NAME: _____ INDEX NO: _____

CLASS: _____ ADM. NO: _____

233/1
CHEMISTRY
Paper 1
THEORY
TIME: 2 hours

12ᵗʰ July, 2014

ALLIANCE HIGH SCHOOL
Kenya Certificate of Secondary Education
TRIALS 2014
CHEMISTRY PAPER 1

INSTRUCTIONS

> Write your name, Index No, class and Adm. No. in the spaces provided.
> Answer ALL questions in the spaces provided.
> Mathematical tables and Electronic calculators may be used.
> All working MUST be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Questions	Maximum score	Candidates score.
1 - 29	80	

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

1. a) Name two sulphates which do not decompose when heated. [1 mk]

   b) i) State the observations made when hydrated copper (III) sulphate crystals are heated gently then strongly. [2 mks]

      ii) Write the equation for the reaction taking place in b(i) above. [1 mk]

2. In the equation below, identify the acid in the forward reaction. Explain your answer. [2 mks]

   i) $H_2PO_{4(qa)}^- + OH_{(aq)}^- \rightleftharpoons HPO_{4(aq)}^{2-} + H_2O_{(l)}$

3. Study the table below showing the solubility of a salt at various temperatures.

Temperature (°C)	Solubility (g/100g of water)
16	28
30	20
50	10
76	6

What would happen if a sample of a saturated solution of the salt at 30°C is heated to 76°C? Explain. [2 mks]

4. The diagram below summarizes results of a series of chemical reactions.
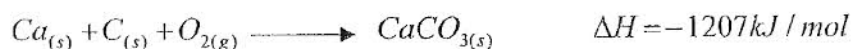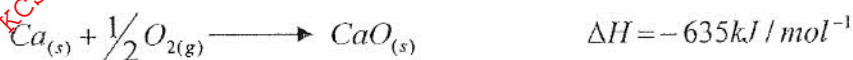

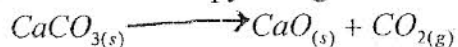a) Name substances: [1 mk]

   A _____

   B _____
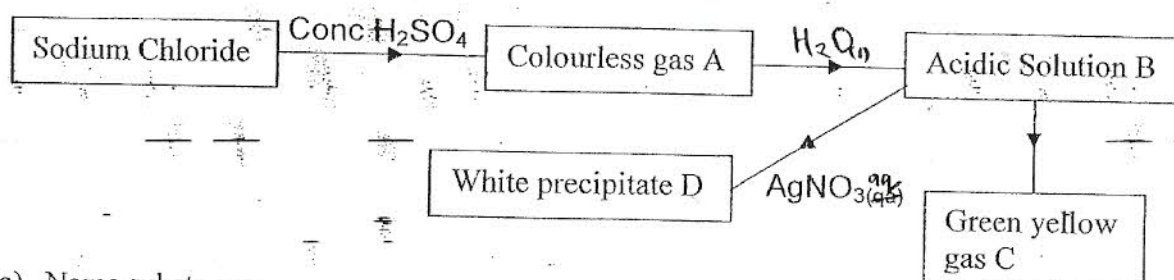
b) Draw the structural formula for the polymer formed when the amino acids polymerise. [1 mk]

11. Given the following equations.

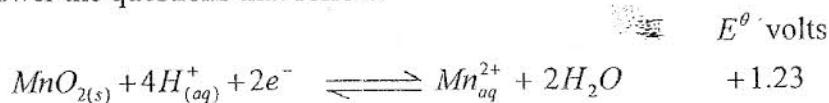$$Ca_{(s)} + \frac{1}{2}O_{2(g)} \longrightarrow CaO_{(s)} \qquad \Delta H = -635kJ/mol^{-1}$$

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} \qquad \Delta H = -394kJ/mol$$

$$Ca_{(s)} + C_{(s)} + O_{2(g)} \longrightarrow CaCO_{3(s)} \qquad \Delta H = -1207kJ/mol$$

