NAME...CLASS...... ADM. NO..................

233/2

CHEMISTRY
THEORY
PAPER 2

JULY 2014

2 HOURS

ALLIANCE GIRLS HIGH SCHOOL
MOCK EXAMINATIONS-2014
KENYA CERTIFICATE OF SECONDARY EDUCATION
CHEMISTRY PAPER 2

INSTRUCTIONS

Answer all the questions in the spaces provided.
Mathematical tables or electronic calculators may be used.
All working must be clearly shown where necessary

For examiners use only

Questions	Maximum score	Candidates Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
TOTAL SCORE	80	

This paper consists of 14 printed pages. Check to ensure all the pages are there.

1

1. The table below gives the solubities of hydrated copper(II) sulphate in mol dm^{-3} at different temperatures

Temperature	Solubility(mol/dm^3)
20	0.04
40	0.06
60	0.13
80	0.22
100	0.30

(a) On the grid provided, **plot** a graph of solubility of copper(II) sulphate{Vertical axis}against temperature. (2 mks)
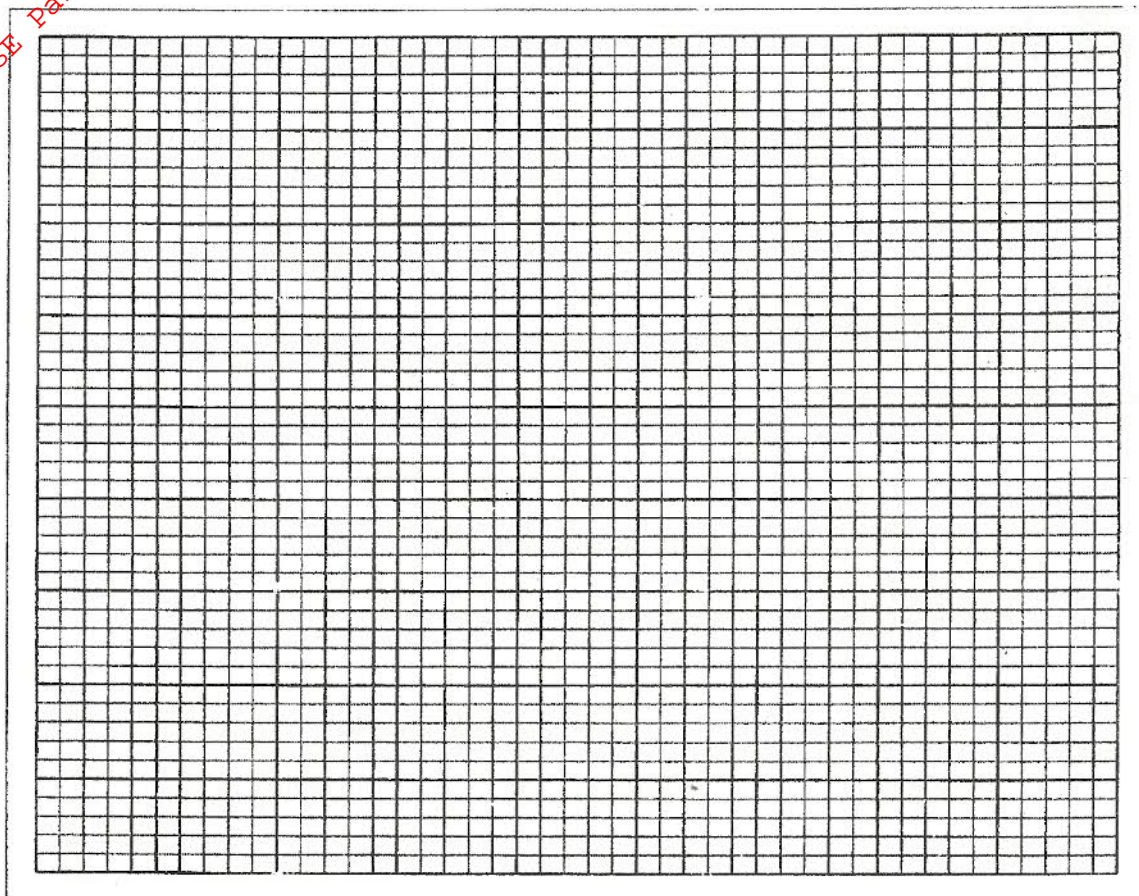
(b) From the graph **determine** the mass of copper (II) sulphate deposited when the solution is cooled from 70^{0}c to 40{molar mass of hydrated copper II sulphate =250g} (2 mk)

