate (VI) is produced as in the equation below

$$2K_2CrO_{4(aq)} + 2HCl_{(aq)} \rightleftharpoons K_2Cr_2O_{7(aq)} + H_2O_{(l)}$$

Yellow Orange

(i) What would you observe, if dilute Sodium hydroxide solution was added to the Orange solution? Explain

(2mks)

……

……

……

……

3. (a)(i) An evacuated flask has a mass of 90.050g. When filled with gas X at s.t.p the flask weighs 90.121g. If the volume of the flasks was 22.2cm^3. Calculate the relative molecular mass of X. (Molar gas volume at s.t.p=22.4dm^3)

(2mks)

(ii) Write the equation of the reaction taking place when propane is burnt in excess Oxygen(1mk)

……

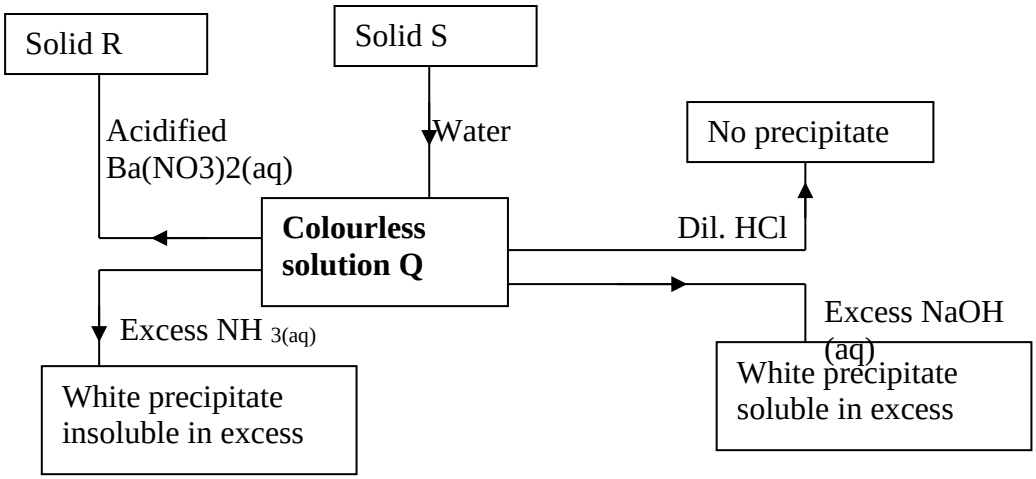
……

……

……

(b)(i) A fixed mass of a gas occupies 4dm3 at 227°C and 152mmHg pressure. At what pressure
will the volume of the same mass of gas be 2dm^3 if the temperature is lowered to -23°C(3mks)

(c) (i) Study the scheme diagram below and answer the questions that follow



Identify
Solution **Q**…….
Solid **R**……
(2mks)

(d) The following is a nuclear equation ***(X and Y are not actual symbols)***

$$^{a}_{m}X \longrightarrow {}^{230}_{90}Y + 2\,{}^{4}_{2}He + 2\,{}^{0}_{-1}e$$

(a) Determine the value of a and m

……

……..

(b) Compare the atomic size of R and L
2mks)

……

……

……

……

4. (I) When hydrogen gas was passed over heated Iron (III) oxide was heated. However, when Iron (III) oxide was heated with carbon, a reaction occurred resulting in the formation of solid product Z. When solid Z was dissolved in dilute Sulpuric (VI) acid, gas Y was evolved.

(a) Explain why carbon reacted with Iron (III) Oxide while hydrogen did not?
(1mk)

……

……

……

……

(b) Identify gas Y
(1mk)

……

……

……

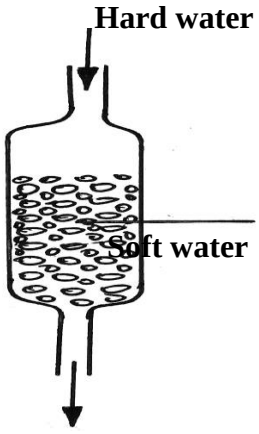
(c) (i) Write an equation for the reaction between Iron (III) Oxide and Carbon
(1mk)

……

……

(ii) Calculate amount of solid Z formed in grams, if 1.5g of Iron (III) oxide was used *(Fe=55.8,O=16)*
(3mks)

(II) The calcium below was used to soften hard water



(i) Explain how the hard water was softened as it passed through the column
(2mks)

……

……

(ii) After some time the material in the column is not able to soften hard water. How can the
material be activated
(2mks)

……

(iii) Give **one** advantage of using hard water for domestic purposes
(1mk)

……

……

……

……

(iv) Some Copper turnings were added to dilute Nitric (V) acid at 40°C
(a) State **one** observation made
(1mk)

……

……

……....

(b) State and explanation observation you will make if the reaction temperature is increased to 55°C
(2mks)

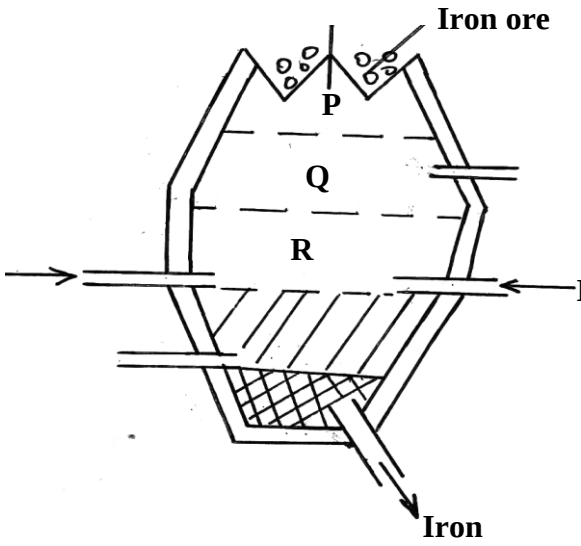
……

……

……

……

5. The diagram below shows the blast furnace for the extraction of iron. Study it and answer the questions that follow



(i) Identify the ore from which Iron is extracted from
(1mk)

……

……

(ii) Which roles does the following material perform in extraction of iron
(a) Coke
(1mk)

……

……

(b) Carbon (II) Oxide
(1mk)

……

……

(iii) Write down the equation for the two chemical changes that takes place in zone P
(2mks)

……

……

……

(iv) What is the temperature range in zone R? and what the importance of the temperature for extraction of Iron metal
(1mk)

……

……

……
……

(v) What is the composition of slag?
(2mks)

……

……

……

……

……

(vi) List any **two** physical properties of iron metal
(2mks)

……

……

……

……

(II) A student was provided with 50cm^3 of HCl in a 250cm^3 volumetric flask (acid in excess). When the reaction stopped he filled the volumetric flask to the 250cm^3 mark up with distilled water.
25cm^3 of this solution requires 2cm^3 of 0.1M NaOH for complete neutralization
(a) Write the equation for the reaction taking place between XCO3 and HCl
(1mk)
……

……

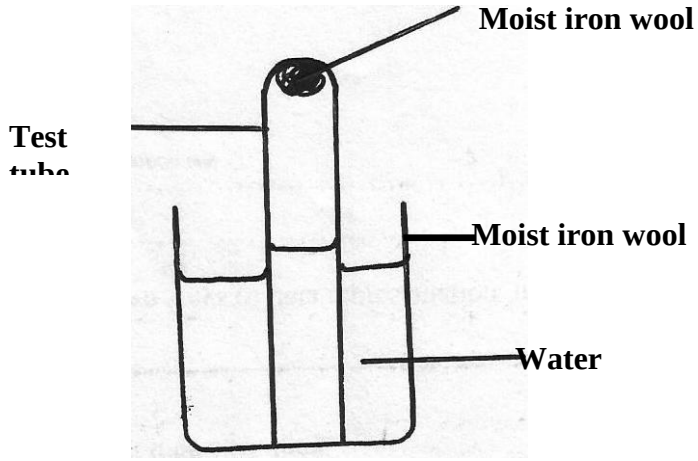
(b)(i) Calculate the number of moles of the acid in 250cm^3 of solution
(2mks)
……
……
……
……
……

(ii) How many moles of the acid reacted with XCO_3?
(2mks)
……
……
……
……
……

(iii) Calculate the molecular mass of the XCO_3
(3mks)
……
……
……
……
……

(d) What is the percentage of X by mass is XCO_3?
(1mk)
……
……
……
……

6. The set-up below was used to study some properties of air



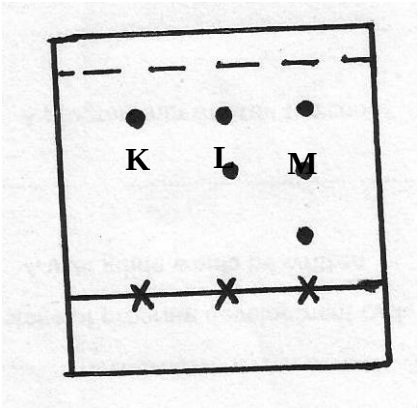
(i) State and explain two observation that would be made at the end of the experiment
(3mks)

……
……
……
……
……

(ii) Write the chemical equation for the chemical change that will take place
(1mk)

……
……
……

(II) The diagram below represents a paper chromatogram from three brands of juices suspected to contain burned food colour



The results showed the presence of burned formed colorings' in L and M only. On the same diagram

(a) Circle the spots which show the burned food colorings'
(1mk)

(b) Show solvent front
(1mk)

(III) (i) Name another gas which is used together with Oxygen in welding
(1mk)

……

……

……

……

(ii) Oxygen and Sulphur belong to group (VI) of the periodic table. Explain why there is big difference in their melting point (melting points of Oxygen is -216^{o}C while that of sulphur is 44^{o}C

(2mks)

……

……

……

……

(iv) Explain how a solid mixture of sodium sulphate can be separated from lead (I) sulphate if the two are mixed together

(3mks)

……

……

……

……

……,……...

7. The table below shows some properties of some organic compounds. Use it to answer the questions that follows;

Compound	Molecular	Mpt^{o}c	Bpt^{o}C
P	$C_2H_4O_2$	16.6	118
Q	C_3H_6	185	-47.7
R	C_3H_8O	-127	97.2
S	C_5H_{12}	-130	36
T	C_5H_8	-90	39.3

(i)

Which of the compounds above is a gas at 25^{o}C? Explain

(2mks)

……

……

……

……

(ii) Describe chemical test that would distinguish between T and S

(2mks)

……

……

……

……

(iii) Compounds R and P reacted to form compound K. Give the name of K and state the group of compounds to which it belongs

(2mks)

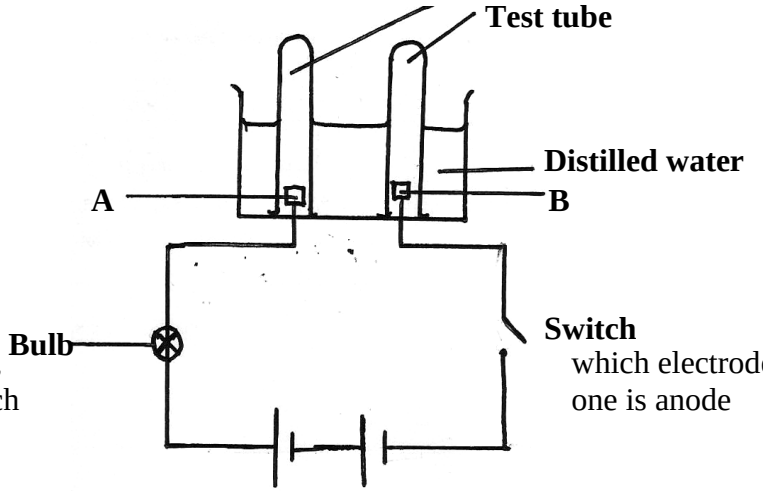
……

……

……

……

(II) Study the diagram below and answer the questions that follow;



(a) State, which electrode is the cathode and which one is anode

(1mk)

……

……

……

……

……

……

(b) Explain why no observation was made when the switch was closed

(1mk)

……

……

……

……

……

……

(c) Small amount of concentrated sulphuric (VI) acid was added to the distilled water and the

Switch closed.

(i) State and explain observation made

(2mks)

……

……

……

……

(ii) Using equations show the reactions that took place at each electrode given that A and B are inert electrodes

(2mks)

……

……

……

……

(iii) Write down overall cell equation for the reaction

(2mks)

……

……

……

……

233/1
CHEMISTRY
PAPER 1
JUNE -2016
TIME: 2 HOURS

CENTRAL YEARLY MEETING OF FRIENDS (CYMF) -2016

Kenya certificate of Secondary Education

233/1
CHEMISTRY
PAPER 1

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all the questions in the spaces provided.
4. Mathematical tables and silent electronic calculators may be used.
5. All working must be clearly shown where necessary.
6. Candidates should check the question paper to ascertain that all the pages are printed as indicated and no question is missing.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1-28	80	

This paper consists of 12 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.

1. Explain the following

i) It is always advisable to scoop chemicals using a clean spatula.

(1mk)

……

……

……

ii) Flammable substances should always be kept away from flames in the laboratory.

(1mk)

……

……

……

2. Name one reagent that can be used to distinguish between Al^{3+} and Zn^{2+} ions in solution and state what would be observed if each of the ions is treated with the reagent you have named. (3mks)

……

……

……

……

……

……

……

……

……

3. Manganese sulphide reacts with acids according to the following equation.

$$MnS_{(s)} + 2H_3O^+_{(aq)} \rightleftharpoons Mn^{2+}_{(aq)} + 2H_2O + H_2S_{(g)}$$

State giving a reason what would happen to the equilibrium if;

i) Water is added to the equilibrium mixture.

(2mks)

……

……

……

ii) Hydrogen chloride is bubbled into the equilibrium mixture.
(2mks)

……
……
……

4. State the conditions under which copper reacts with sulphuric (vi) acid and give an equation for the reaction.
(2mks)

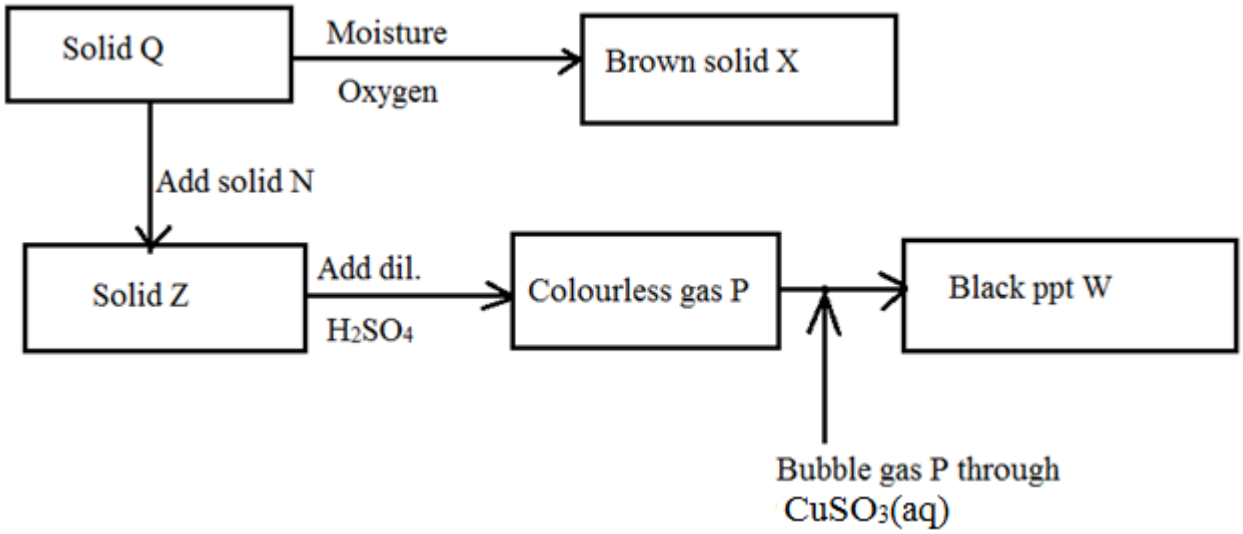
……
……
……

5. When 8.8g of hydrocarbon Z was burnt in excess air 14.4g of water and 11.95 dm^3 of carbon (vi) oxide were obtained at s.t.p. Determine the empirical formula of Z.
(3mks)

6. When zinc granules are dropped into two separate solutions of dilute sulphuric (vi) acid effervescence of a colourless gas occurs in each case. Give equations to represent the reactions that take place.
(2mks)

……
……
……
……
……

7. Study the chart below and answer the questions that follow.



a) Identify solid X.
(1mk)

……

……....

b) Write the ionic equation for the reaction between P and copper (ii) sulphide solution. (1mk)

……

……

c) State the observations made when gas P is bubbled through iron (iii) chloride solution. (1mk)

……

……

8. State and explain the observation made when a moist red litmus paper is put in a gas jar of dry chlorine gas.
(2mks)

……

……

……

9. Use the information in the table below to answer the questions that follow.

Melting point	Element	Atomic number
97.8	R	11
660	S	13
1440	T	14
-40.1	U	17
63.1	V	19

a) Write the electron arrangement of

i) Ion of S

……

……

ii) atom of T

……

……

b) Explain why the melting point of T is higher than that of U.