Calculate the enthalpy change for the reaction
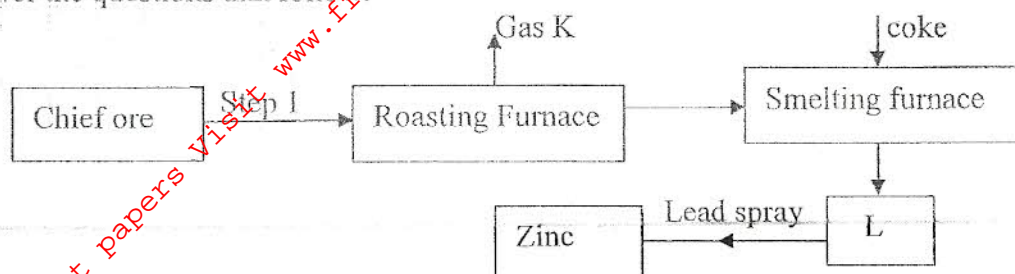$$CaCO_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)} \qquad [2 \text{ mks}]$$

12. Below is a list of standard reduction potentials for two half-cells in acidic conditions. Use them to answer the questions that follow.

$$E^\theta \text{ volts}$$

$$MnO_{2(s)} + 4H^+_{(aq)} + 2e^- \rightleftharpoons Mn^{2+}_{aq} + 2H_2O \qquad +1.23$$

$$Cl_{2(g)} + 2e^- \rightleftharpoons 2Cl^-_{(aq)} \qquad +1.36$$

Predict whether manganese(IV) oxide would oxidize hydrochloric acid to chlorine gas. [2 mks]

13. The flow chart below shows the extractions of zinc metal from its chief ore. Study the flowchart and answer the questions that follow.

```
                    Gas K                    coke
                      ↑                        ↓
 ┌───────────┐ Step 1 ┌──────────────────┐   ┌──────────────────┐
 │ Chief ore │──────→ │ Roasting Furnace │──→│ Smelting furnace │
 └───────────┘        └──────────────────┘   └──────────────────┘
                                                       ↓
                         ┌──────┐  Lead spray  ┌──────────┐
                         │ Zinc │ ←─────────── │    L     │
                         └──────┘              └──────────┘
```

    a)   Name the chief ore used in the process.   [1 mk]

    b)   Write the equations for the reaction in the roasting furnace.   [1 mk]

    c)   State the functions of the lead spray.   [1 mk]

   d) Give two uses of zinc.   [1 mk]

14. When 10g of a mixture of potassium chloride and anhydrous sodium sulphate is dissolved in water and excess barium chloride solution added, 6.9g of barium sulphate is precipitated. Calculate the composition of the mixture.   [3 mks]

       ($K = 39$, $Cl = 35.5$, $Na = 23$, $S = 32$, $O = 16$, $Ba = 137$)

15. Hydrogen sulphide gas was bubbled into an aqueous solution of iron(III) chloride.

    a) State and explain the observations made.   [2 mks]

    b) Write the equation for the reaction that took place.   [1 mk]

16. Study the scheme below and answer the questions that follow.
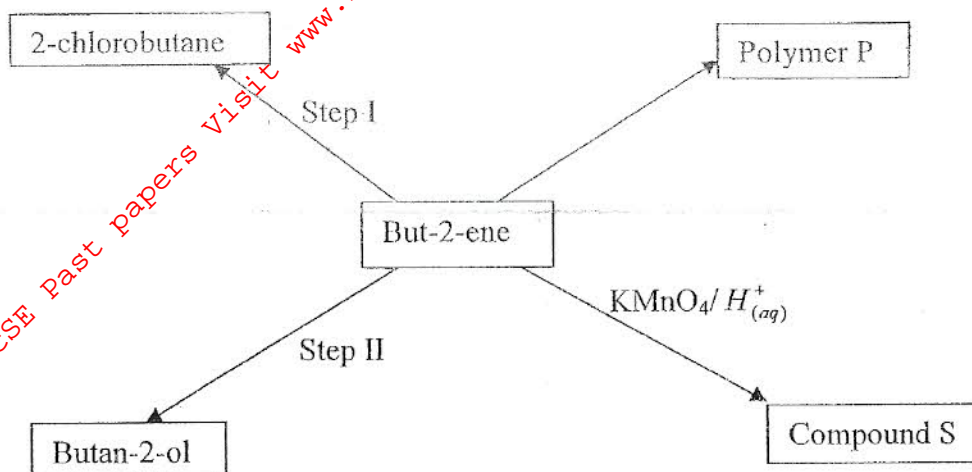
a) Draw the structure of polymer P. [1 mk]

b) Name compound S. [1 mk]

c) Give the reagents and conditions for step I & II. [2 mks]