2

©In an experiment to determine the solubility of sodium chloride, $5.0cm^3$ of saturated solution of sodium chloride weighing 6.42g were placed in a volumetric flask and diluted to a total volume of $250cm^3$. $25.0cm^3$ of the diluted solution of sodium chloride completely reacted with $24.1cm^3$, of 0.1M silver nitrate solution.

$$AgNO_3 \text{ (aq)} + NaCl \text{ (aq)} \longrightarrow AgCl \text{ (s)} + NaNO_3 \text{ (aq)}$$

Calculate :

Moles of silver nitrate in $24.1cm^3$ of solution   (1 mk)

Moles of sodium chloride in $25.0cm^3$ of solution   (1 mk)
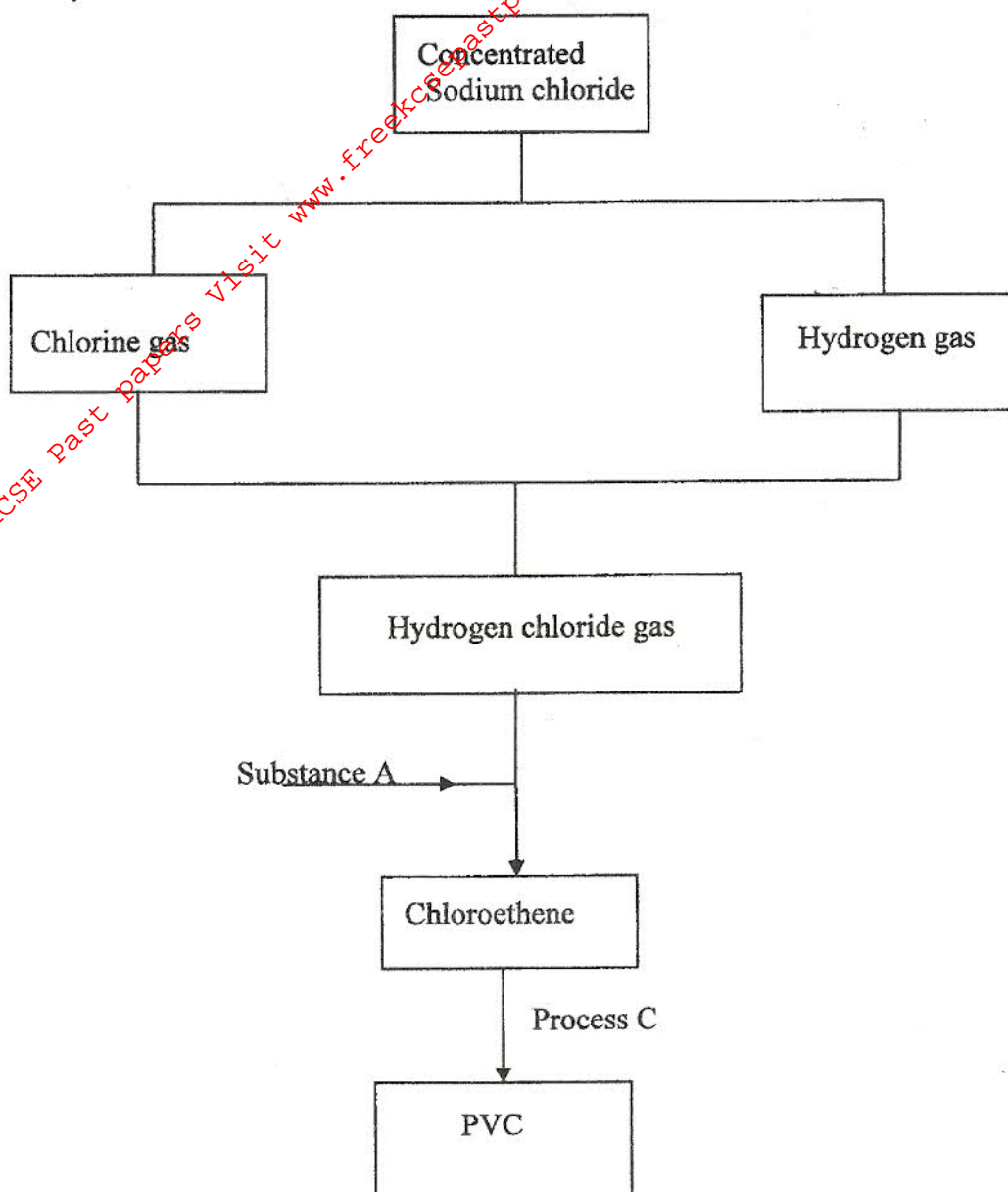
Moles of sodium chloride in $250cm^3$ of solution   (1 mk)