(2mks)

……

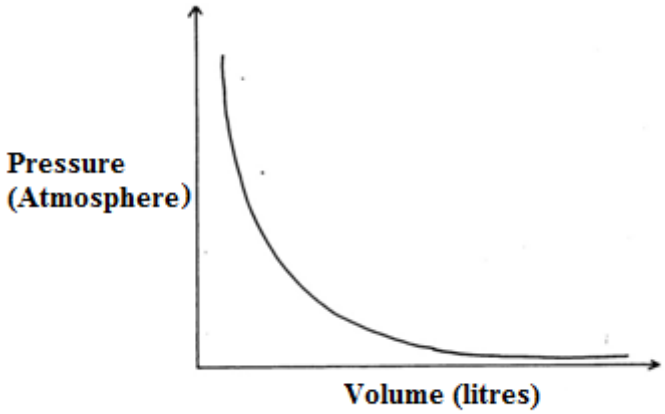
……

……

10. Calculate the volume of nitrogen (i) oxide produced when 38.2g of ammonium nitrate is completely decomposed by heating (at s.t.p). (N=14, H=1, O=16)

(3mks)

11. The graph below shows the behavior of affixed mass of a gas at constant temperature.



a) What is the relationship between the volume and the pressure of the gas?
(1mk)

……

……

……

b) $60cm^3$ of oxygen gas diffused through a porous partition in 50 seconds. How long would it take $60cm^3$ of sulphur(iv) oxide gas to diffuse through the same partition under same conditions? (S = 32, O = 16.0)
(3mks)

12. a) When extinguishing a fire caused by burning kerosene carbon(iv) oxide is preferred to water. Explain.
(2mks)

……

……

……

……

……

b)Write the formula of the oxide of carbon which is ‘silent killer’.

(1mk)

……

…….

13. What is an Amphoteric oxide? Give two examples.

(2mks)

……

……

…….

……

…….

14. A certain fertilizer is suspected to be containing nitrate ions. Describe how the presence of nitrate ions can be determined in such fertilizer.

(3mks)

……

……

…….

……

…….

……

…….

15. Starting with zinc carbonate solid, described how zinc hydroxide can be prepared in the laboratory.

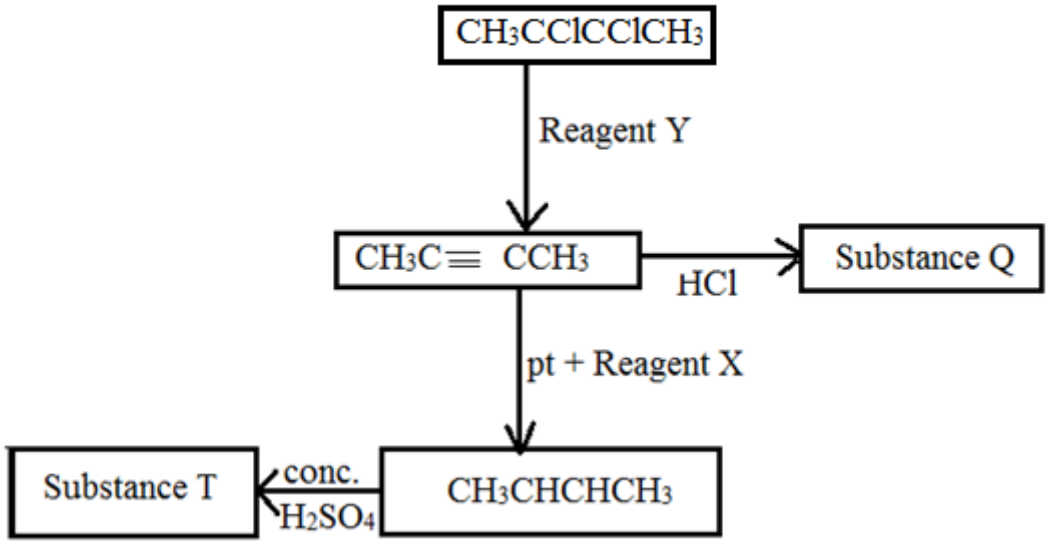
(3mks)

……

……

…….

16. Below is a scheme of some reactions starting with but-2-ene. Study it and answer the questions that follow.



a)Name Y, X and T.

(1 ½ mks)

Y……

……

X……

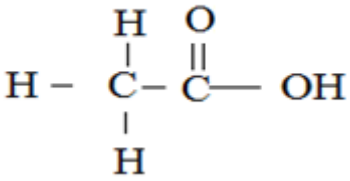
……

T……

…….

b)i) Give the name of the following organic compounds.

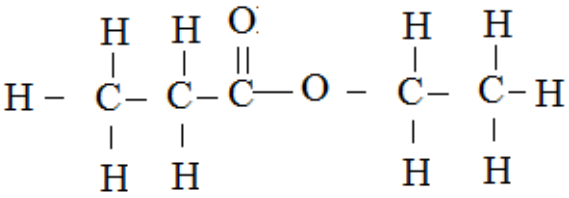
(½ mk)



……

……

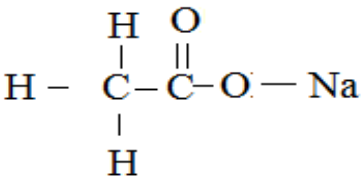
ii)



……

……

iii)



……

……

17. The following results were obtained during an experiment to determine the solubility of potassium nitrate in water at 30^0C.

Mass of dish = 15.86g

Mass of dish + saturated solution at 30^0C = 26.86g

Mass of dish + solid KNO_3 after evaporation to dryness = 16.7g

Calculate the mass of saturated solution containing 60.0g of water at 30^0C.

(3mks)

18. Apart from their location, state any two differences between a proton and an electron.

(1mk)

……

……

……

19. Explain why chlorine is a gas while iodine is a solid at room temperature.

(2mks)

……

……

……

……

20. a) When magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases giving white ash. Write two equations for the reactions that take place.

(2mks)

……

……

……

b)Give the total number of atoms present in the gas produced when water is added to magnesium nitrate.

(1mk)

……
…….

21. Use the thermo chemical equations below to answer the questions that follow.

$C_2H_2 + \frac{7}{2} O_2(g) \longrightarrow 2\ CO_2(g) + 3H_2O(l)$ $\Delta H = -1560KJ/MOL$

$C(s) + O_2(g) \longrightarrow CO_2\ (g)$ $\Delta H = -394KJ/MOL$

$H_2(g) + ½\ O_2(g) \longrightarrow H_2O\ (g)$ $\Delta H = -286KJ/MOL$

i) Draw an energy cycle diagram to the enthalpy of formation of ethyne.
(1 ½ mks)

ii) Calculate the enthalpy of formation of ethyne.
(1 ½ mks)

22. For the reaction

$Cl_2\ (g) + 2I^-\ (aq) \longrightarrow 2Cl^-\ (aq) + I_2(s)$

Use oxidation numbers determine the reducing agent.
(3mks)

23. When aqueous sodium hydroxide solution was added to freshly prepared acidified iron (ii) sulphate solution a green precipitate was formed. When hydrogen peroxide was first added to iron (ii) sulphate solution followed by sodium hydroxide solution, a brown precipitate was formed. Explain the observations.

(3mks)

……

……

……

……

24. Use the following information to answer the questions that follow.

$Sn^{2+}(aq) + 2e^- \longrightarrow Sn(s)$ $E^\theta = -1.014V$

$Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$ $E^\theta = 0.34V$

a) Write the cell representation for the cell made up of two half cells.

(1mk)

……

……

b) Write an equation for the cell reaction.

(1mk)

……

……

c) Calculate the E^θ value for the cell.

(1mk)

25. i) Define the term electrolysis.

(1mk)

……

ii) Hydrogen and oxygen can be obtained by electrolysis of acidified water. Using equation for the reaction at the electrode, explain why the volume of hydrogen obtained is twice that of oxygen.

(2mks)

……

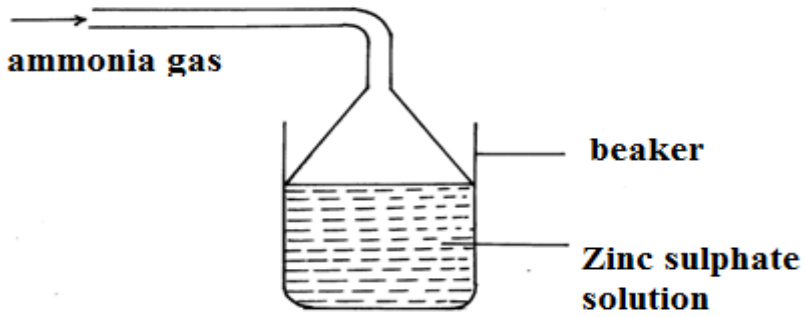
……

……

……

……

26. A student prepared ammonia gas and let it into a solution of zinc sulphate using the arrangement shown below.



a) State and explain the observations that were made in a beaker.

(2mks)

……

……

……

……

b) Write the ionic equation involving zinc ions.

(1mk)

……

……

……

……

27. Use dots (.) and cross (x) to show the bonding in:

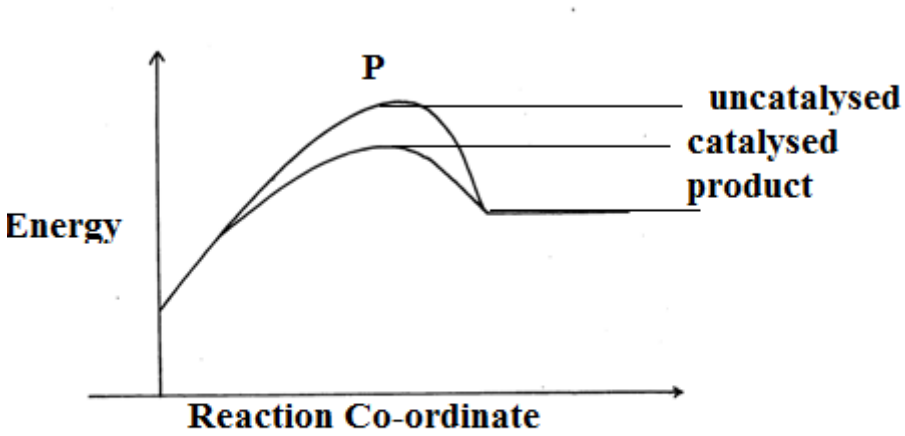
a) The compound formed between phosphorous and hydrogen. (P = 15, H = 1)

(2mks)

c) Carbon (ii) oxide. (C = 6, O = 8)

(1mk)

28. The energy level diagram below shows the effect of catalyst on the reaction path.



a) What does point P represent?

(1mk)

……

……

……

b) With reference to energy level diagram, explain how a catalyst increases the rate of reaction.

(2mks)

……

……

……

233/2
CHEMISTRY
PAPER 2
JUNE-2016
TIME: 2 HOURS

CENTRAL YEARLY MEETING OF FRIENDS (CYMF) -2016

Kenya certificate of Secondary Education

233/2
CHEMISTRY
PAPER 2

INSTRUCTIONS TO CANDIDATES

*-Answer **ALL** questions in the spaces provided after every question.*

FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	10	
2	12	
3	12	
4	13	
5	10	
6	12	
7	11	
TOTAL SCORE	80	

This paper consists of 11 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.

1. The grid below is part of the periodic table. Use it to answer the questions that follow. (The letters are not the actual symbols of the elements)

				A		B	C	
D			E	F			G	
							H	

a) Which is the most reactive non-metallic elements shown in the table? Explain. (2mks)

……

……

……

……

b) i)Write the formula of the compound formed when element A reacts with element B. (1mk)

……

…….

ii) Name the bond type in the compound formed in b(i) above.

……

…….

c) i)What is the name given to the family of elements where C, G and H belong? (1mk)

……

…….

ii) Write an equation for the reaction that occurs when C in gaseous form is passed through a solution containing ions of element H. (1mk)

……

d) The melting points of elements F and G is1410^{0}C and -101^{0}C respectively. In terms of structure and bonding, explain why there is a large difference in the melting points of F and G.

(2mks)

……

……

……

……

e) D forms two oxides. Write the formula of each of the two oxides.

(1mk)

……

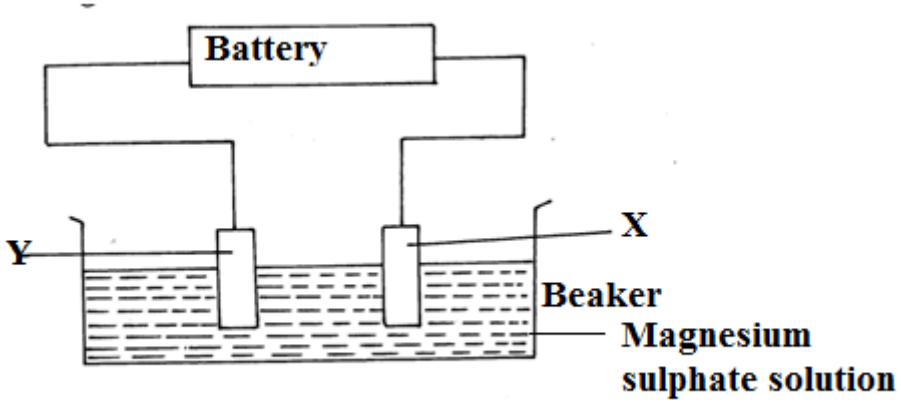
……

……

f) K is an element that belongs to the 3rd period of the periodic table and is a member of the alkaline earth elements. Show the position of K in the grid.

(1mk)

2. (a) The set-up below was used to investigate products formed at the electrodes during electrolysis of aqueous magnesium sulphate using inert electrodes. Use it to answer the questions that follow:-



i) During the electrolysis, hydrogen gas was formed at electrode x. Identify the anode, give a reason for your answer.
(2mks)

……
……
……
……

ii) Write the equation for the reaction which takes place at electrode Y.
(2mks)

……
…….

iii) Why is the concentration of magnesium sulphate expected to increase during electrolysis. (2mks)

……
……
……
……

iv) What will be observed if red and blue litmus papers were dipped into the solution after electrolysis.
(2mks)

……
……
……
……

b) During electrolysis of magnesium sulphate, a current of 0.3A was passed for 30 minutes, calculate the volume of the gas produced at the anode. Molar gas volume 24dm^3, 1 faraday=96500C) (3mks)

c) State two application of electrolysis.

