Name ..... Index No. .....

Candidates signature .....

233/1

Date .....

CHEMISTRY
Paper 1

July/August 2013

Time 2 hours

MERU COUNTY JOINT EVALUATION TEST

Kenya Certificate of Secondary Education

CHEMISTRY

Paper - 233/1

July/August 2013

Time: 2 hours

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided.
- Sign and write the date of examination in the spaces provided.
- Answer ALL questions in the spaces provided.
- All working must be shown.
- Electronic calculators and mathematical tables may be used.

FOR EXAMINERS USE ONLY

Questions	Max Score	Candidate's Score
1 – 18	80	

This paper consists of 12 printed pages

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

1. The ions R^{2+} and T^- have identical electronic configuration of 2, 8. Write the electronic arrangement of the elements. (2 marks)

.....

.....

.....

2. The scheme below shows the energy changes that are involved between ice, water and steam. Study it and answer the questions that follow.

$$H_2O_{(s)} \underset{\Delta H_4}{\overset{\Delta H_1}{\rightleftharpoons}} H_2O_{(l)} \underset{\Delta H_3}{\overset{\Delta H_2}{\rightleftharpoons}} H_2O_{(g)}$$

a) What name is given to energy change ΔH_4? (1 mark)

.....

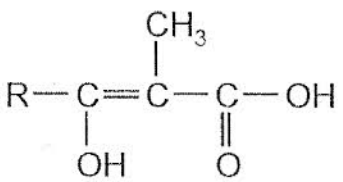
.....

b) What is the sign of ΔH_2? (Give a reason) (1 mark)

.....

.....

3. Compound Z has the structure.



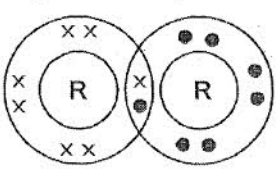
Name three functional groups in compound Z. (1½ marks)

.....

.....

.....

4. a) Identify the type of bond represented by substance R shown below, explain your answer. (2 marks)



.....

.....

.....

b) Predict the group of the periodic table into which R belongs. (1 mark)

.....

.....

5. An organic compound Y was analysed and found to contain carbon, hydrogen and oxygen only. 1.29g of Y on combustion give 2.64g of carbon (IV) oxide and 0.81g of water. What is the empirical formula of Y? (C=12, H=1, O=16) (3 marks)

.....

.....

.....

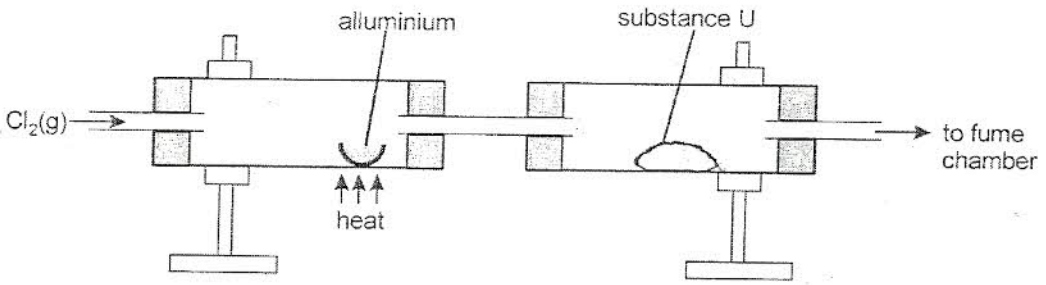
.....

.....

.....

.....