Step I: reagent _____ Condition: _____

Step II: reagent _____ Condition: _____

17. An iron spoon is to be electroplated with silver. Draw a labeled diagram of the set-up that could be used. [2 mks]

18. In an experiment, a student put equal volumes of mixtures of ethanoic acid in water (tube A) and ethanoic acid in hexane (tube B) in each test tube, equal amounts of solid sodium hydrogen carbonate were added. State and explain the observations made. [3 mks]

19. The following reaction is in equilibrium in a closed system.

$$C_{(s)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + H_{2(g)}$$

State giving reasons how an increase in pressure would affect the amount of hydrogen. [2 mks]

20. A volume of 15cm³ of ethane gas was exploded with 50cm³ of oxygen. If both volumes were measured at the same temperature and pressure, calculate the volume of the resulting gaseous mixture. [3 mks]

21. Give the IUPAC names of the following: [3 mks]

$$C_2H_5$$
a) CH$_3$CHCCH$_3$ _____

b) CHCCH(CH$_3$)CH(Br)CH$_3$ _____

$$CH_3$$
c) CH$_3$CH=C- COOCH$_2$CH$_3$ _____
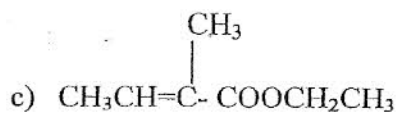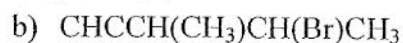
21. The scheme below represents the manufacture of a cleansing agent N.

R ──[hexagon]── $\xrightarrow{\text{Add M}}$ R ──[hexagon]── SO$_3$H $\xrightarrow{\text{NaOH}_{(aq)}}$ Cleansing agent N

a) Name reagent M. _____ [1 mk]

b) Draw the structure of N and state the type of cleansing agent in which N belongs. [2mks]

c) State one advantage of using N as a cleansing agent. [1mk]

22. The set-up below was used to prepare a sample of nitrogen(I)oxide.
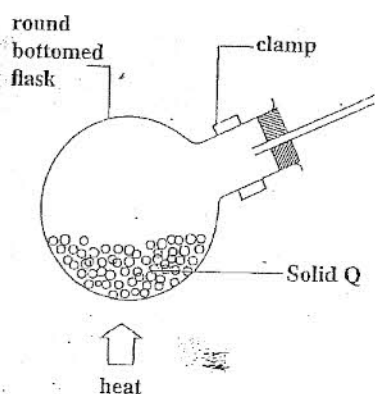
a) Name solid Q. _____ [1 mk]

b) Complete the diagram to show how nitrogen (I) oxide is collected. [1 mk]

c) What precaution should be taken when carrying out this experiment and why? [1 mk]

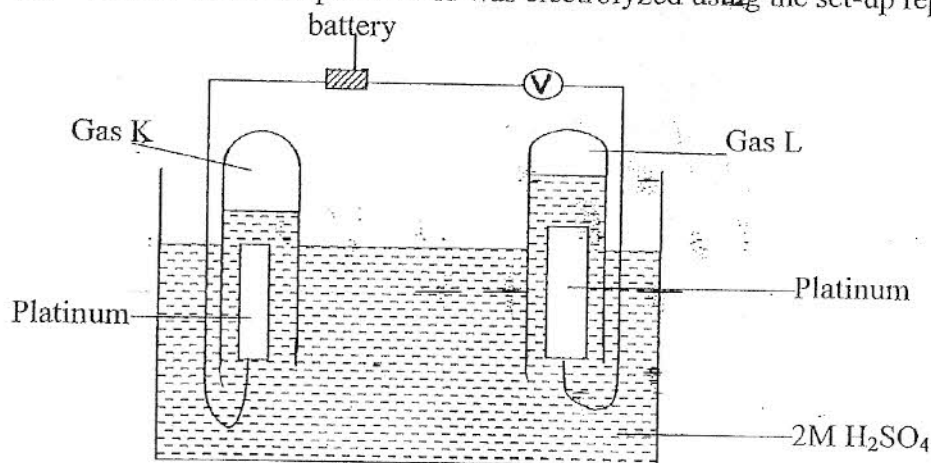d) Write the equation for the reaction that produces nitrogen (I) oxide. [1 mk]