(2mks)

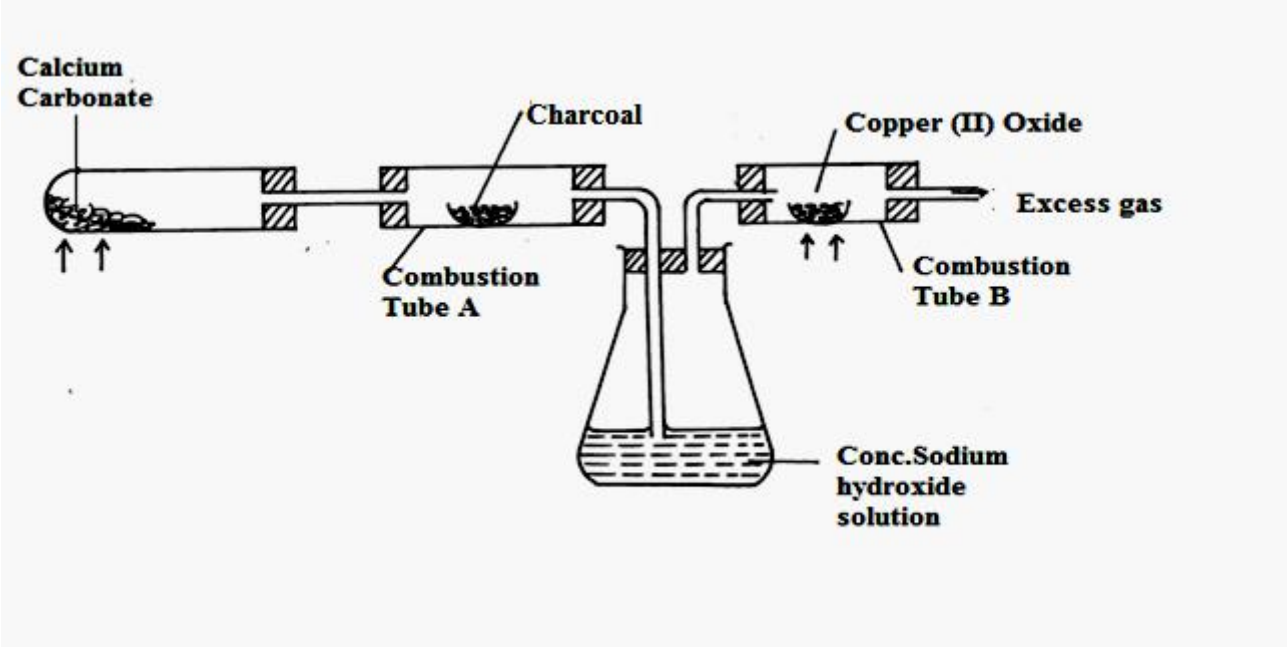
……

……

……

……

3. Study the following set-up apparatus and use it to answer the questions that follow:



a) i) What is the role of concentrated sodium hydroxide solution in the above set-up. (2mks)

……

……

……

ii) Suggest one other compound that could have been used in place of conc. Sodium hydroxide solution.

(1mk)

……

……

……

b)State and explain the observation made in combustion tube B at the end of the experiment.

(2mks)

……

……

……

……

c)i) Write an equation for the reaction that took place when calcium carbonate was heated. (1mk)

……

……

……

ii) Suggested one other compound that can be used in place of calcium carbonate. (1mk)

……

……

d) What property of charcoal is shown in combustion tube A. Explain your answer. (2mks)

……

……

……
……

e) i) What observation will be made at the end of the experiment if copper (ii) oxide was replaced with lead (ii) oxide.

(2mks)

……
……
……

ii) Write an equation for the reaction in e(i) above.

(1mk)

……
……

4. a) A form three student carried out an experiment where they titrated 20 cm^3 of M_2CO_3 with 0.5M HCl using phenolphthalein indicator. The M_2CO_3 solution was prepared by dissolving 6.47g of salt in distilled water then made upto 250cm^3 of solution. Complete the table below and answer questions that follows.

Titration	**I**	**II**	**III**
Final burette reading (cm^3)	20.2		45.2
Initial burette reading (cm^3)		20.2	30.2
Volume of titre cm^3	15.2	15.0	

(1 ½ mk)

b) calculate the average titre (show all your working)

(1mk)

c) Determine number of moles of acid used.

(2mks)

d) Write the equation of the reaction above.

(1mk)

e) Determine number of moles of the carbonate (M_2CO_3) used.

(2mks)

f) Calculate the molarity of the carbonate M_2CO_3 used.

(2mks)

g) Determine the relative formulae mars of carbonate M_2CO_3 used.

(2mks)

h) Show how relative atomic mass of M is obtained.

(1 ½ mks)

5. a) State Charles law.

(1mk)

……

……

……

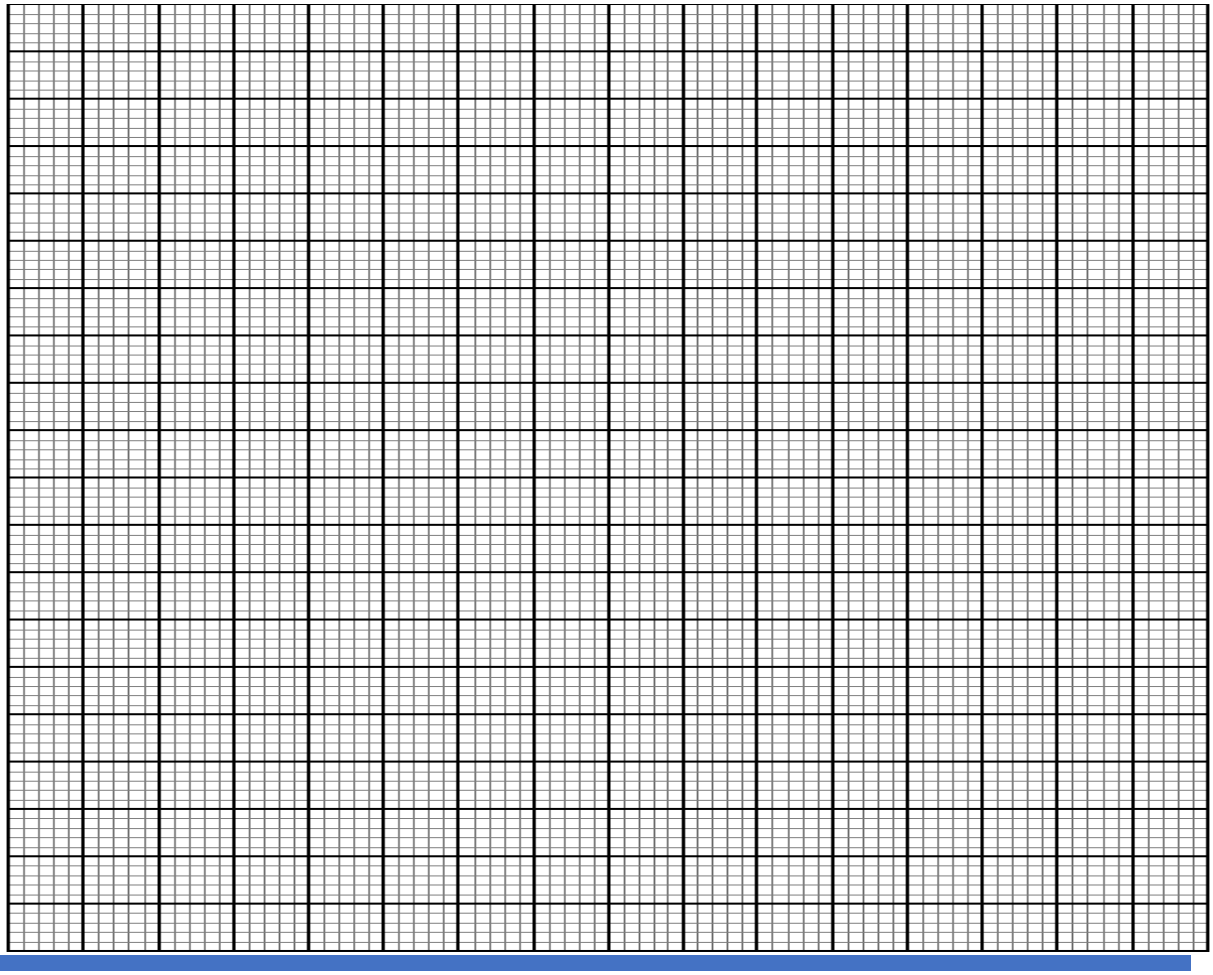
b) A gas occupies 200cm^3 of O^0C and 740mmHg pressure. What volume will occupy at 47^0C at the same pressure?

(3mks)

c) The following table gives sample results from an experiment carried out to investigate the relationship between the volume of a fixed mass of gas with its temperature.

Temperature^{o}C	0	20	40	60	80
Volume of the gas (cm^3)	140	150	160	170	180

i) Plot a graph of volume (Y-axis) against temperature (x-axis).
(4mks)



ii) Determine the volume of a gas at 50^0C from the graph.

(1mk)

……

……

iii) Determine from the graph the temperature in (^{0}C) when the volume of a gas is 165cm^3. (1mk)

……

…….

6. a) Define the following terms as used in organic chemistry.

i) Hydro carbon

(1mk)

……

……

……

ii) Isomer

(1mk)

……

……

……

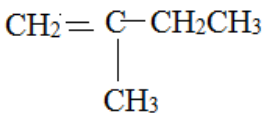
b) Name the following compounds.

i)$CH_3CH_2CH_2CH_3$

……

……

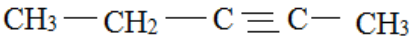
ii)



……

……

iii)



……

……

c) Draw the structure of the following:

i) But-1-yne

ii) 3,3-dimethylbut-1-ene

iii) 2,2-dimethylpropane

(3mks)

d) Distinguish between alkenes and alkanes.

(2mks)

……

……

……

e) State two sources of alkenes.

i)

……

……

.....

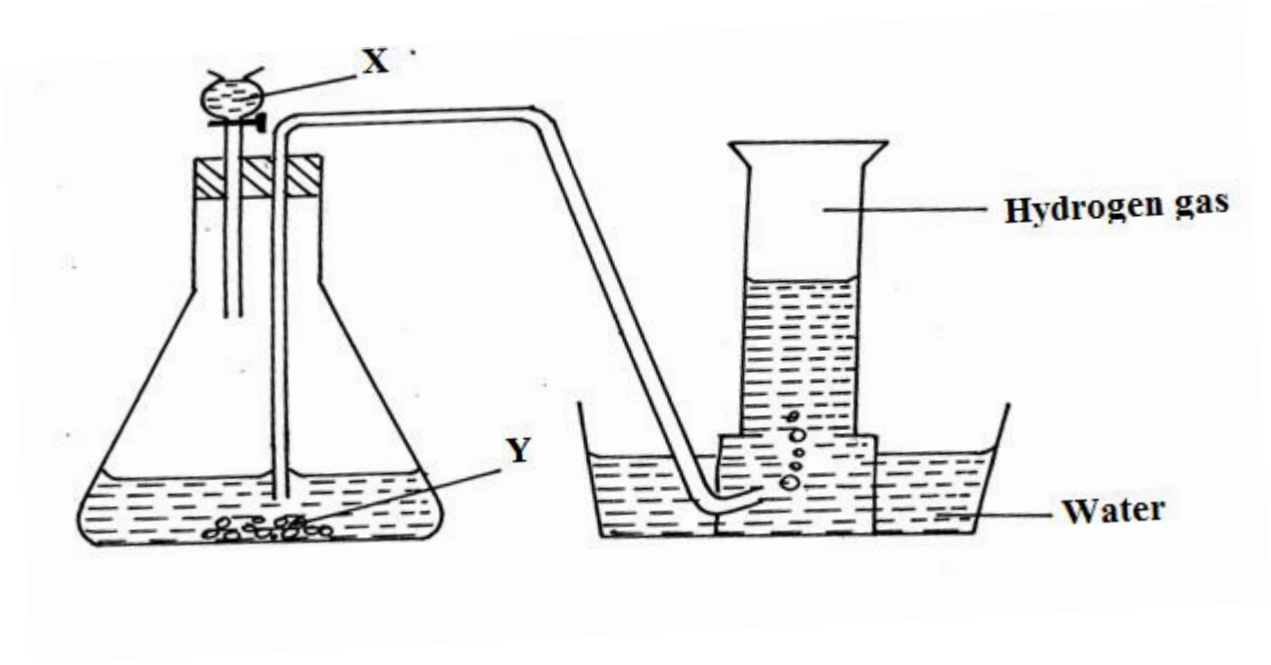
ii)

……

……

……

7. The figure below is asset up of apparatus for the preparation of hydrogen gas.



a) State mistake made in the set up.

(1mk)

……

……

b) Identify substance

i)X……

……..

ii)Y……

…….

c) Write an ionic equation for the reaction between X and Y.

(1mk)

i)X……
……..

ii)Y……
…….

d)State and explain the observation made when hydrogen gas was passed over heated copper(ii)oxide in a combustion tube.

(2mks)

……
……
……

e) Under suitable conditions hydrogen reacts with nitrogen to produce ammonia.

i) Name the catalyst used in the reaction.

(1mk)

……
…….

ii) Explain why the catalyst used should be powdered.

(1mk)

……
……
…….

iii)Give a reason why concentrated sulphuric (vi) is not a suitable drying agent for ammonia gas.

(1mk)

……
……
……

iv) State two commercial uses of hydrogen gas.

(2mks)

……
……

233/1
CHEMISTRY
(THEORY)
PAPER 1
JULY/AUGUST–2016
TIME: 2 HOURS

SAMETA SUB-COUNTY JOINT EVALUATION TEST–2016

Kenya Certificate of Secondary Education (K.C.S.E)
233/1
CHEMISTRY
(THEORY)
PAPER 1
JULY/AUGUST–2016
TIME: 2 HOURS

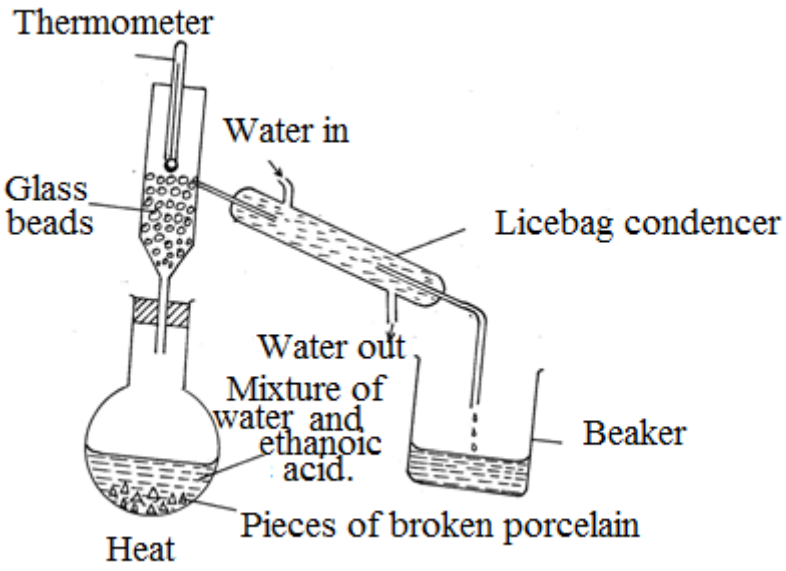
INSTRUCTIONS TO CANDIDATES

1. *Write your name and index no in the spaces provided above.*
2. *Sign and write the date of exam in the spaces provided above.*
3. *Answer all the questions in the spaces provided after each.*
4. *Mathematical tables and silent electronic calculators may be used.*
5. *All working must be clearly shown where necessary.*
6. *This paper consists of 12 printed pages. Candidates should check to ensure that all pages are printed as indicated and that no questions are missing.*
7. *All answers should be written in English.*

FOR EXAMINERS'S USE ONLY

QUESTIONS	MAX.SCORE	CAND.SCORE
1–28	80	

1. The diagram below shows a set up that was used by a student to separate a mixture of water and enthalpys acid. Study it and answer the questions that follow.



a) State one mistake in the set up.

(1mk)

……

……

……

b) State one reason why the round–bottomed flask in preferred to the flat bottomed flask.

(1mk)

……

……

……

c) What is the role of the pieces of broken porcelain?

(1mk)

……

……

……

2. Carbon does not react with dilute acids but reacts with concentrated mineral acids such as concentration rated Sulphuric (VI) acid.

a) Write a balanced chemical equation for the reaction between concentrated sulphuric(VI) acid and Carbon.

(1mk)

……

……

……

b) Explain why the reaction you given in (a) above is a redox reaction.

(2mks)

……

……

……

……

……

……

3. A form 1 student was given a mixture containing pure samples of ammonium chloride, copper (II) oxide and potassium carbonate. Describe how the student can separate the mixture to obtain pure samples of each component.