6. Chlorine gas was passed over heated aluminium foil to form substances U as shown below.



a) Identify substance U. (1 mark)

.....

b) Write a chemical equation for the reaction which takes place when chlorine and heated aluminium foil react. (1 mark)

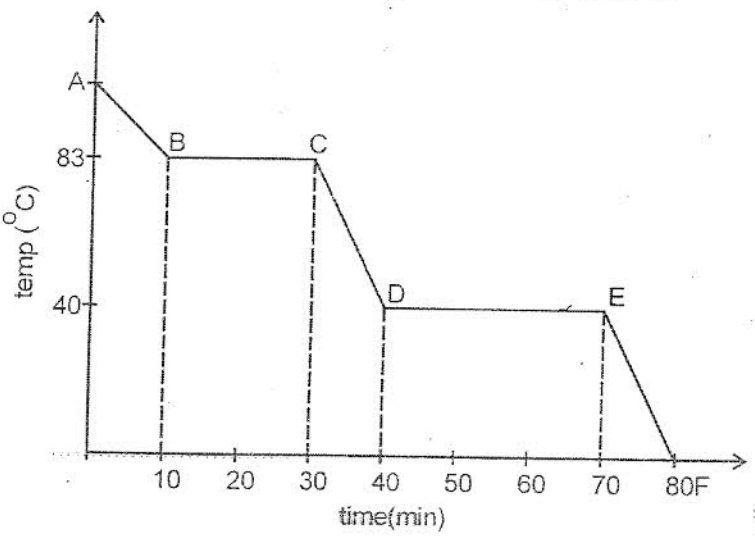
.....

c) State the property of the product formed in the first combustion tube that makes it possible for it to be collected in the second combustion tube as shown above. (1 mark)

.....

.....

7. Study the diagram below which shows a cooling curve of substance Z.



a) Identify the region at which the substance is a liquid. (½ mark)

.....

.....

b) From the diagram identify the melting point of Z. (1 mark)

.....

.....

.....

c) At which point among the points A, B, C, D, E and F do molecules of substance Z have

i) lowest kinetic energy. (1 mark)

.....

ii) Lowest intermolecular forces of attraction energy? (1 mark)

.....

8. State and explain what is observed when sulphur (IV) oxide is bubbled through each of the following aqueous solutions:

a) Acidified potassium chromate (VI) (1½ marks)

.....

.....

.....

b) Iron (III) sulphate solution. (1½ marks)

.....

.....

.....

9. a) The pH of a sample of soil was found to be 5.0. An agricultural office recommended the addition of calcium oxide in the soil. State two functions of the calcium oxide in the soil. (2 marks)

.....

.....

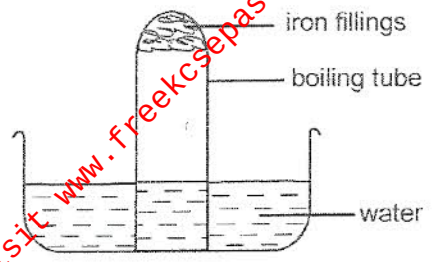
.....

b) Give a reason why distilled water is neutral. (1 mark)

.....

.....

10. The following set up of apparatus was used in a chemistry lesson aim at studying a certain chemical process. Study it and answer the questions that follow.



a) Which chemical process was being investigated in this experiment? (1 mark)

.....

b) Before the experiment, the iron filings were first sprinkled with water. Explain why? (1 mark)

.....

.....

c) Give one improvement that need to be included in the set up so as to be able to calculate the percentage of air used in the process (a) above. (1 mark)

.....

.....

11. Describe how the following reagents can be used to prepare lead (II) sulphate. Solid potassium sulphate, solid lead (II) carbonate, dilute nitric (V) acid and distilled water. (3 marks)

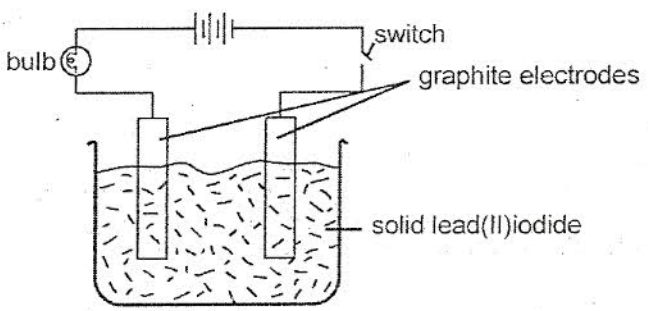
.....

