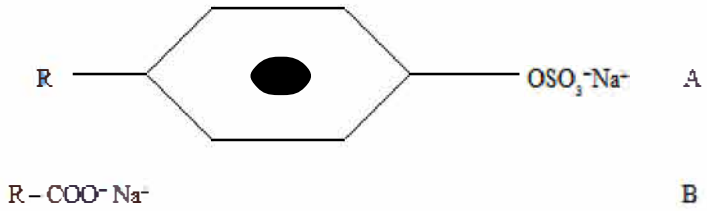
MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2016
Kenya National Examination Council

233/1
CHEMISTRY
PAPER 1 (THEORY)
TIME: 2 HOURS
JULY/AUGUST 2016

1. a) Three isotopes of Magnesium has mass numbers 24, 25 and 26. What is the mass number of the most abundant isotope of Magnesium? Explain. (2mks)
b) Define the term isotope. (1mk)

2. a) Define hard water. (1mk)
b) The structure below represents two cleansing agents.



Which of the above cleansing agent would be suitable for washing in hard water? Give a reason. (2mks)

3. The heat of neutralization of a strong acid is usually 57.4kJmol^{-1}, whereas that of a weak acid is less than 57.4kJmol^{-1} . Explain (2mks)

4. When an electric current of 0.5A was passed through a molten chloride of J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at cathode.
1F = 96500C
a) Calculate the quantity of electricity used. (1mk)
b) Determine the value of x if the ion of metal J is represented as J^{x+} (2mks)

5. Your friend's clothes have caught fire. Inorder to extinguish the fire you decide to cover with a damp blanket. What is the purpose of the clamp blanket? (1mk)

6. Calculate the number of Calcium atoms in 10g of calcium.
(Ca = 40, Avogadro number = 6.0 x 10^{23}) (1mk)

7. The table below shows the pH values of some solutions.

Solution	J	K	L	M	N
pH	6	13	2	10	7

a) Which solution is likely to be:
i) Potassium hydroxide (1mk)
ii) Lemon juice (1mk)
b) Explain why a solution of hydrogen chloride gas in methyl benzene was identified as N. (1mk)

8. A piece of burning magnesium ribbon was placed in a gas jar full of nitrogen gas. The product Q formed was then reacted with water.
a) Write the chemical formula for the product Q. (1mk)
b) Write the equation for the reaction between product Q and water. (1mk)
c) Using dot (•) and cross (X) diagrams to represent electrons, draw the structure to show bonding in a nitrogen molecule. (N = 14) (1mk)

9. How would the following pair of compounds be chemically distinguished? CH3COOH and CH_3CH_2OH. (2mks)

10. Name the products of electrolysis of fused copper (II) chloride using carbon electrodes.
Anode (½ mk)
Cathode (½ mk)
Explain (1mk)

11. Zinc metal can be used in the laboratory to prepare hydrogen gas from an appropriate mineral acid while copper metal cannot. Explain. (1mk)

12. a) State one factor that can determine stability of an atom. (1mk)
b) Radioactive polonium -216 decays as shown below.

$$^{216}_{84}Po \longrightarrow {}^{216}_{82}Pb + M\alpha + N\beta\beta$$

Find the value of M and N. (2mks)
c) If after 112 days $^1/_{16}$ of Polonium remained, calculate the half-life of polonium. (2mks)

13. When bromine gas reacts with aqueous sodium hydroxide an equilibrium is established as shown below.

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

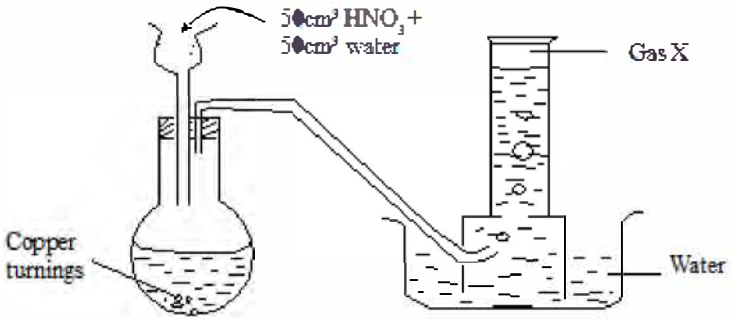
(Brown) Colourless

What observation would be made if a few drops of dilute sulphuric (VI) acid were added to the equilibrium mixture? Explain. (2mks)

14. One compute combustion of 0.5g of an organic compound P (containing only carbon, hydrogen and oxygen) 0.733g of carbon (IV) oxide and 0.3g of water were produced.
Determine the empirical formula of P. (3mks)

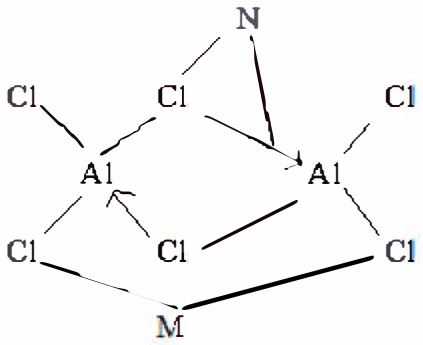
15. Compare the atomic sizes of sodium and magnesium. Explain. (2mks)

16.



a) Name gas X. (½ mark)
b) Write an equation for production of gas x in the set-up. (1mk)
c) It's hat to test whether gas x supports burning using a glowing splint. Explain. (2mks)