Mass of sodium chloride in $5.0cm^3$ of saturated sodium chloride solution
(Na=23.0, Cl=35.5)   (1 mk)

Mass of water in $5.0cm^3$ of saturated solution of sodium chloride   (1 mk)

The solubility of sodium chloride in g/100g water   (1 mk)

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

```
                    ┌─────────────────┐
                    │  Concentrated   │
                    │ Sodium chloride │
                    └────────┬────────┘
              ┌──────────────┴──────────────┐
     ┌────────┴────────┐           ┌─────────┴────────┐
     │  Chlorine gas   │           │   Hydrogen gas   │
     └────────┬────────┘           └─────────┬────────┘
              └──────────────┬──────────────┘
                    ┌────────┴──────────┐
                    │ Hydrogen chloride gas │
                    └────────┬──────────┘
        Substance A          │
        ──────────────►      │
                    ┌────────┴────────┐
                    │  Chloroethene   │
                    └────────┬────────┘
                      Process C
                    ┌────────┴────────┐
                    │      PVC        │
                    └─────────────────┘
```

(a) (i) **Identify** substance A   (1 mk)

(ii) Write an **equation** for the reaction that leads to the formation of chloroethene. (1 mk)

(b) **Name** process C.   (1 mk)

4

(c) Give two **uses** of PVC

(2 mks)

(d) **State and explain** the observation that would be made if chlorine gas is bubbled into an aqueous solution of Sodium iodide.

(2 mks)

(e) In the preparation of a bleaching agent (Sodium hypochlorite), excess chlorine gas is bubbled into 15 litres of cold 2M Sodium hydroxide solution.
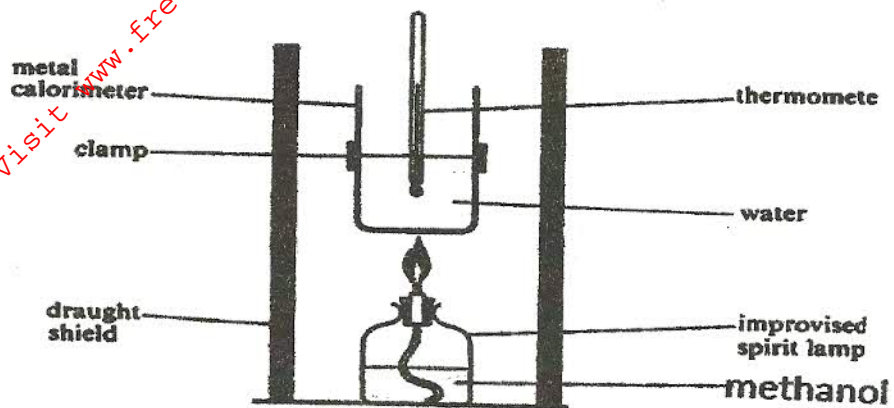
(i) Write an **equation** for the reaction between chlorine gas and cold dilute sodium hydroxide.