(3mks)

……

……

……

……

……

……

……

……

……

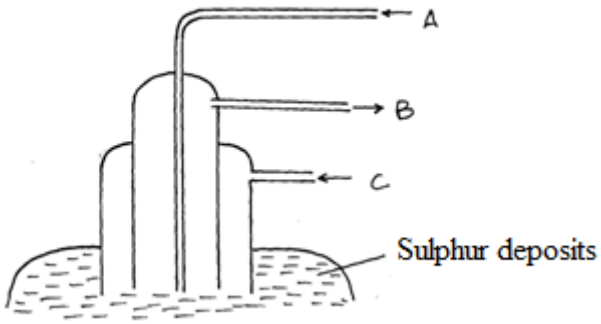
4. During electrolysis of an Solution of a trivalent metal, a current of 2.0 Amperes was passes for 30minutes and 0.336g of the metal were deposited. Calculate the relative atomic mass of the metal. (IF=96,500)

(3mks)

……

……

5. The diagram below shows the set up used to extract Sulphur from the underground deposits. Study it and answer the questions that follow.



a) Name the above process.

(1mk)

……

……

……

b) Name the substance that passes through A and C.

A …….

(1mk)

B …….

(1mk)

6. The combustion of ethyne in oxy-acetylene torches can be represented by the following equation.

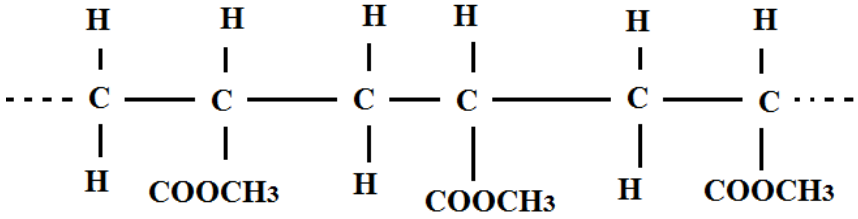
$2H - C \equiv C - H_{(g)} + 5O_{2(g)} \rightarrow 4CO_2 + 2H_2O_{(g)}$

Calculate the ΔH for the combustion of ethyne given the following bond energies.

Bond	Bond energy kJ/mole
C=O	745
C–H	415
C≡C	837
O=O	498
H–O	464

(3mks)

7. The diagram below shows part of a synthetic polymer that is used to make high quality transparent objects. Study it and answer the questions that follow.



a) Give the common name of the polymer.

(1mk)

……

……

……

b) Draw the structure of the monomer from which the polymer is made.

(1mk)

……

……

……

c) Name two products that are made from the polymer.

(2mks)

……

……

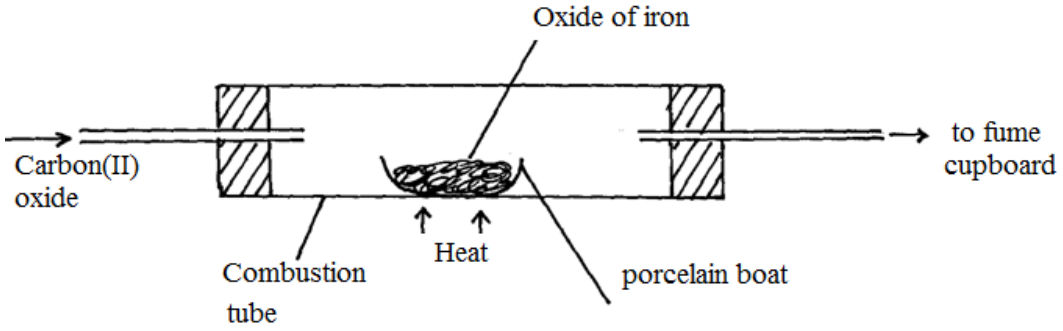
……

……

……

……

8. The diagram below shows an experiment in which Carbon (II) oxide was reacted completely with a heated oxide of iron. Study the diagram and the data shown below it and answer the questions that follow.



Mass of porcelain boat	=	12.20g
Mass of porcelain boat + oxide of iron	=	17.42g
Mass of porcelain boat + residue	=	15.98g

Determine the empirical formula of the oxide. (Fe=56, O=16)

(3mks)

……

……

9. Potassium manganate (VII) oxidizes concentrated hydrochloric acid forming chlorine gas according to the following equation.

$$2KMnO_4(s) + 16HCl(aq) \rightarrow 2KCl(aq) + 2MnCl_2(aq) + 8H_2O(l) + 5Cl_2$$

Calculate the mass of $KMnO_4$ required to form $1.68dm^3$ of chlorine measured at standard temperature and pressure uin the presence of hydrochloric acid. (K=39, Mn=55, O=16, Molar gas volume at S.T.P =$22.4dm^3$)

(4mks)

……

……

……

……

……

10. The table below shows the atomic number of element A to H(not their actual symbols.)

Element	A	B	C	D	E	F	G	H
Atomic number	12	13	14	15	16	17	18	19

a) Which element is the best?

i) Reducing agent

(1mk)

……

……

……

ii) Oxidizing agent

(1mk)

……

……

……

b) Write the formula of the chloride of D.

(1mk)

……

……

……

11. Bombardment of Uranium –235 with flow neutrons results in the following nuclear reactions.

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3{}^{1}_{0}n + \text{energy}$$

a) What type of nuclear reaction is this?

(1mk)

……

……

……

b) Give one commercial use and one military use of these reactions.

i) Commercial use

(1mk)

……

……

……

ii) Military use

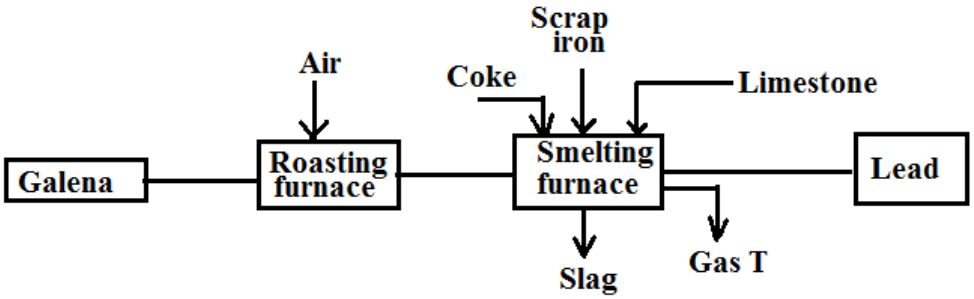
(1mk)

……

……

……

12. The diagram below is a flow chart for the extraction of lead metal. Study it and answer the questions that follow.



a) Write down the formula of the major components of galena.

(1mk)

……

……

……

b) Write the equation for the reaction that takes place in the roasting furnace.

(1mk)

……

……

……

c) Identify gas T.

(1mk)

……

……

……

13. The formation of Sulphur(IV)oxide in the contact process can be represented by the following thermochemical equation.

$$2SO_2(g) + O_2 \rightleftharpoons 2SO_3(g) \quad \Delta H = -197kJ$$

State and explain the effect of increasing the pressure on the yield of Sulphur(VI) oxide. (2mks)

……

……

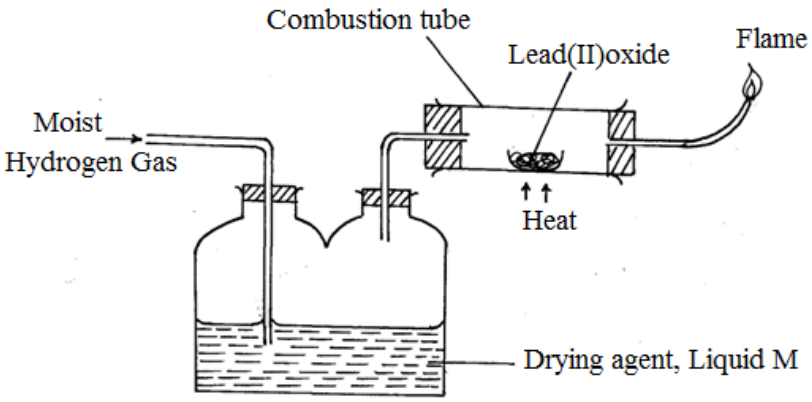
……

……

……

……

14. The set up below was used to investigate some properties of hydrogen gas. Study it and anser the questions that follow:



a) Name a suitable liquid that can serve as a drying agent, liquid M.
(1mk)

……

……

……

b) State the observation made in the combustion tube as the experiment progresses. (1mk)

……

……

……

c) Write a balanced chemical equation for the reaction taking place in the combustion tube.

(1mk)

……

……

……

15. State two factors that accelerate rusting of iron materials.

(2mks)

……

……

……

……

……

……

16. Give the name of each of the following processes that occur when the given salt is exposed tio air.

a) Anhydrous copper (II) sulphate becomes wet and changes colour from white to blue.

(1mk)

……

……

……

b) Sodium carbonate – 10 water changes from transparent crystals to a white powder. (1mk)

……

……

……

17. One of the main uses of sulphuric (VI) acid in the manufacture of ammonium sulphate fertilizer.

a) Give an equation for the reaction involved in the formation of ammonium sulpahate.

(1mk)

……

……

……

b) Calculate the mass in tones of ammonium sulphate that would be formed if 24.5 tonnes sulphuric (VI) acid were reacted completely with ammonia (N=14, S=32, H=1) (2mks)

……

……

……

18. Hot water pipes used to convey hard water burst more often than those used to convey soft water. Give two possible reasons for this.

(2mks)

……

……

……

……

……

19. Given below are standard electrode potentials of some elements. Study them and answer the questions that follow.

$A^{+}(aq)$	+	e^{-}	→	A(s)	+0.80V
$B^{2+}(aq)$	+	2e	→	B(s)	–0.44V
$2C^{+}(aq)$	+	$2e^{-}$	→	$C_2(g)$	0.00V
$D^{+}(aq)$	+	e^{-}	→	D (s)	–2.71V
E_2 (S)	+	2e	→	$2E^{-}$ (aq)	+–2.87V

a) Which is the strongest oxidizing agent.

(1mk)

……

……

……

b) Calculate e.m.f of the cell constructed using element A and D.

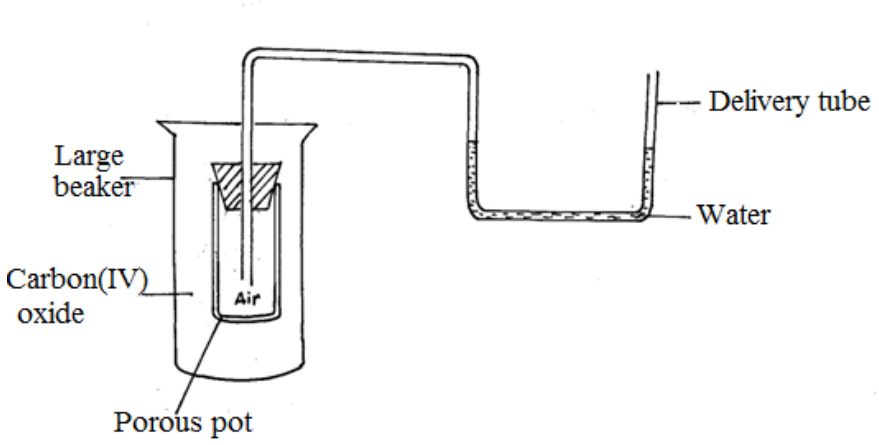
(2mks)

……

……

……

20. The set up shown below was used to compare the rates of diffusion of different gases. Study it and answer the questions that follow.



State and explain the observation that would be made in the delivery tube after the experiment has run for some time.

(3mks)

……

……

……

……

……

……

……

……

……

21. A sample of oxygen gas occupies a volume of $35cm^3$ at 20ºC. What will be the volume of the same sample at 75ºC if the pressure remains unchanged?

(2mks)

……

……

……

……

22. Name the catalyst used in the following processes;

a) Large scale manufacture of ammonia gas in the Haber process.

(1mk)

……

……

……

b) Large scale manufacture of concentrated Sulphuric (Vi) acid in the contact process.(1mk)

……

……

……

c) Laboratory preparation of oxygen gas using hydrogen peroxide.

(1mk)

……

……

……

23. State the observation made when chlorine gas is bubbled tghourg a potassium iodide solution.

(2mks)

……

……

……

……

……

……

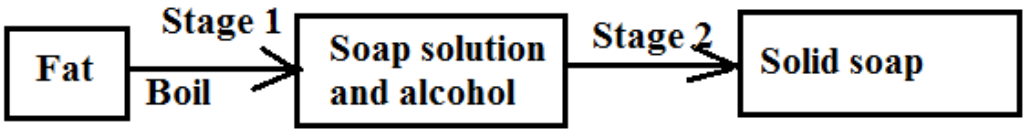
24. Change in temperature affects the equilibrium state of a reversible reaction. State two other factors that affect a chemical equilibrium.
(2mks)

……
……
……
……
……
……

25. Copper readily forms useful alloys with other metals. Name any three alloys of copper.(3mks)

……
……
……
……
……
……
……
……
……

26. The scheme below is a summary of the stages involved in the manufacture of soap.



a) In what class of organic compounds do facts belong.

(1mk)

……

……

……

b) Give the name of the process involved in stage 1 and a chemical substance that is added.

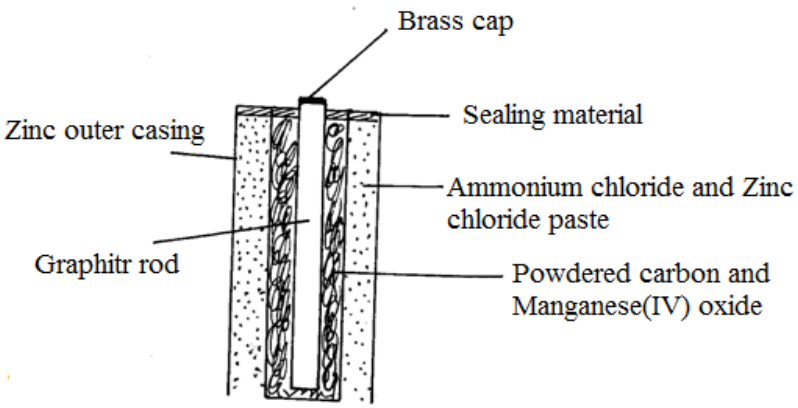
i) Name of the process ……..

(1mk)

ii) Chemical substance ……..

(1mk)

27. The diagram below shows a longitudinal section of a dry cell. Study it and answer the questions that follow.



a) Give two roles of the Zinc outer casing.

(2mks)

……

……

……

……

……

……

b) Write down the equation for the oxidation reaction.

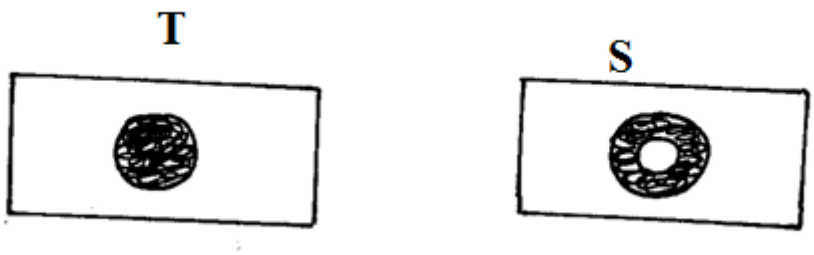
(1mk)

……

……

……

28. The diagram below shows two pieces of white card paper, T and S that had been placed over a non–luminous Bunsen burner flame at different level. The dark colour indicates charming of the paper.



Explain the observation in T.

(3mks)

……

……

……

……

……

……

……

……

……

233/2
CHEMISTRY
(THEORY)
PAPER 2
JULY/AUGUST–2016
TIME: 2 HOURS

SAMETA SUB-COUNTY JOINT EVALUATION TEST–2016

Kenya Certificate of Secondary Education (K.C.S.E)
233/2
CHEMISTRY
(THEORY)
PAPER 2
JULY/AUGUST–2016
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. *Write your name and index no in the spaces provided above.*
2. *Sign and write the date of exam in the spaces provided above.*
3. *Answer all the questions in the spaces provided after each.*
4. *Mathematical tables and silent electronic calculators may be used.*
5. *All working must be clearly shown where necessary.*
6. *This paper consists of 12 printed pages. Candidates should check to ensure that all pages are printed as indicated and that no questions are missing.*
7. *All answers should be written in English.*

FOR EXAMINERS'S USE ONLY

QUESTIONS	MAX.SCORE	CAND.SCORE
1	13	
2	11	
3	11	
4	09	
5	12	
6	11	
7	13	
TOTAL	**80**	

1. The grid below represents part of a periodic table study and answers the questions that follow. The letters do not represent the actual symbols of the elements.