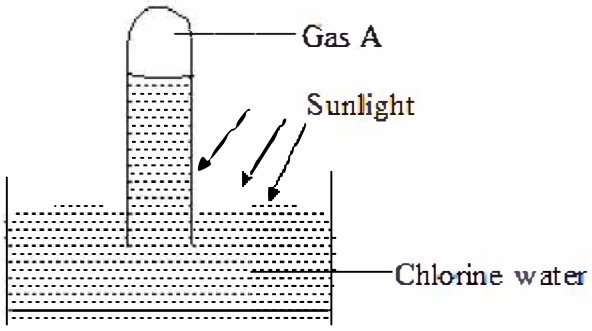
17. When solid M is dissolved in water, it dissolves to form a blue solution. Addition of ammonia solution forms a blue precipitate which dissolves in excess to form a deep blue solution. Write the formula and name of the ion responsible for the deep blue solution. (2mks)



18. The diagram below represents the structure of aluminium chloride.
a) Identify the bonds labelled
M (½ mark)
N (½ mark)
b) What is the difference between bonds M and N? (1mk)

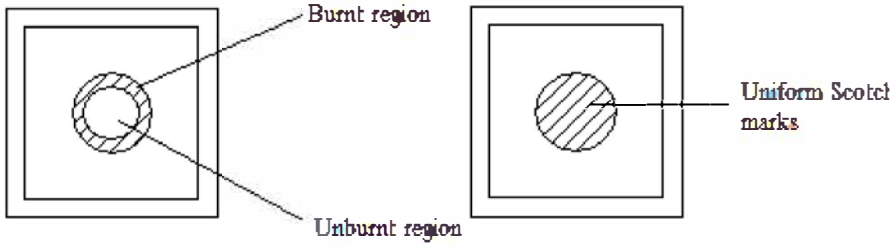
19. a) Define hydration energy. (1mk)
b) Given that hydration energies of Ca^{2+} and Cl^- are -1891kJmol^{-1} and - 384kJmol^{-1} respectively and that the lattice energy of calcium chloride is +2237kJmol^{-1}, calculate the molar enthalpy change of solution of calcium chloride. (3mks)

20. The diagram below shows an experiment involving chlorine water.

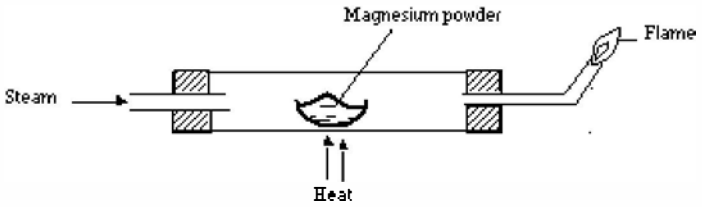


a) State and explain the observations made after 24 hours. (2mks)
b) Write an equation to show the formation of gas A. (1mk)
c) State one use of chlorine gas. (1mk)

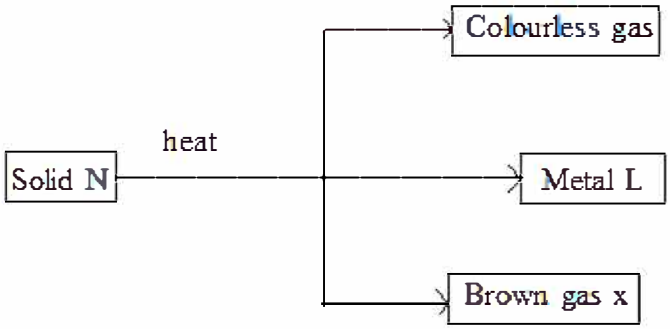
21. The solubility of salt Y at 60^0C is 40g/100g of water and 48/100g of water at 100^0C.
    a) How much salt Y would saturate 190g of water at 100^0C. (1½ mark)
    b) 150g of a saturated solution of Y is 100^0C is cooled to 60^0C. Calculate the mass of Y that crystallizes. (1 ½ mks)
22. The diagram below shows the appearance of two pieces of paper placed in different parts of a non-luminous flame of a Bunsen burner and removed quickly before they caught fire.



    a) What do the experiments show about the outer region of the flame? (1mk)
    b) From the above experiment, which part of the flame is better for use in heating? Give a reason. (2mks)
23. Steam is passed over heated magnesium as shown in the diagram below.



    a) State one observations that will be made in the tube as heating is carried out. (1mk)
    b) What substance is being burnt at A? (1mk)
    c) Write a balanced chemical equation to show the reaction which takes place in the combustion tube. (1mk)
24. The volume of a given mass of a gas is $250cm^3$ at 27^0C and 720mmHg pressure. What will be the volume of the gas at s.t.p. (3mks)
25. Given the equation $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ DH= $-92kJmol^{-1}$
    Explain what happens to the position of the equilibrium when
    a) Temperature is raised. (1mk)
    b) Pressure is changed. (2mks)
26. State and explain the observations made when a few drops of concentrated sulphuric (IV) acid is added to
    a) Hydrated Copper (II) sulphate. (2mks)
    b) Sugar (2mks)
27. Study the flow chart below and answer the questions that follow.



    a) Given that solid N burns in air with a red flame. Identify:-
    i) Cation present in solid N (½ mark)
    ii) Metal oxide L (½ mark)
    iii) Gas X (½ mark)
    b) Write down the formula of the anion present in solid N. (½ mark)
28. Determine the volume of 2.0M NaOH which when diluted to $250cm^3$ would produce a 0.8M NaOH solution. (2mks)
29. Explain how you would obtain pure ammonium chloride from a mixture of lead sulphate and ammonium chloride? (2mks)
30. a) Carbon exhibits allotropy. Name one element other than carbon that has the same characteristic. (1mk)
    b) In terms of structure explain why graphite conducts electricity while diamond does not? (2mks)
    c) Define allotropy. (½ mark)