(1 mk)

(ii) **Calculate** the number of moles of sodium hydroxide used

(2 mks)

3. The diagram below shows a set-up that was used to determine the molar heat of combustion of methanol.

During the experiment, the information below was recorded.

Volume of water = 300cm³

Initial temperature of water = 24.0°C

Final temperature of water = 47.5°C

Mass of methanol + lamp before burning = 142.8g

Mass of methanol + lamp after burning = 141.3g

Calculate the:

(a) heat evolved.

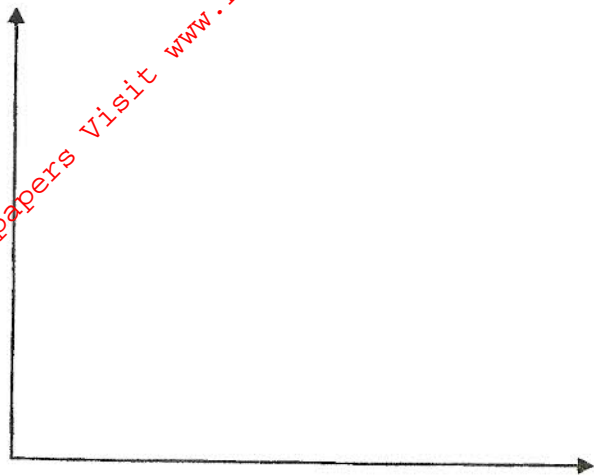(Density of water = 1g/cm³, specific heat capacity of water = 4.2Jg⁻¹k⁻¹) (2 mks)

(b) Molar heat of combustion of methanol.

(Molar mass of methanol = 32g) (1mk)

c)(i) Write the thermochemical equation for the combustion of methanol. (1mk)

6

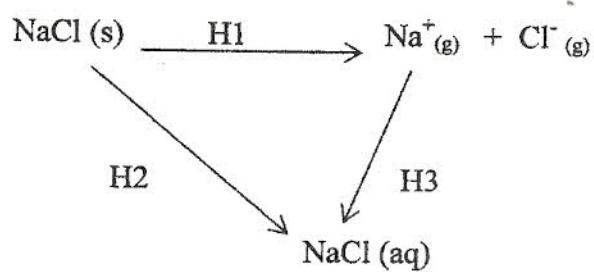(ii)   **Draw** an energy level diagram for reaction in (c)(i) above.   (2mks)

(d)The value of molar heat of combustion of methanol in (b) above obtained is less than the literature value. **State** one source of the error in the experiment   (1mk)

(e) Study the energy cycle diagram below and answer the questions that follow:

$NaCl$ (s) $\xrightarrow{\text{H1}}$ $Na^+_{(g)}$ + $Cl^-_{(g)}$

H2   H3

NaCl (aq)

(i) What does ΔH_1 and H2 **represent**?   (2 mk)

   H1

   H2

(ii) **Show** the relationship between ΔH_1, ΔH_2 and ΔH_3 (1 mk)

4. Use standard electric potentials for elements A, B, C, D and F given below to answer the questions that follow.

	E^{θ} (Volts)
A^{2+} (aq) + 2e $\longrightarrow$ A (s)	- 2.90
B^{2+}(aq) + 2e $\longrightarrow$ B (s)	-2.38
C^{+} (aq) + 2e $\longrightarrow$ C (g)	- 0.00
D^{2+} (aq) + 2e $\longrightarrow$ D (s)	+ 0.34
½ F_2 (g) + e $\longrightarrow$ F⁻ (aq)	+2.87
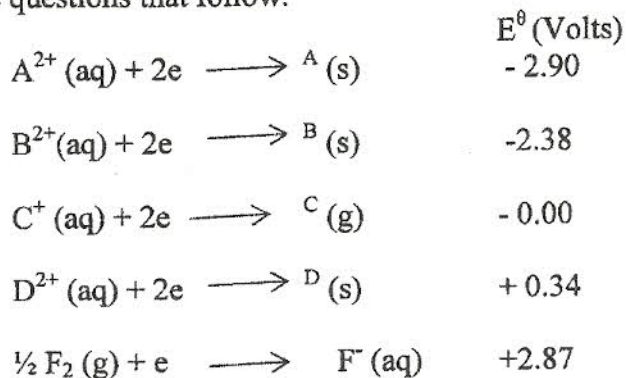
(i) Which element is likely to be hydrogen? Give **a reason** for your answer   (2 mks)