V									A
B	F			G	Z	N	E		
W	J		T	L			H	C	
D	K						M		
Y									

a) What name is given to the family of the;

i) Elements to which E, H and M belong?

(1mk)

……

……

……

ii) Elements to which F, J and K belong?

(1mk)

……

……

……

b) Write the chemical formula of the;

i) Sulphate of T.

(1mk)

……

……

……

ii) Nitrate of J.

(1mk)

……

……

……

c) Name the type of bond and structure formed between in a compound of;

(1mk)

i) D and N.

Bond……..

Structure……..

ii) T and H.
(1mk)

Bond:
……

Structure:
……

d) i) Ionic radius of element E is bigger than its atomic radius. Explain. (2mks)

……

……

……

……

ii) The oxide of G has a lower melting point than the oxide of L. Explain. (2mks)

……

……

……

……

……

……

iii) Explain in terms of structure and bonding the following observations. There is an increase in melting and boiling point from W to T. (2mks)

……

……

……

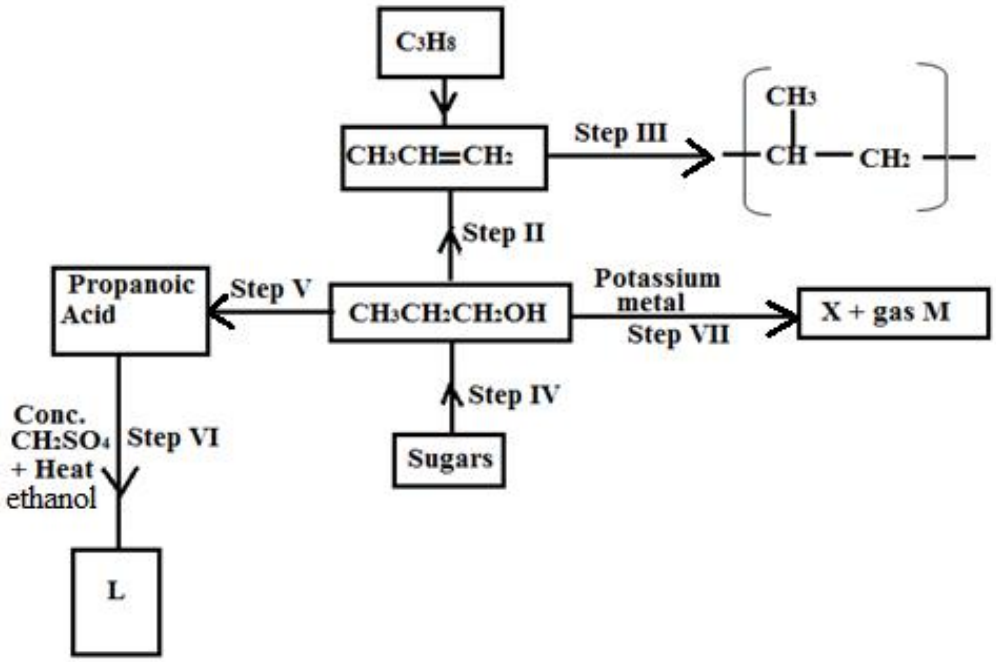
……

……

……

e) Using dots (●) and crosses diagram show bonding in ZV_4^+. (1mk)

2. Study the flow chart below and answer the questions that follow.



a) i) Name the type of reaction in the following steps.

I step III

(½mk)

……

……

……

II step IV

(½mk)

……

……

……

i) Name the important reagent and conditions in.

STEP I – Reagent……

(½mk)

Condition……

(½mk)

STEP II – Reagent……

(½mk)

Condition……

(½mk)

b) i) Write a balanced equation for the reaction taking place in STEP VII.

(1mk)

……

……

……

ii) Give the systematic name of substance L.
(1mk)

……

……

……

c) Describe chemical text used to differentiate between C_3H_8 and C_3H_6.
(2mks)

……

……

……

……

……

……

d) i) If the reactive molecular mass of compound formed in STEP III is 42,000. Determine the value n in the compound.(C=12.0, H=1.0)
(2mks)

……

……

……

……

……

……

ii) State one disadvantage of continued use of items made from the compound formed in Step III.
(1mk)

……

……

……

3. a) Use the standard electrode potentials for element A, B, C and D given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

Standard electrode potential					E^{θ}(volts)
A^{+2}	+	2e	$\rightleftharpoons$	A(s)	–2.90
B^{+2}	+	2e	$\rightleftharpoons$	B(s)	–2.38
$C^{+}(aq)$	+	e	$\rightleftharpoons$	$\frac{1}{2}C_2(g)$	0.00
$D^{+2}(aq)$	+	2e	$\rightleftharpoons$	D (s)	+0.34
$\frac{1}{2}E_2(g)$	+	e	$\rightleftharpoons$	$E^{-}(aq)$	+2.87

i) Which element is likely to be hydrogen? Give a reason for your answers. (2mks)

……

……

……

ii) What is E^{θ} value of the strongest reducing agent. (1mk)\

……

……

……

iii) In the space provided, draw a labeled diagram of the electrochemical cell that would be obtained when half-cell of element B and D are combined. (3mks)

iv) Calculate the E^{θ} of the electrochemical cell constructed in (iii) above. (1mk)

……

……

……

b) During the electrolysis of aqueous copper (ii) sulphate using copper electrodes, a current of 0.2 A was passed through the cell for 5 hours.

i) Write an ionic equation for the reaction that took place at the anode. (1mk)

……

……

……

ii) Determine the in mass of the anode which occurred as a result of the electrolysis process. (Cu=63.5 IF=96,500C) (3mks)

……

……

……

……

……

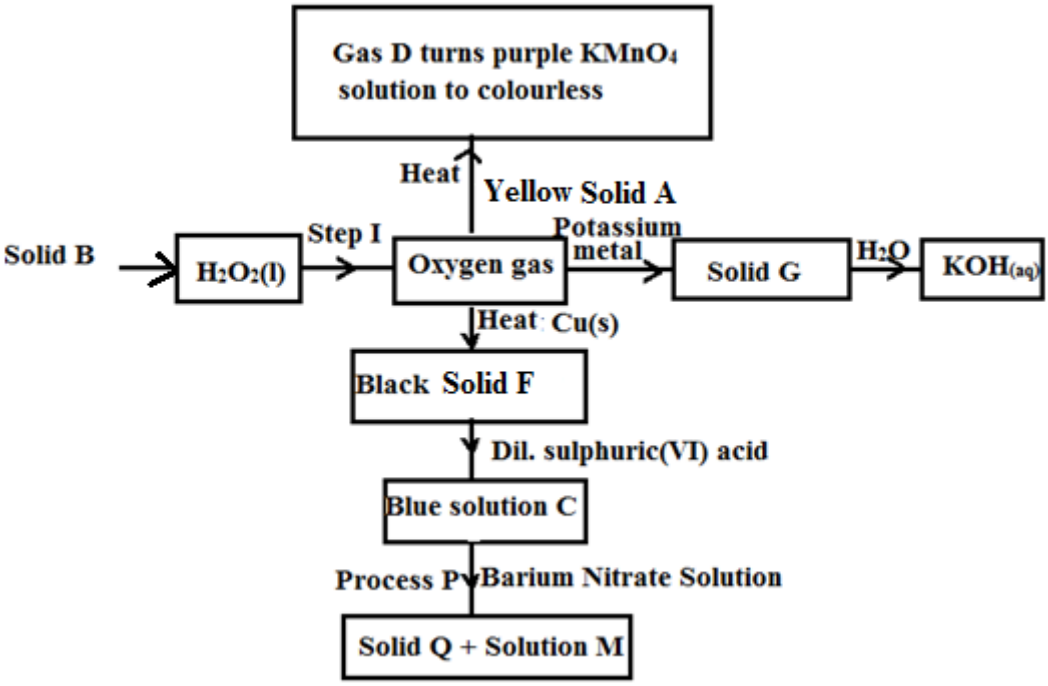
……

……

……

……

4. The flow chart below represents preparation of oxygen gas. Study it and answer the questions that follow.



a) Identify the following substances. (2mks)

i) Solid A.

……

……

……

ii) Gas D

……

……

……

iii) Solid Q.

……

……

……

iv) Solution M.

……

……

……

b) Write a chemical equation for the:

i) Formation of solid G. (1mk)

……

……

……

II) Gas D.

(1mk)

……

……

……

iii) Blue solution

(1mk)

……

……

……

iv) In Step I.

(1mk)

……

……

……

c) State the confirmatory that for oxygen gas.

(1mk)

……

……

……

d) Write the ionic equation for the reaction taking place in process P.

(1mk)

……

……

……

e) State one use of oxygen.

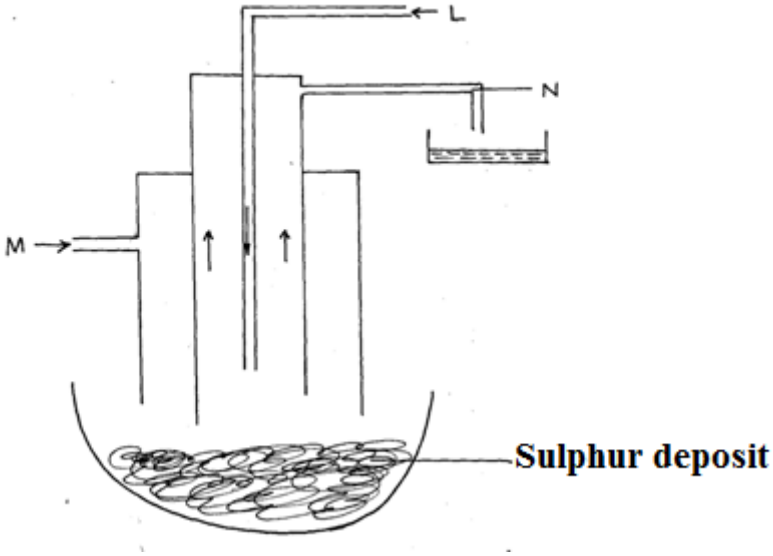
(1mk)

……

……

……

5. a) The diagram below represents the extraction of sulphur by the Frasch process. Study it and answer the questions that follow.


L
N
M
Sulphur deposit

i) Name the substances that pass through pipes:

L ……..

M ……..

N …….

ii) What is the purpose of substance:

I. M

(1mk)

……

……

……

II. L

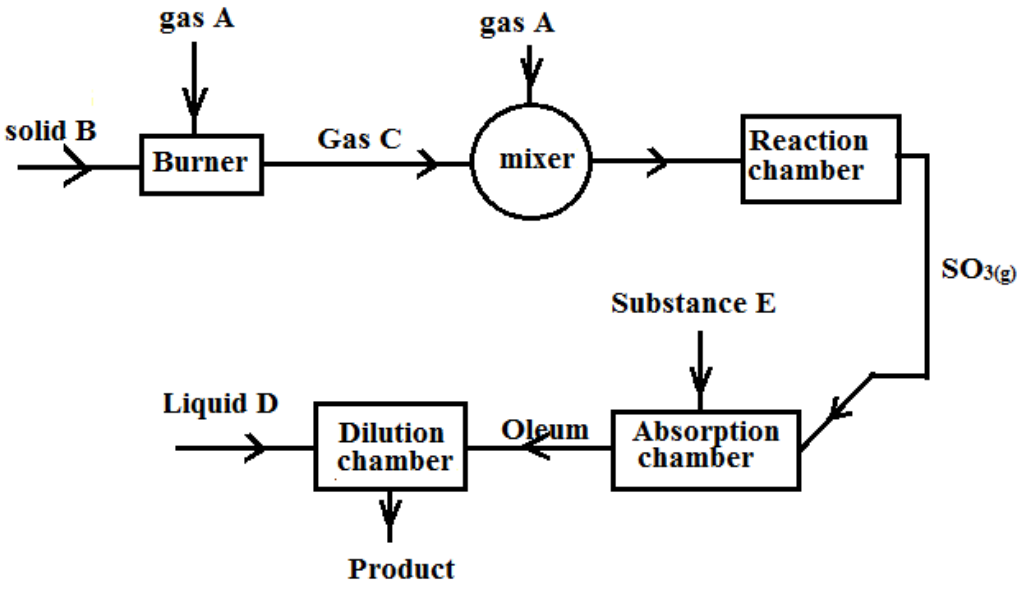
(1mk)

……

……

……

b) The chart below shows how Sulphur (VI) acid is produced on a large scale by the contact process.



i) Identify

I. Gas A

(1mk)

……

……

……

II. Solid B.

(1mk)

……

……

……III. Gas C.

(1mk)

……

……

IV. Substance E.

(1mk)

……

……

ii) Name the catalyst used in the reaction chamber.

(1mk)

……

……

iii) Write a chemical equation for the reaction taking place in the dilution chamber.

(1mk)

……

……

c) State one industrial use of Sulphuric (VI) acid.

(1mk)

……

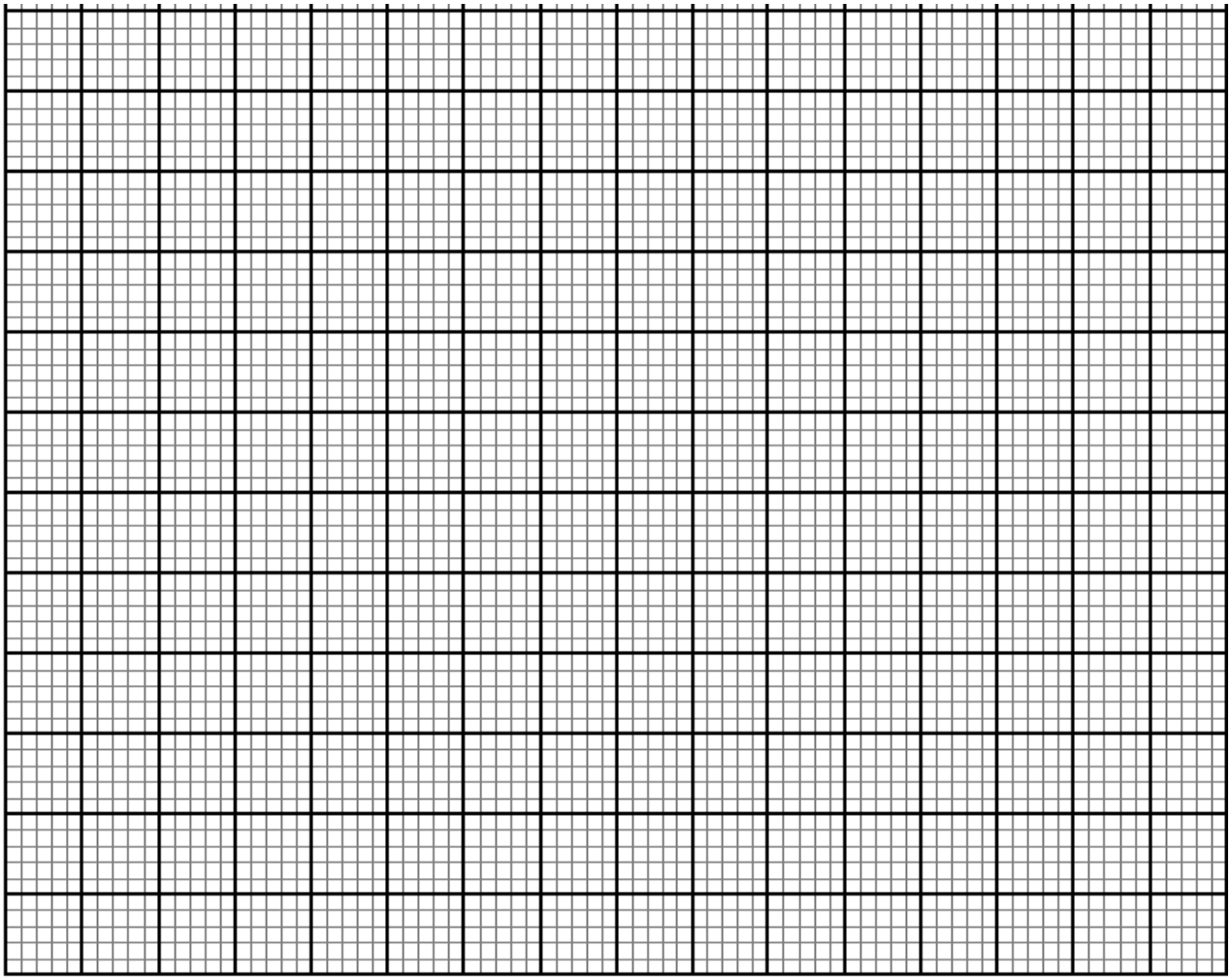
……

6. a) Solubility of salt X and Y were determined at different temperatures as shown in the following data.