.....

.....

.....

12. A student set up the apparatus as shown below to pass an electric current through molten lead (II) iodide. Study it and answer the questions that follow.



a) On closing the switch the bulb did not light until a certain condition was met. State the missing condition. (1 mark)

.....

.....

b) State the observations made at the anode when the condition in (a) above was met. (1 mark)

.....

.....

c) Give two reasons why graphite is used as material for electrodes. (1 mark)

.....

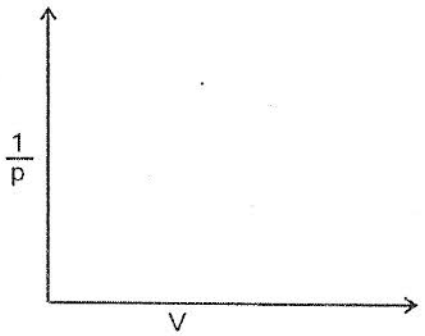
.....

13.a) State Boyle's law. (1 mark)

.....

.....

b) On the axis below, sketch the graph of $^1/_p$ against volume. (1 mark)



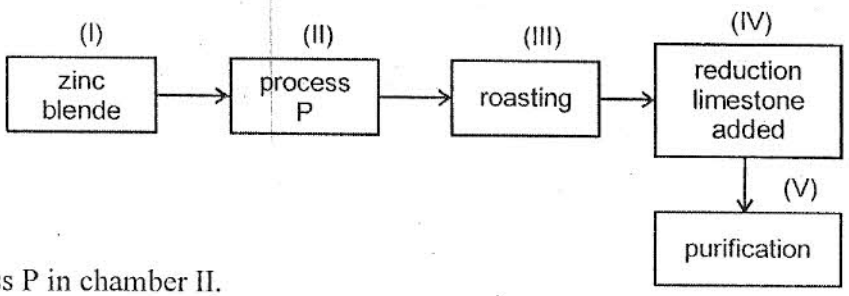
c) A given mass of a gas occupies 100cm³ at 700mmHg. Calculate its volume at 720mmHg. (1 mark)

.....

.....

.....

14. The scheme below shows the stages in the extraction of zinc from zinc blende.



a) Name process P in chamber II. (1 mark)

.....

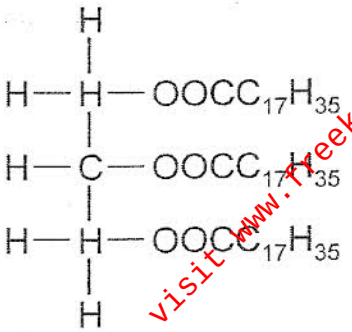
b) Write a chemical equation for the reaction taking place at the roasting stage. (1 mark)

.....

c) What is the role of limestone at stage IV? (1 mark)

.....

15. A compound W has the structure shown below.



a) Name the family of compounds to which W belongs. (1 mark)

.....

b) State one physical property of W that you would use to recognise it. (1 mark)

.....

c) Name two sources of the compound W above. (1 mark)

.....

16. a) 8.0g of a radioactive element was reduced to 0.5g after 16 hours. Determine the half life of the element. (1 mark)

.....

.....

.....

.....

b) A radioactive element W decays as shown below.

$^{238}_{92}W \rightarrow {}^{206}_{82}Pb + a\beta + b\alpha$

Determine the value of a and b. (2 marks)

.....