23. 6.84g of aluminium sulphate were dissolved in 150cm^3 of water. Calculate the molar concentration of the sulphate ion in solution. (RFM of aluminium sulphate is 342). [2 mks]

24. The table below shows properties of some chlorides. Study it and answer the questions that follow.

Chloride	Mp(^{o}C)	Bp(^{o}C)	Electrical conductivity in aqueous solution	pH of solution
AlCl$_3$	-	183	Good	3
NaCl	860	1420	Good	7
PCl$_5$	32	75	Good	3
HCl	-146	-29	Good	1

a) Explain the high melting and boiling points of sodium Chloride. [1 mk]

b) Write an equation for the reaction between PCl$_5$ and water. [1 mk]

c) Explain the pH value of aqueous solution of AlCl$_3$. [1 mk]

d) Draw the dot(.) and (x) diagram to show the bonding in NaCl. [1 mk]

25. 100cm^3 of 2M sulphuric acid was electrolyzed using the set-up represented by the diagram below.

a) Label the anode and the cathode. [1 mk]

b) Write an equation for the reaction at the anode. [1 mk]

c) Comment on the concentration of the electrolyte as electrolysis continues. [1 mk]

26. Ammonia gas is a molecular compound but dissolves in water. Explain. [1 mk]

27. 90cm³ of 0.01M sodium hydroxide were added to a sample of water containing calcium hydrogen carbonate. Calculate the mass of solid precipitated.
(Ca = 40, Na = 23, O = 16, H = 1, C = 12) [3 mks]

28. Part of the structure of a polymer is given below.

$$-CH_2-CH-CH_2-CH-CH_2-CH-$$
$$\qquad\ \ | \qquad\qquad\ \ | \qquad\qquad\ | $$
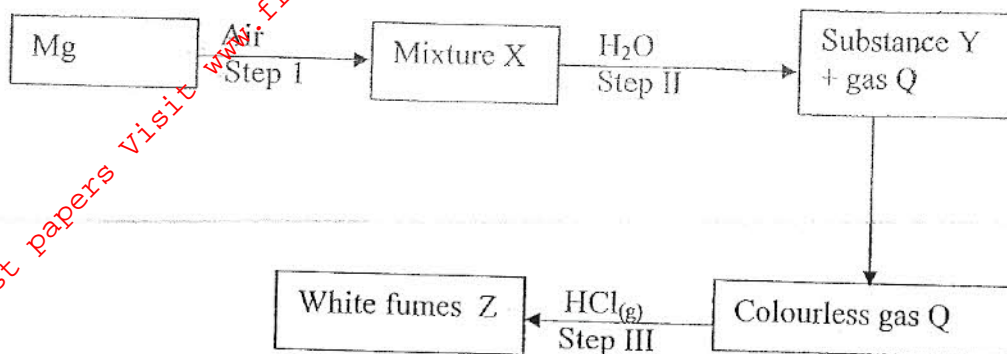$$\qquad\ \ CN \qquad\qquad CN \qquad\qquad CN$$
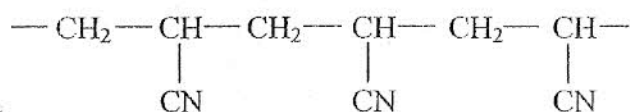
a) Draw the structure of the monomer. [1 mk]

b) Given the RMM of the polymer is 7950, determine the number of monomers in the polymer.
(C = 12, H = 1, N = 14) [1 mks]

29.

| Mg | Air Step 1 → | Mixture X | H_2O Step II → | Substance Y + gas Q |

| White fumes Z | ← $HCl_{(g)}$ Step III | Colourless gas Q |

Identify:

[2 mks]

i) Mixture X _____

ii) Substance Y _____

iii) Gas Q _____

iv) White fumes Z _____

x END x