Temperature (ºC)		0	20	40	60	80	100
Solubility of 100g of water	X	12	30	75	125	185	250
	Y	15	20	35	45	65	80

i) On the grid provided, plot a graph of solubility (vertical axis) against temperature.

(4mks)



ii) From the graph determine the solubility of each at 50ºC.

X ……..

(1mk)

Y ……

(1mk)

iii) At what temperature was the solubility of both salts equal.

(1mk)

……

……

……

iv) Saturated solution of salt X at 70ºC was cooled to 20ºC. What mass of the crystal were deposited.

(1mk)

……

……

……

b) i) What is permanent hardness of water?

(1mk)

……

……

……

ii) State two chemical substance that can be used to remove permanent hardness in water.
(1mk)

……

……

……

c) Explain why aluminium sulphate solution is acidic.
(1mk)

……

……

……

7. a) Use the bond energies given below to calculate the enthalpy change for the reaction.
(2mks)

$C_2H_{6(g)} + Br_{2(g)} \rightarrow C_2H_5Br_{(g)} + HBr_{(g)}$

Bond	C–H	C–Br	Br–Br	H–Br	C–C
Bond energy (kJ)	413	280	193	365	343

b) Hydrogen peroxide decomposes according to the equation below.

$H_2O_{(l)} \rightarrow H_2O_{(l)} + \frac{1}{2}O_g \quad \Delta H = -98kJ/mol$

If 6.8g of hydrogen peroxide contained $75cm^3$ of solution in water were decomposed, determine the rise in temperature due to the reaction. (Specific heat capacity of water = $4.2g^{-}k^{-}$,density of water = $1g/cm^3$. (O =16, H =1) (2mks)

……

……

……

……

……

……

c) On the space provided below sketch the cooling curve that would be obtained when a boiling tube containing water at 80ºC is immersed in a freezing mixture maintained at –10ºC.
(3mks)

d) Butane C_4H_{10} cannot be prepared directly from its elements but its standard heat of formation DHf^{θ} can be obtained directly. The following are some heats of combustion.

ΔH_C^{θ} Carbon (S) = – 393kJ/mol

ΔH_C^{θ} $(H_2)_{(g)}$ = –286 kJ/mol

ΔH_C^{θ} (C_4H_{10}) = –2877kJ/mol

i) Draw an energy cycle diagram linking the heat of formation of butane with its heat of combustion and heat of combustion of its constituent elements. (2mks)

……

……

……

……

……

……

ii) Calculate the heat of formation of butane ΔH_f^{θ} (C_4H_{10}) (2mks)

……

……

……

……

……

……

e) Given that the lattice energy of potassium chloride is +690Kj/mol and hydration enthalpies of K^+ and Cl^- are –322kJ/mol and – 364kJ/mol respectively. Calculate the enthalpy of solution of potassium chloride. (2mks)

……

……

……

……

……

……

233/1
CHEMISTRY
Paper 1
THEORY
July 2016
2 Hours

SUKEMO JOINT EXAMINATION TEST

Kenya Certificate of Secondary Education
CHEMISTRY
Paper 1
THEORY

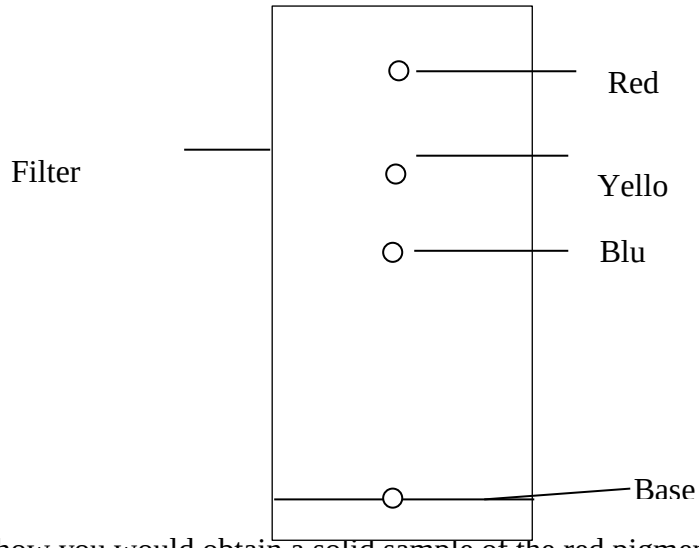
Instruction to Candidates

- Write your name, index number class and admission number in the spaces provided
- Sign and write the date of examination in the spaces provided.
- Answer **all** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working **must** be clearly shown where necessary.
- This paper consist of 17 printed pages
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and no questions are missing.
- Candidates should answer the questions in English.

For Examiner's Use Only

Questions	Maximum Score	Candidates Score
1-29	80	

1. The chromatogram below shows the constituents of ink in sample M using methylated spirit as the solvent



(a) Describe how you would obtain a solid sample of the red pigment from the chromatogram above.

(2marks)

……

……

……

……

……

(b) State one property of the red dye.

(1mark)

……

……

2. State and explain the observation that would be made when a gas jar of sulphur (IV) oxide is inverted over a gas jar of hydrogen sulphide.

(2marks)

……

……

……

……

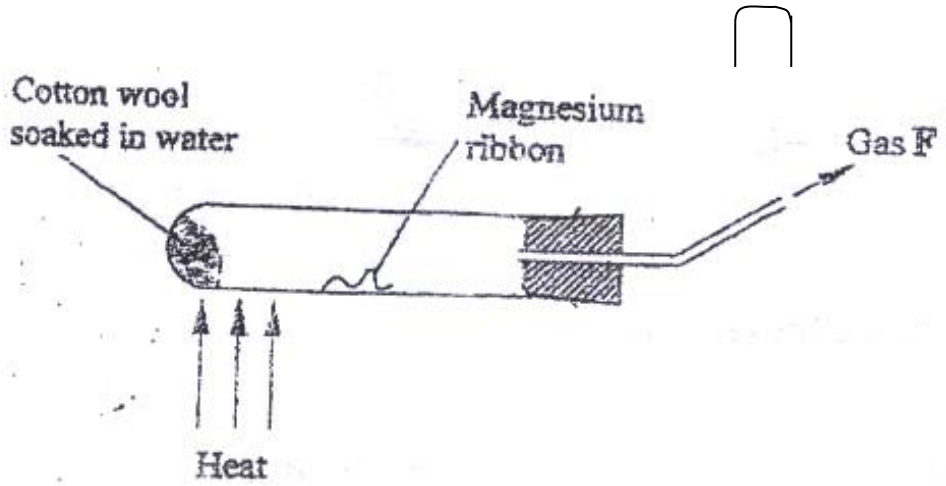
……

……

……

……

3. When magnesium is reacted with steam, it reacts rapidly forming a white solid and hydrogen gas.



(a) What property of hydrogen gas makes it to be collected as shown above. (1mark)

……..…

…..

(b) How would you show that the gas collected is hydrogen gas?

(1mark)

……..…

….

(c) When copper turnings were used instead of magnesium ribbon, hydrogen gas was not produced. Explain.

(1mark)

……

……

……

……

4. Draw **three** and **name** the apparatus used in the laboratory for measuring accurate volume of liquids.

(3marks)

……

……

……

5. When a hydrated sample of calcium sulphate $CaSO_4.X\ H_2O$ was heated until all the water was lost, the following data was recorded.

Mass of crucible =30.296g

Mass of crucible + hydrated salt =33.111g

Mass of crucible + anhydrous salt =32.781g

Determine the empirical formula of the hydrated salt.

(RFM $CaSO_4$ =136 , H_2O =18)

(3marks)

……

……

……

……

……

……

……

……

……

……

6. Starting with Zinc oxide describe briefly how a pure sample of zinc carbonate can be prepared in the laboratory.

(3marks)

……

……

……

……

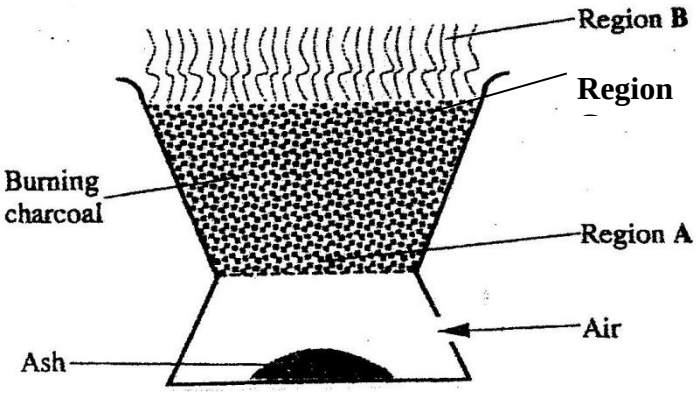
……

……

……

……

7. The diagram below represents a charcoal burner. Study it and answer the questions that follow



Write equations for the reactions taking place at ;

(3marks)

A……..……..…

B…….……..

C……...

8. In qualitative analysis, identification of sulphate ions can be represented by the equation below:

Sulphate ions + barium ions + hydrochloric acid ⟶ white precipitate

(a) Give the name of the white precipitate.

(1mark)

……..….

…….

(b) Explain why dilute hydrochloric acid is used in sulphate ion test

(1 mark)

……

……

…….....

.....

9. The table below gives the atomic and ionic radii of elements A, B and C. Study it and answer the questions that follow.

Element	Atomic radius (nm)	Ionic radius (nm)
A	0.133	0.078
B	0.090	0.120
C	0.157	0.098

(a)Which elements are metals? Explain.

(1mark)

……

……

……

……

……

(b) The metals in (a) above belong to the same group of the periodic table. Which one is the most reactive? Explain.

(1mark)

.....

.....

.....

.....

10. Chlorine gas is bubbled into an aqueous solution of potassium iodide

(a) State the observation that would be made.

(1mark)

……

……

……...

……

……

(b) Write a balanced chemical equation for the reaction that occurred. (1 mark)

……

……

11. Below is part of a nuclear equation

$$^{23}_{92}U \xrightarrow{\beta} {}^{a}_{b}S$$

(i) Determine the values of **a** and **b**

a……

(½mark)

b……

(½mark)

(ii) An element **Q** has a half- life of 12 years .What fraction of **Q** will remain after 36year

(2marks)

……

……

……

……

……

……

12. A certain chemical reaction takes place twice as quickly if their temperature is raised by 10°C. If a particular reaction takes 32 minutes at 20°C, how long does it take if the temperature is raised to 50°C. Explain why the reaction is faster.

(3marks)

……

……

……

……

……

……

……

……

……

13. 100cm^3 of a mixture of ethane and excess oxygen were ignited. The final volume was cooled and bubbled through aqueous sodium hydroxide. The volume reduced by 32 cm ^{3}.

Calculate:-

(a) Composition of the original mixture.

(2marks)

……

……

……

……

……

……

……

……

(b) Volume of the excess oxygen.

(1mark)

.....

.....

.....

14. Elements **A** and **B** have atomic numbers **6** and **8** respectively.

(a) Give the formula of the compound formed when **A** and **B** combine.

(1mark)

……

…….....

.....…

(b)Use dots (**.**) and crosses (**x**) to show bonding in the compound formed in (a) above.

(1mark)

……

……

……

……...

……

……

(c) What type of structure will be formed when **A** and **B** combine.

(1mark)

……

…..

15. (a) State Le- Chateliar's principle

(1mark)

……

……

……

……

……

(b) The equilibrium reaction of phenolphthalein indicator in water may be represented as follows

$$\underset{\text{Colourless}}{Hph_{(aq)}} + H_2O \rightleftharpoons H_3O^+_{(aq)} + \underset{\text{Red}}{Ph^-_{(aq)}}$$

State and explain the observations that would be made when a few drops of nitric(V) acid is

added to the equilibrium mixture

(2marks)

……

……

……

……

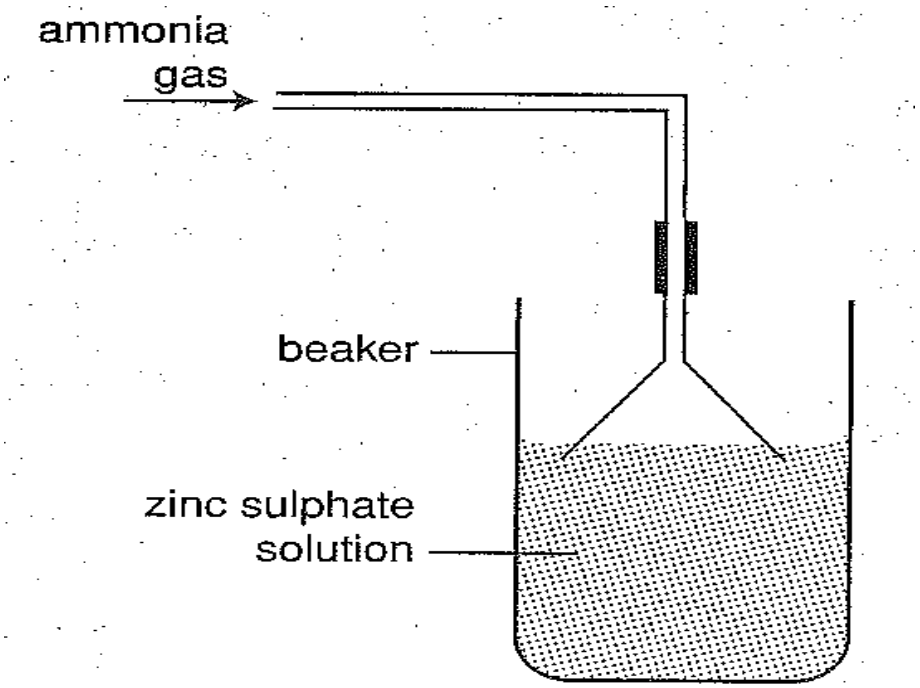
……

16. 1.0 g of an alloy of aluminium and copper was reacted with excess dilute hydrochloric acid. 840 cm^3 of hydrogen gas was produced at s. t. p. Calculate the percentage of aluminium in the alloy. (Al=27, Molar Gas Volume is 22400 cm^3).

(3marks)

……

17. A student prepared ammonia gas and allowed it to pass into a solution of zinc sulphate as shown in the set- up below.



(a) State and explain the observations that were made in the beaker after sometime.
(2marks)

……

……

……

……

……

……

……

……

……

(b) Write the formula of the complex ion formed in the beaker.
(1mark)

……

……

……

……

18. A solution of ammonia gas in water turns red litmus paper blue while a solution of ammonia in methylbenzene does not. Explain.

(2marks)

……

……

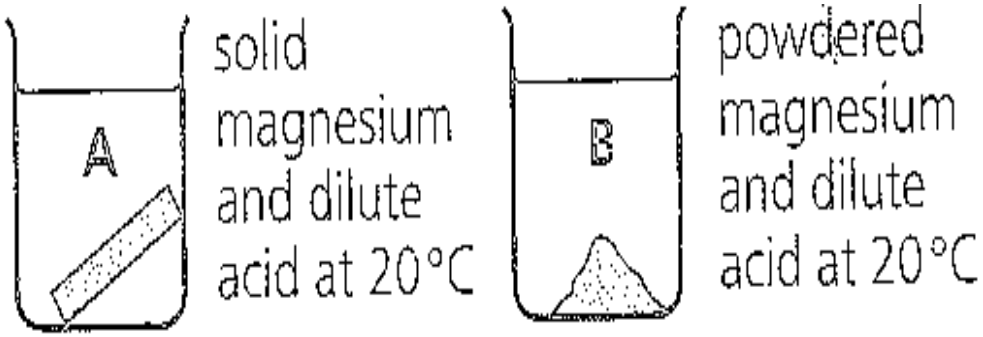
……

……

……

……

19. A student set-up the apparatus below to study how magnesium reacts with dilute hydrochloric acid.



The same mass of magnesium and the same volume of hydrochloric acid was used in each experiment. In which set-up did the reaction take a short time? Explain

(2marks)

……

……

……

20. (a) Determine the oxidation number of phosphorous in the compound H_3PO_4.