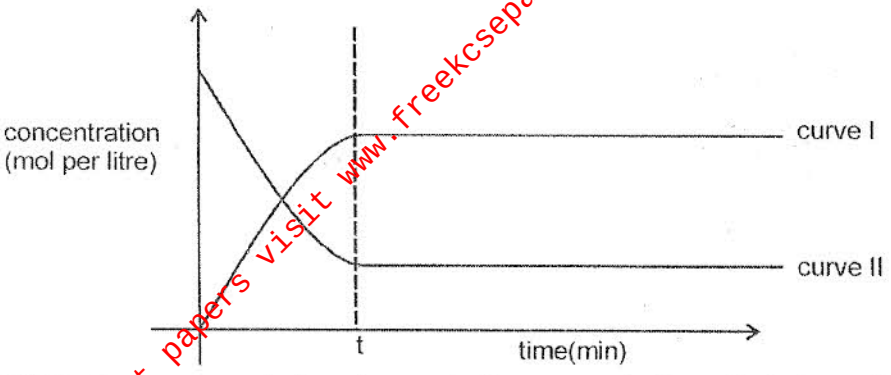
.....

.....

.....

17. The curve below represents the changes to concentration of substance P and Q with time in the reaction.

$P_{(g)} \rightleftharpoons Q_{(g)}$ Use it to answer the questions that follow.



a) Which curve represents the changes in the concentration of substance Q? (1 mark)

.....

b) What does time 't' represent in relation to the reaction given? (1 mark)

.....

c) If a catalyst is used in the reaction.

$P_{(g)} \rightleftharpoons Q_{(g)}$

Indicate on the graph where time 't' would be. (1 mark)

18. A current of 15000 amperes was passed for 1.5 hours in the industrial manufacture of sodium. What mass of sodium in kilograms was produced? (IF = 96500C, Na = 23.0) (3 marks)

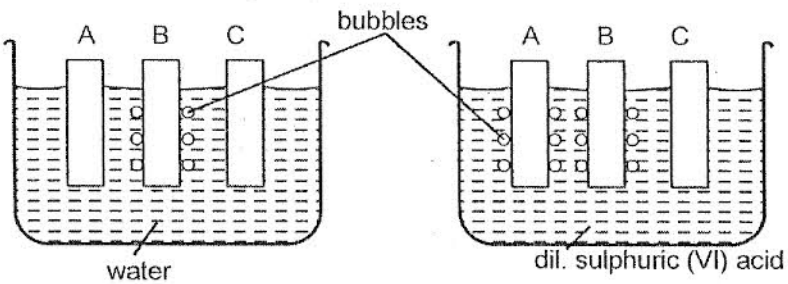
.....

.....

.....

.....

19. Three metal rods A, B and C were first polished (scrubbed with a sand paper) and then dipped into dilute sulphuric (VI) acid and water as shown below. Study it and answer the questions that follow.



a) Why were the metal surfaces first polished? (1 mark)

.....

b) Arrange the metals in order of their increasing reactivity. (1 mark)

.....

.....

.....

c) Name the gas produced in this experiment. (1 mark)

.....

20. State and explain the observations made when sodium carbonate powder is added to aluminium chloride solution in water.

Observation: (1 mark)

.....

.....

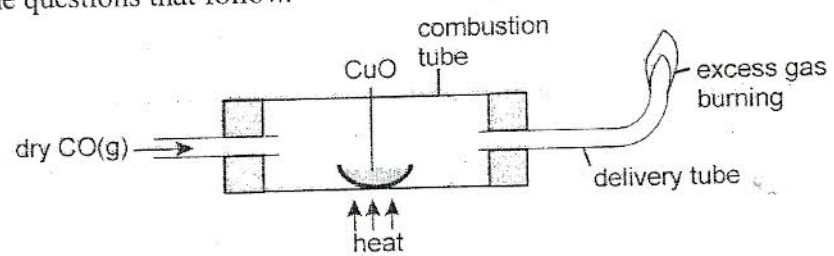
Explanation. (2 marks)

.....

.....

.....

21. The diagram below is a set-up used to investigate a certain property of carbon(II) oxide. Study it and answer the questions that follow.



a) State the observation made in the combustion tube. (1 mark)

.....