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

(iii) In the space provided **draw a labeled diagram** of the electrochemical cell that would be obtained when half – cells of elements B and D are combined   (2 mks)

(iv) **Calculate** the E^θ value of the electrochemical cell constructed in (iii) above   (2 mks)

(b) During the electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours

(i) Write an **ionic equation** for the reaction that took place at the anode   (1 mk)

(ii) **Determine** the change in mass of the anode which occurred as a result of the electrolysis process (Cu=63.5, 1 Faraday = 96,500 coulombs.   (2 mks)

5. The graph below represents a radioactive decay series for isotope H. Study it and answer the questions that follow
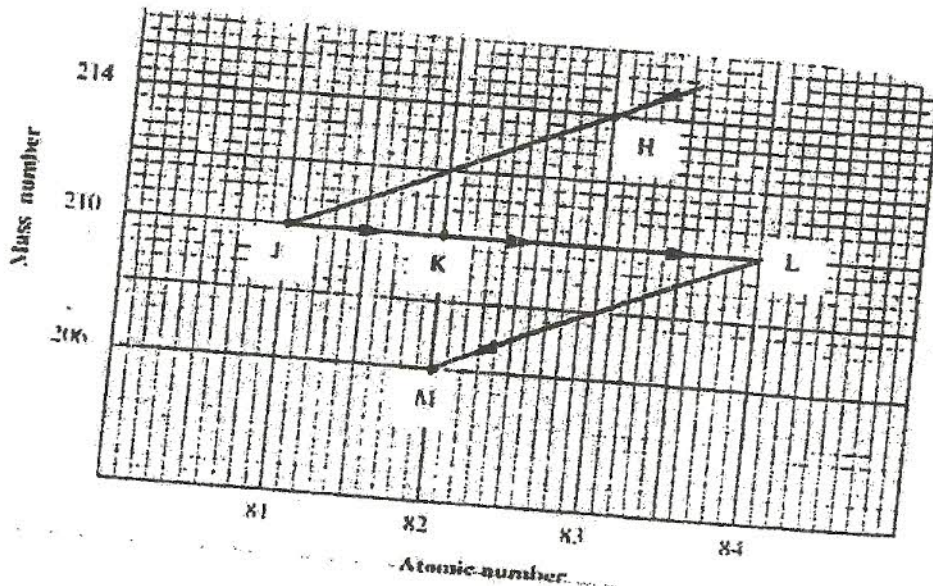
(a) **Name** the type of radiation emitted when isotope H changes to isotope J. (1 mk)

(b) Write an **equation** for the nuclear reaction that occur when isotope J changes to isotope K (1

c) **Identify** a pair of isotope of an element in the decay series (1 mk)

(d) 100 g of a radioactive substance was reduced to 12.5 g in 15.6 years.
Calculate the half – life of the substance. (2 marks

(b) Write 2 **differences** between chemical and nuclear reactions (2 mks)

Nuclear	chemical

(c) Write 2 **applications** of radioactivity in medicine (2 mks)

(d) **Define** half life (1 mk)

6. 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).

N								
P							M	V
Q	R			S				
							K	

(a) Identify:

    (i)   a metal that is denser than water.   (1mk)

    (ii)   A metal that is lighter than water.   (1mk)

(b) Which letter represents the element with the highest proton number?   (1mk)

(c) Write the electronic configurations of:

    R^{+}.. (1mk)

    M^{-}..(1mk)

(d) What type of structure and bond in element V?   (1mk)

    Structure...

   Bond...