(1mark)

……

……

……

……

……

……

(b) Study the following equation.

$$Mg\ (s) + 2H_2O\ (l) \longrightarrow Mg(OH)_2\ (aq) + H_2\ (g)$$

Which species has undergone oxidation? Explain (1 mark)

……

……

……

(c) Use the cell representation below to answer the question that follow

$$Cr_{(s)} / Cr^{3+}{}_{(aq)} // Fe^{2+}{}_{(aq)} / Fe_{(s)}$$

Write the equat

(1mark)

……

….

21.(i) A radioactive substance emits three different particles. Name the particle with highest mass

(1mark)

……

……

(ii) Find the values of Z_1 and Z_2 in the nuclear equation below

(1mark)

$$^{Z_1}_{92}u + {}^{1}_{o}n \longrightarrow {}^{94}_{38}Sr + {}^{140}_{z_2}Xe + 2\,{}^{1}_{0}n$$

Z_1

……

……

Z_2

……

……

(iii) What type of nuclear reaction is represented in b(i) above

(1mark)

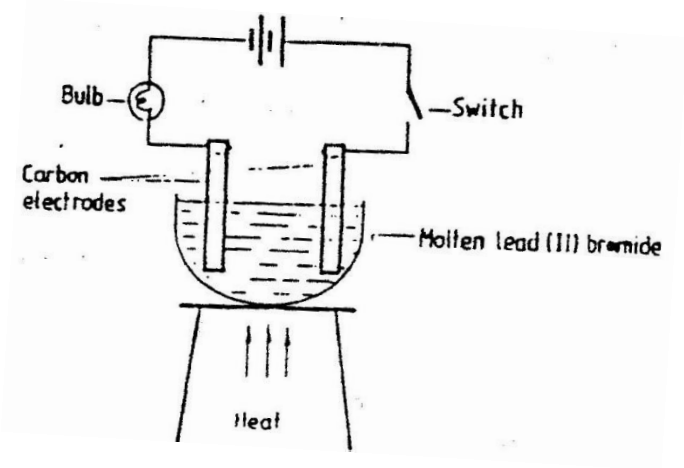
……
…

(iv) Give one harmful effect of isotopes

(1mark)

……....
....

22. Study the set-up below and answer the questions that follow



State and explain the observations that would be made when the circuit is completed

(3marks)

……
……
……
……
……
……**23.** (i) Define Solubility

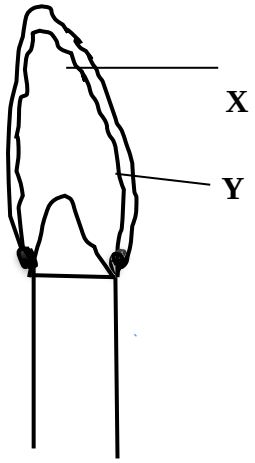
(1mark)

……
……
……
……

(ii) The solubility of sodium nitrate at 90^{o}C is 50g in 100g of water and at 15^{o}C its solubility is 25g in 100g of water.120g of a saturated solution of sodium nitrate is cooled from 90^{o}C to 15^{o}C.Calculate the mass of sodium nitrate crystals that would be formed at 15^{o}C.

(2marks)

24. The diagram below represents a type of flame produced by a Bunsen burner



(a) Name the type of flame above

(1mk)

……

…

(b) Give a reason for your answer

(1mark)

……..…

…

(c) State the colour of the parts of the flame labeled **X** and **Y**

(1mark)

……

……

25. Give the systematic names of the following compounds

(a) $CH_3CH_2CH_2CH_2OH$

(1mark)

…….

…..

(b)$CH_3CH_2CH_3$

(1mark)

……..…

….

(c)

(1mark) $CH_3CH_2C(=O)OCH_2CH_3$

26. Use the data below to calculate the enthalpy change for the reaction below.

(3mark $CH_{4g)} + 2\ O_{2\ (g)} \longrightarrow 2\ CO_{2\ (g)} + 2\ H_2O_{(l)}$

Bonds	**Energy Kj**
C-H	414
O=O	497
C=O	803
H-O	464

……

……

……

……

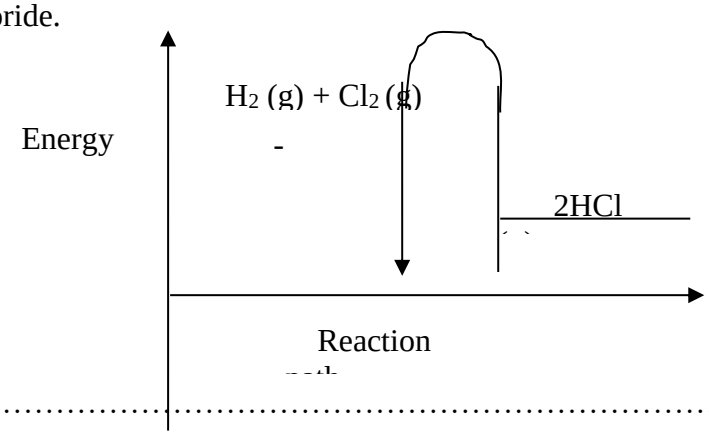
……

……

……

……

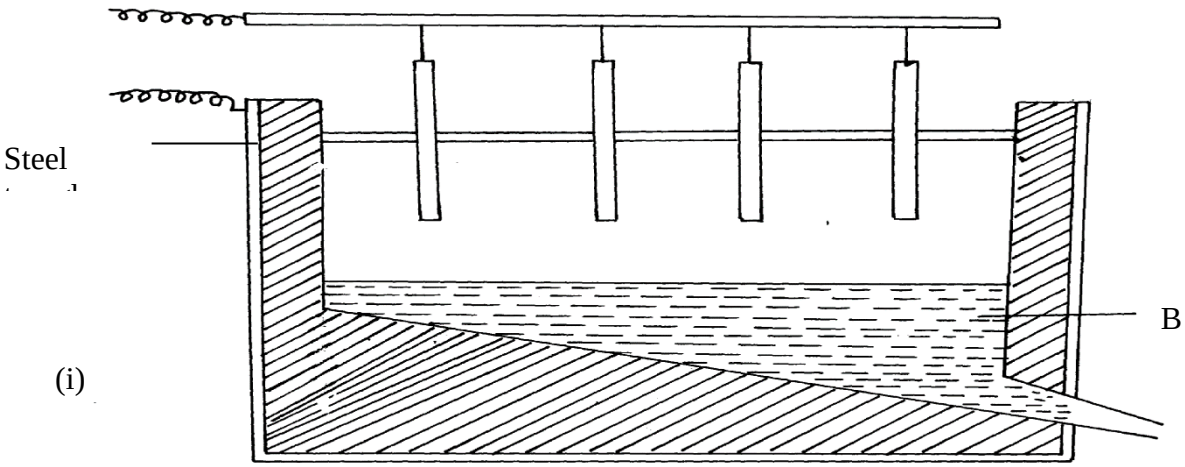
27. Use the energy profile below to calculate the molar enthalpy of formation of hydrogen chloride. (1mark)



……

……

28. The diagram below represents the second stage in extraction of aluminium metal



(i)

……..

….

(ii) How is the ore (bauxite) concentrated before it is electrolyzed

(1mark)

……

……

……

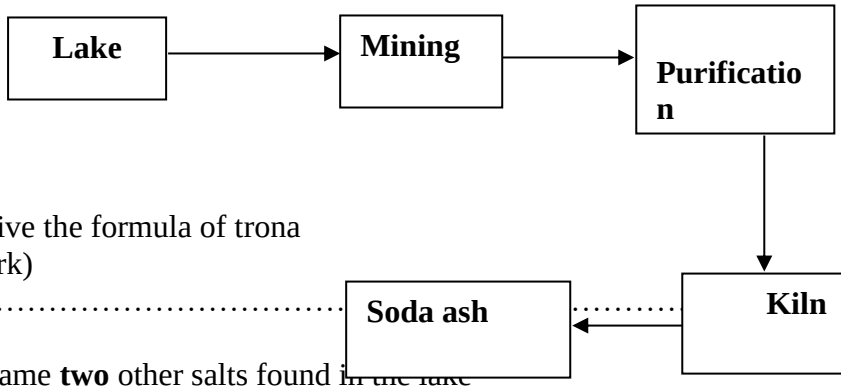
(iii) What is the purpose of dissolving electrolyte B in molten cryolite (Na_3AlF_6)

(1mark)

……

……

29. The flow chart below shows the soda ash manufacturing process at Lake Magadi. Study it and answer the questions that follow.



(a) Give the formula of trona
(1mark)
……
……

(b) Name **two** other salts found in the lake
(1mark)
……
……
……
……

(c) State **one** use of sodium hydrogen carbonate
(1mark)
……
……

233/2
CHEMISTRY
PAPER 2
Theory
JULY 2016
2 HOURS

SUKEMO JOINT EXAMINATION TEST – 2016

Kenya Certificate of Secondary Education
Chemistry paper 2

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in spaces provided above.
- Sing and write the date of examination in the spaced provided above.
- Answer all the questions in the spaces provided.
- KNEC Mathematical tables and silent electronic calculators may be used.
- All working MUST be clearly shown where necessary.
- Candidates should answer the questions in English.

For examiners use only

Question	Maximum score	Candidate's score
1	13	
2	09	
3	12	
4	13	
5	13	
6	09	
7	11	
Total score	80	

1. Use the table below to answer the questions below

A				E			H	
	C		D		G			K
B				F			J	

i) Giving reasons, select the element which is

I) Most reactive nonmetal (2 marks)

……

……

……

II) Most reactive metal (2 marks)

……

……

……

ii) How does reactivity of **A** compare with that of B. Explain (1mark)

……

……

…

iii) Explain why the atomic radius of **G** is smaller than that of C (1 mark)

……

……

……

iv) An element **W** forms ion $\mathbf{W^2}$ if W is in period 3, indicate the position of **W** on the grid (1 mark)

……

……

v) Write the formula of the compound formed when **C** reacts with **H** (1 mark)

……

……

b) Study the information in the table below and answer the questions that follow

Substance	M.P (°C)	B.P (°C)	Electrical conductivity		Solubility in water
			In solid state	In molten state	
P	714	1418	Does not conduct	Conducts	Very soluble
Q	-95	56	Conducts	Conducts	Insoluble
R	1083	2580	Does not conduct	Conducts	Insoluble
S	-101	-34	Conducts	Does not conduct	Very soluble
U	-23	77	Does not conduct	Does not conduct	Soluble
V	-219	-183	Does not conduct	Does not conduct	Insoluble
W	1560	2600	Does not conduct	Does not conduct	insoluble

i) Name two substances which are gaseous at room temperature (1 mark)

……

……

……

ii) Select the substance that could be dissolved in water and be separated from the solution by fractional distillation (1 mark)

……

……

……

iii) Which substance could be an electrolyte? (1 mark)

……

……

iv) Element U has low M.P and B.P whereas W has high M.P and B.P. Explain (2 marks)

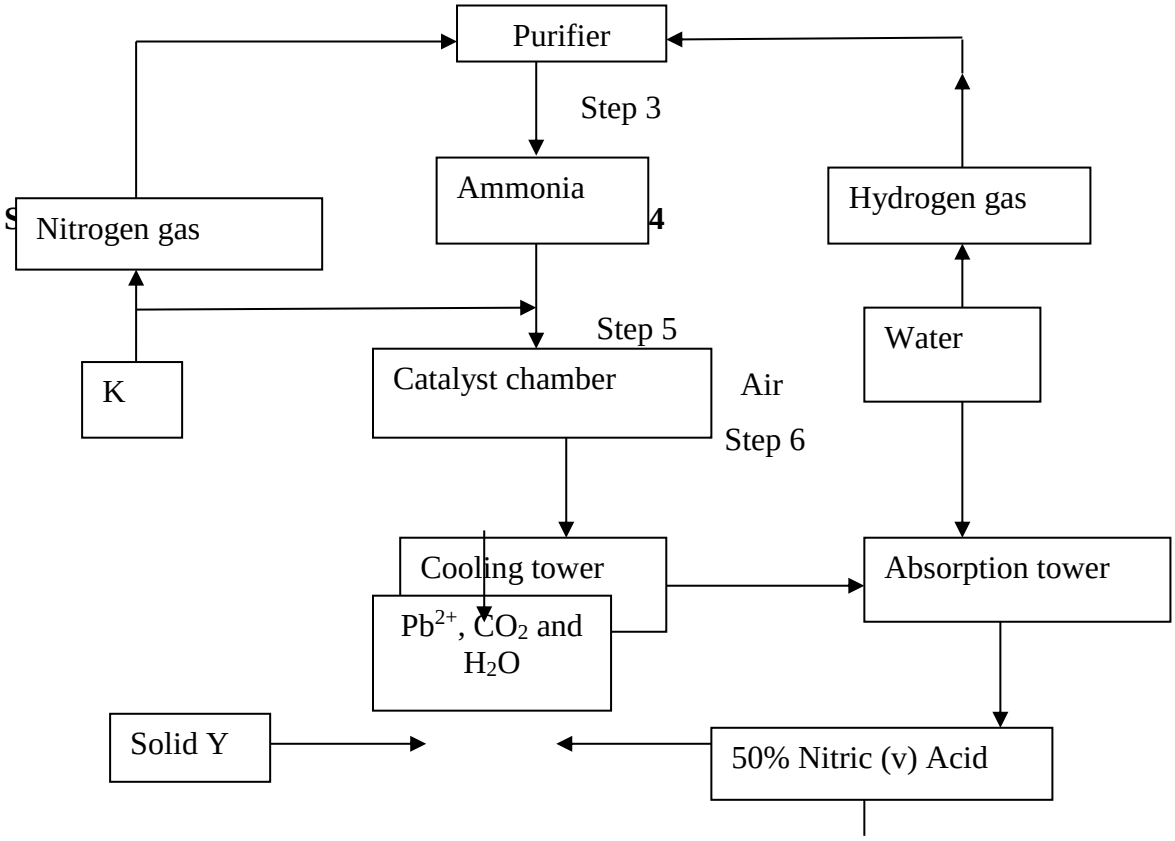
……

……

……

……

2. The flow chart below shows the industrial preparation of nitric V. acid. Study it and answer the questions that follow:



a) Identify substance

i) K (½ mark)

……

…

ii) Y (½ mark)

……

……

b) Name two impurities that are removed in the purifier (1 mark)

……

……

……

……

c) The nitric (IV) acid produced is about 50% concentrated. Name the process that can be used to increase the concentration (1 mark)

……

……

d) Name the catalyst used in

i) Step 3 (½ marks)

……

……

ii) Catalytic chamber (½ mark)

……

……

e) Write down the equation for the reaction taking place in the cooling tower (1 mark)

……

…

f) Excess air is used in step 6. Explain (1 mark)

……

……

g) State and explain the observations made when concentration nitric v acid is heated with sulphur in open (2 marks)

j) State one industrial use of nitric v acid (1mk)

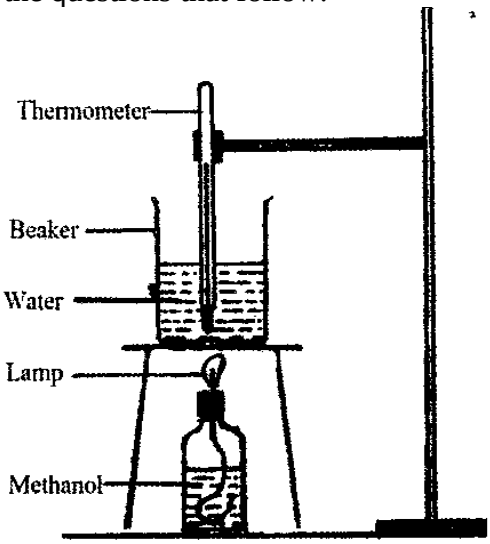
……

……

3. (a) In an experiment to determine the heat of combustion of methanol, CH_3oH a student used

a set up like the one shown in the diagram below. Study the set-up and the data below it

and answer the questions that follow.