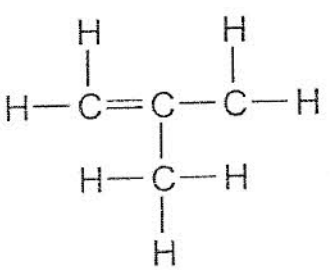
b) By use of an equation, explain the observations in (a) above. (1 mark)

.....

c) Why should excess gas be burnt at the end of the delivery tube? (1 mark)

.....

22. Compound P has the following structural formula.



a) Name compound P. (1 mark)

.....

b) Write and name the compound formed when P is reacted with chlorine gas. (2 marks)

.....

.....

23. Study the information in the table below and answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Atomic number	Melting point °C
L	11	98
M	13	660
N	14	1410
Q	17	-101

a) Explain the difference in melting point of L and M. (1 mark)

.....

.....

b) N forms an oxide with a very high melting point. Explain this observation. (1 mark)

.....

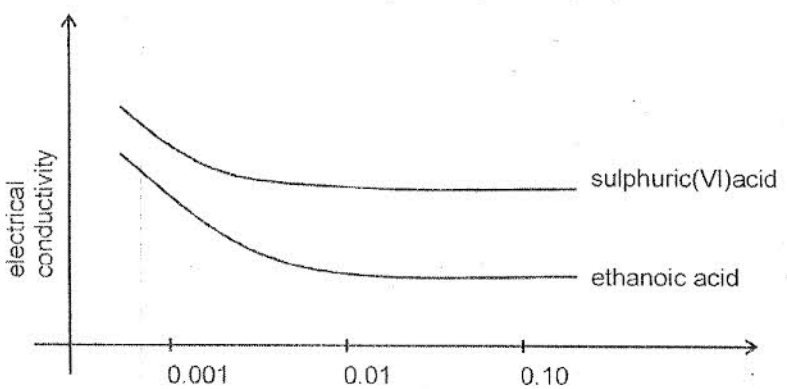
.....

c) Q and L react to form a compound. Does the compound formed conduct electricity in solid state? Explain. (1 mark)

.....

.....

24. The curves below show how electrical conductivity of sulphuric (VI) acid and ethanoic acid vary with concentration.



Explain why the electrical conductivity of 0.01M sulphuric (VI) acid is higher than that of 0.01M ethanoic acid. (2 marks)

.....

.....

.....

.....

25. 25cm³ of hydrochloric acid was completely neutralised by 30cm³ of a solution containing 5.3g of sodium carbonate per litre solution. (Na = 23, C=12, O=16)

a) Determine the concentration of sodium carbonate. (1 mark)

.....

.....

b) Calculate the molarity of hydrochloric acid solution. (2 marks)

.....

.....

26. A cleaned magnesium ribbon was burnt in a gas jar of dry nitrogen to form a white powder X

a) Write an equation for the formation of powder X. (1 mark)

.....

.....

b) Powder X was dissolved in water to give a solution Y and gas Z.

i) State the effect of solution Y on litmus. (1 mark)

.....

ii) Name gas Z. (1 mark)

.....

27. a) What is allotropy? (1 mark)

.....

b) Consider the scheme below for allotropes of sulphur.

Allotrope J $\underset{}{\overset{96^{\circ}C}{\rightleftharpoons}}$ Allotrope K

i) What is the significance of temperature 96°C? (1 mark)

.....

.....

ii) Name allotrope J and K. (1 mark)

.....

28. Below are molar enthalpies of combustion of propane, hydrogen and carbon.

$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 2H_2O$ $\quad \Delta H^{\theta}_{C} = -2220$ Kj/mol

$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$ $\quad \Delta H^{\theta}_{C} = -286$ Kj/mol

$C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\quad \Delta H^{\theta}_{C} = -383$ Kj/mol

a) Write the equation for the formation of propane from it elements. (1 mark)

.....

.....

b) Determine the molar enthalpy of formation of propane. (2 marks)

.....

.....