(e) Write equation for the reaction that occurs between Q and K.   (1mk)

(f) Explain why element K has higher boiling point than that of M yet they belong to the same group.   (1mk)

(g) How do the ionization energies of Q and S compare? Explain your answer.   (1mk)

7. The scheme below shows the manufacture of sodium carbonate by the Solvay process. Study it and use it to answer the questions that follow.
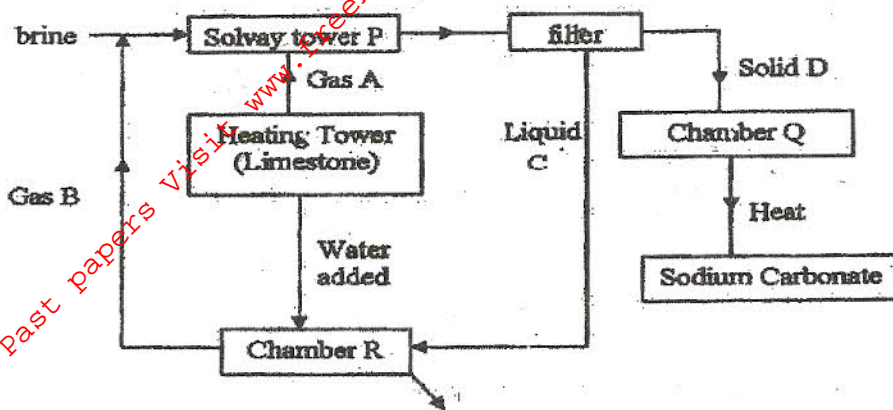
(a) **Name** gases:

    A

    B   (2mark)

(b) **Name**

    liquid C

    Solid D   (2mark)

(c) Write **equations** for the reactions taking place in   (2marks)

    Tower P

    Heating tower

(d) **Name** the by product formed in chamber R and give one of its uses   (2marks)
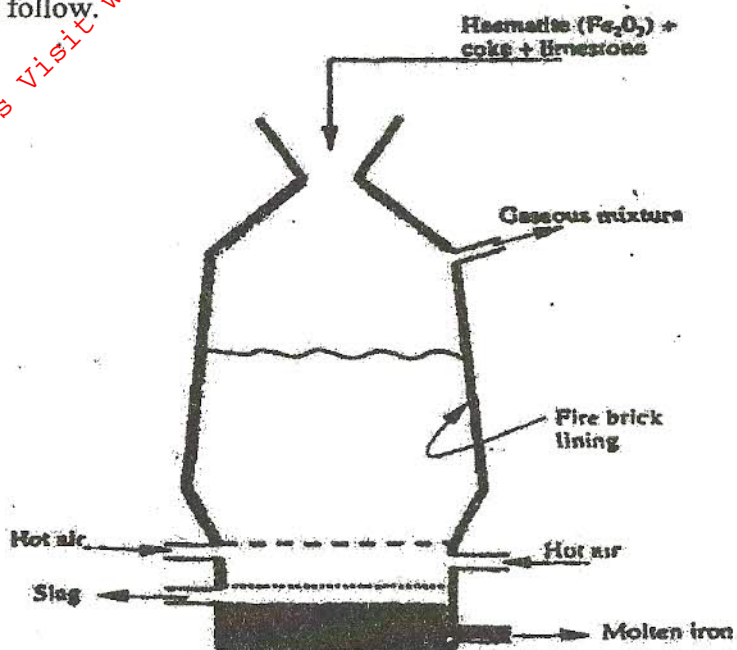
    Name

    Use

(c) **State** two uses of sodium carbonate   (2mark)

8. The extraction of iron from its ores takes place in the blast furnace. Study it and answer the questions that follow.

a) **Name**

  (i) One of the substances in the slag (1mk)

  (ii) Another iron ore material used in the blast furnace. (1mk)

  (iii) One gas which is recycled. (1mk)

B)**Write** 2 equations for the reduction of the major iron ore in Haematite (2 mks)

c) **State** the 2 purposes of limestone in the blast furnace. (2mks)

(d) **Give a reason** why the melting point of the iron obtained from the blast furnace is 1200^0 whil
that of pure iron is 1535°C   (1mk)

(2mk

(e) **State** two uses of steel

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