Volume of water	=	$500cm^3$
Final temperature of water	=	27.0°c
Initial mass of lamp + methanol	=	20.0°C
Final mass of lamp+ methanol	=	22.1g
Initial mass of lamp + methanol	=	22.98g
Density of water	=	$1.0g/cm^3$

i) Write an equation for the combustion of methanol (1 mark)

……

……

ii) Calculate:

I) The number of moles of methanol used in the experiment (C = 12, O = 16, H = 1) (1 mark)

……

……

II) The heat change in the experiment (1 mark)

……

……

……

……

……

III) The heat of combustion per molar of methanol (1 mark)

……

……

……

……

……

(IV) Explain why the value of the molar heat of combustion for methanol obtained in this experiment is different from the theoretical value (1 mark)

……

……

……

(iii) Differentiate between lattice energy and hydralion energy (2 marks)

……

……

……

……

……

(iv) Use the values given in the table below to answer the questions that follow

Low	Enthalpy of hydralion
Mg^{2+}	- 1891
Cl^{-}	- 384

Given that lattice energy of $MgCl_2$ is -2489 $KJmol^{-1}$

a) Draw an energy cycle diagram for dissolving magnesium in water (2 marks)

b) Use your energy cycle diagram above to calculate the enthalpy of magnesium chloride in water (2 marks)

……

……

……

……

……

c) Given that heat of combustion of S is 296.8$KJmol^{-1}$ determine the heating value of S = 32 (1mark)

……

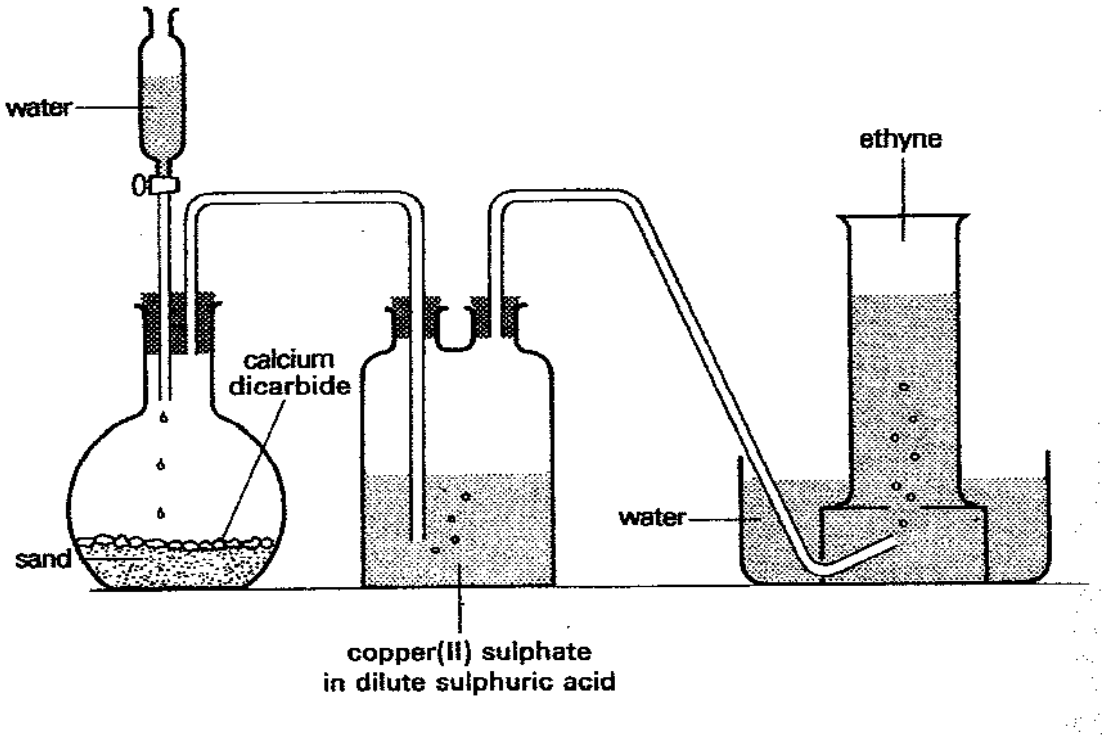
……

……

……

……

4. (a) The set up below was sued to prepare ethyne gas.



i) Write an equation for the reaction that produces ethyne gas (1 mark)

……

…

ii) When ethyne is ignited, it burns with a sooty flame. Explain (1 mark)

……

……

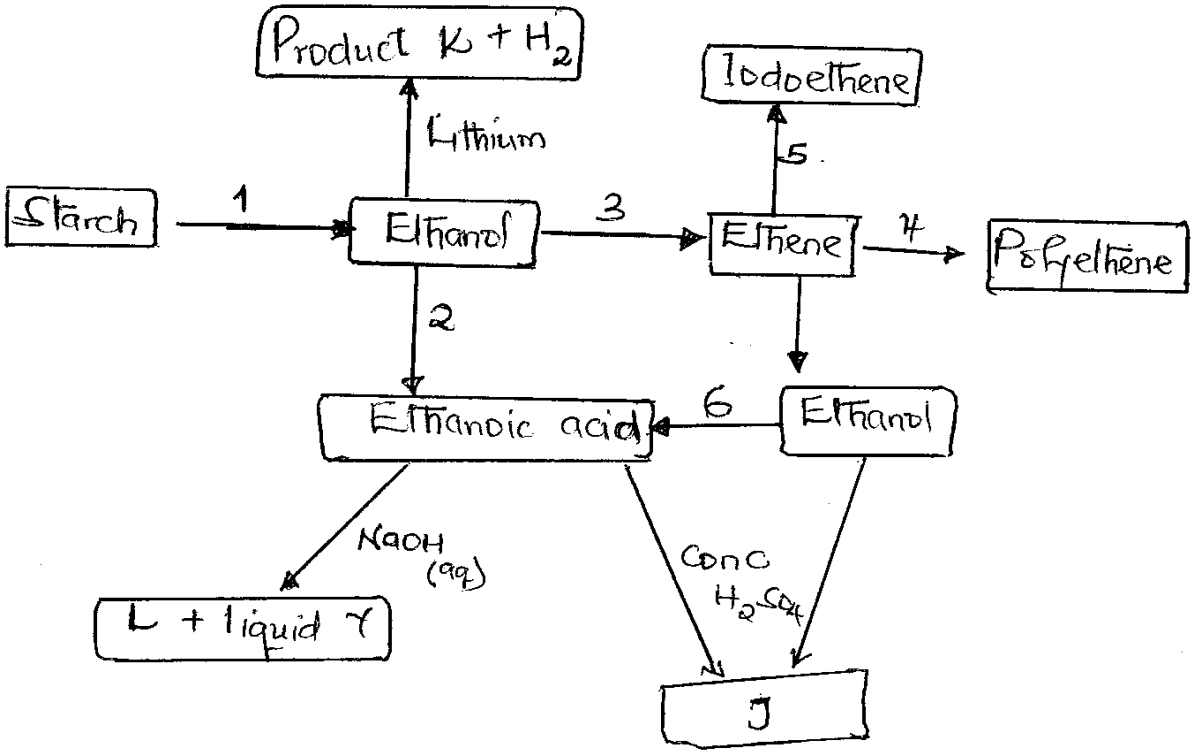
……

iii) In the reaction flask, sand is used to prevent the flask from breaking due to the great amount of heat produced. How else is this prevented (1 mark)

……

……

b) Study the flow chart below and use it to answer the questions that follow.



i) Name the process (2 marks)

Process 1…… Process 2 ……

Process 3 …….. Process 4 …….

ii) Name products K, J, L (3 marks)

……

…

iii) Reagent for process 2 (1 mark)

……

…

iv) Write an equation to show formation of: (2 marks)

Product L

……

…

Product J

……

…

v) What conditions are required to convert ethane to ethanol (1 mark)

……

…

vi) Name the reagent used in step 6. (1 mark)

……

…

5. a) The table below gives reduction potential obtained when the half cells for each of the metals represented by letters J, K, L, M and N were connected to a copper half cell as reference electrode.

Metal	**A reduction potential (volts)**
J	-1.10
K	-0.047
L	0.00
M	+0.45
N	+1.16

i) What is metal L likely to be ? Explain (1 mark)

……

……

……

……..

ii) Which is the metal cannot be displaced from the solution of its salt by any other metal in the table. Explain (2 marks)

……

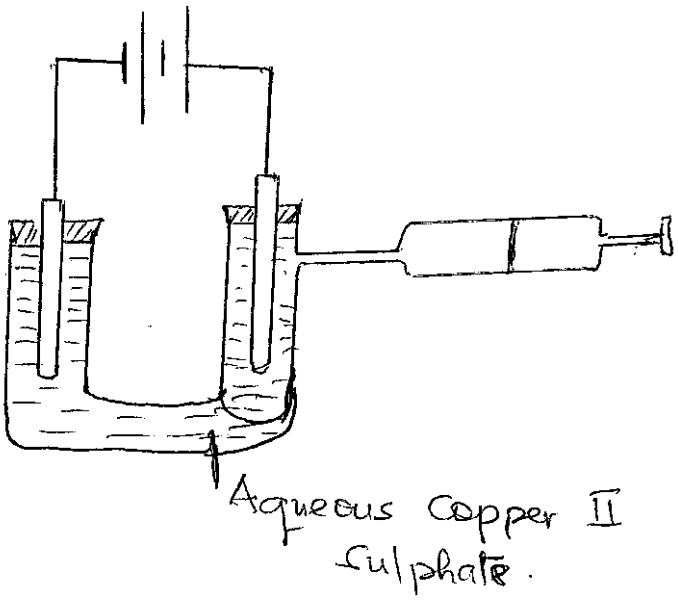
……

……

……

iii) In the space provided draw a labeled diagram of the electrochemical cell that would be obtained when half cells of element K and M are combined if the 2 are divalent metals (3 marks)

b) The set-up of apparatus shown below was sued to electrolyze aqueous copper (II) sulphate



i) What is meant by electrolysis (1 mark)

……

…

ii) Write an equation for the reaction at the anode (1 mark)

……

…

iii) Calculate the volume of the gas collected in the syringe when a current of 0.4 amperes is passed through the electrolyte for 50 minutes. (If = 96500C and the molar gas volume s 24000cm3 at room temperature and pressure) (3 marks)

……

……

……

……

……

……

b) Explain what happens to the colour of the electrolyte during the electrolysis. (1 mark)

……

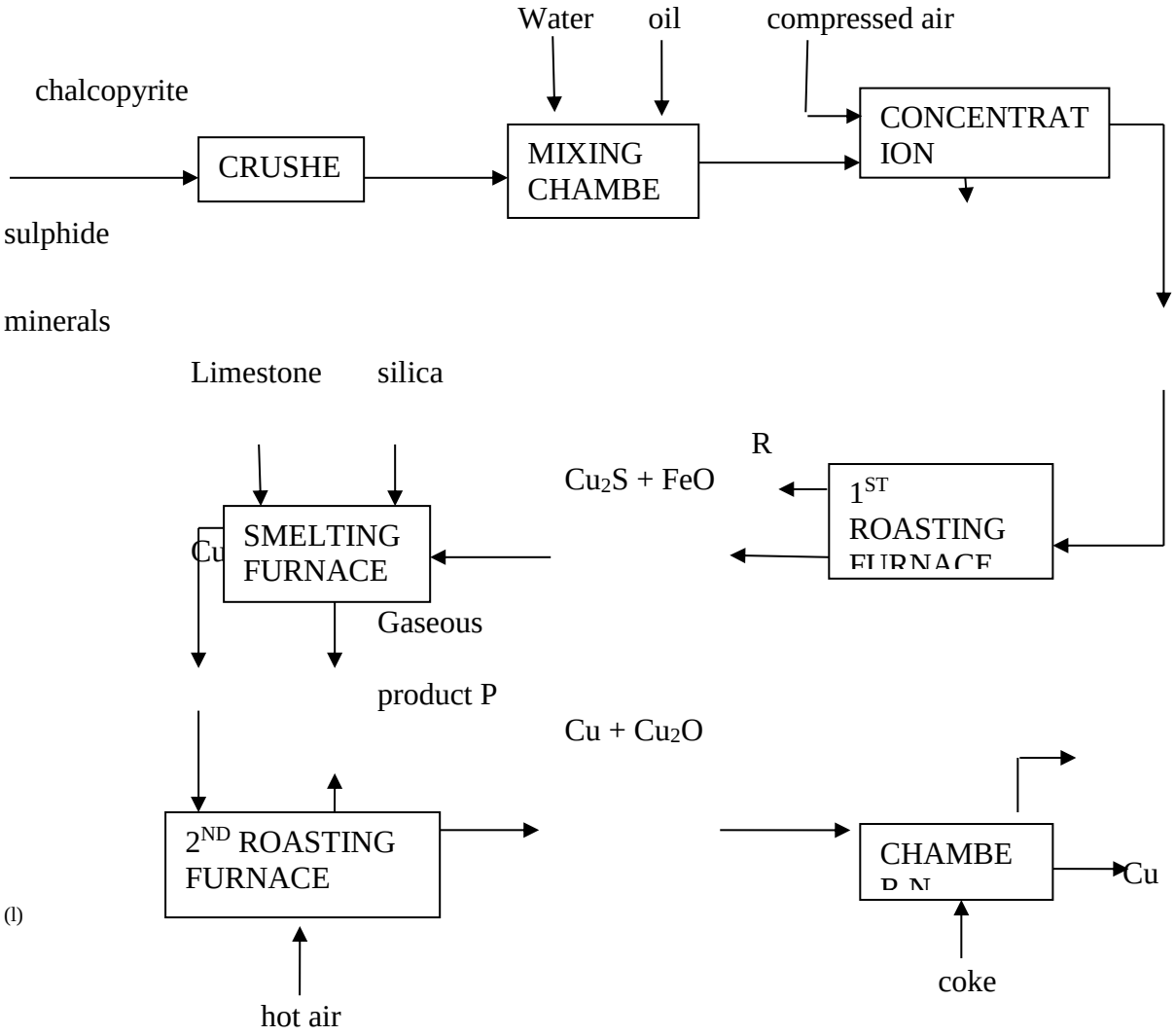
…

c) Explain why no gas is obtained in the syringe when platinum are replaced with copper. (1 mark)

……

……

6. One of the main mineral sources of copper is chalcopyrite, $CuFeS_2$. Study the following flow chart which shows how copper can be extracted from chalcopyrite and answer the questions that follow.



i) Name gas K (1 mark)

……

……

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

……

……

iii) Write the formuale of the cation present in the slag m (1 mark)

……

……

iv) Identify gas P (1 mark)

……

……

v) What name is given to the reaction taking place in chamber N? (1 mark)

……

……

b) Copper obtained from chamber N is not pure. Draw a well labeled diagram to show the set-up that can be used to refine the copper by electrolysis (2 marks)

c) Give 2 uses of copper metal. (2 marks)

……

……

……

……

……

……

……

……

8. The table below gives some properties of three salts, D, E and F

Salt	**D**	**E**	**F**
Solubility	**Insoluble**	**Soluble**	**Soluble**
Effects of heat	Decomposes forming a white residue G and a colourless gas H. Gas H forms a white precipitate with lime water	Decomposes to form yellow residue and two gases, I and J. Gas I is reddish brown. Gas J is colourless	Dissociates into two gases; K and L. Gas K turns wet litmus wet litmus paper blue. Gas K and L readily recombine on cooling to form dense white fumes of salt F

Further tests showed that when residue G was reacted with water and the product heated with salt F, gas K was evolved. When D reacted with nitric (V) acid, there was effervescence. the resulting solution formed a white precipitate with dilute sulphuric (VI) acid, But not with hydrochloric acid.

a) Identify;

i) Gas H (1 mark)

……

……

ii) Gas I (1 mark)

……

……

iii) Salt D (1 mark)

……

……

iv) Salt F (1 mark)

……

……

b) Write an equation for the thermal decomposition of D (1 mark)

……

……

c) Name the compound formed when residue G is reacted with water (1 mark)

……

……

……

d) A solution of E reacted with an aqueous solution of gas L, forming a white precipitate that dissolved when warmed

i) Write an ionic equation for the formation of the white precipitate (1 mark)

……

……

ii) Write the formula of the ions that are present in salt E (1 mark)

……

…

e) Explain what would be observed if sodium hydroxide was added to a solution of E, dropwise till in excess (2 marks)

……

……

……

……

……

f) State one use of salt F (1 mark)

……

……

……