Name…………………………………… ………………….………… Index No: …………………….

233/1
CHEMISTRY
PAPER 1 THEORY
TIME: 2 HOURS

CHEMISTRY PAPER 1

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.
- Answer *all* the questions in the spaces provided.
- Mathematical table and silent electronic calculators may be used.
   All working **must** be clearly shown where necessary.

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidate's score
1-30	80	

1.   State **two** reasons why most apparatus in the laboratory are made of glass   (2mks)

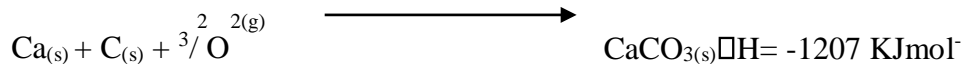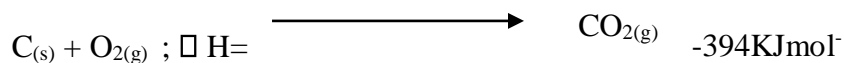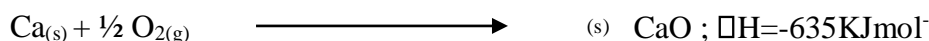……………………………………………………………………………………………..

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2.   The following is an organic compound represented as $CH_3CH_2COOCH_2CH_3$
        (i) Name the organic acid and alkanol used in making the compound   (2mks)

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        (ii) Name the organic compound and the gas formed when the alkanol in (i) above is reacted
            with Potassium   (1mk)

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3.   Use the information below to answer the question that follows

$Ca_{(s)} + ½ O_{2(g)}$ ⟶ $_{(s)}$ CaO ; ⬚H=-635KJmol⁻

$C_{(s)} + O_{2(g)}$; ⬚ H= ⟶ $CO_{2(g)}$ -394KJmol⁻

$Ca_{(s)} + C_{(s)} + {}^3/_2 O^{2(g)}$ ⟶ $CaCO_{3(s)}$⬚H= -1207 KJmol⁻

Calculate the enthalpy change for the reaction

4.   (a) What is the role of the following parts during fractional distillation of a mixture of water
        and ethanol
        (i) Fractionating column   (1mk)

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        (ii) Glass beads in the fractionating column   (1mk)

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(b) State any one application of fractional distillation process (1mk)

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5.   Name the process which takes place when:
       (i) Iodine changes directly from solid to gas (1mk)

       ………………………………………………………………………………………………..

       (ii) $Fe^{2+}_{(aq)}$ changes to $Fe^{3+}_{(aq)}$ (1mk)

       ………………………………………………………………………………………………..

       (iii) White sugar changes to black solid when mixed with excess concentrated sulphuric (VI) acid
                                                                                                    (1mk)

       ………………………………………………………………………………………………..

6.   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 their melting point (3mks)

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7.   (a) Name a suitable drying agent to be used to dry chlorine gas (1mk)
       ………………………………………………………………………………………………..

       (b) Chlorine reacts with red hot powder to give iron (III) chloride but not iron (II) chloride.
          Explain? (1mk)

       ………………………………………………………………………………………………..

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       (c) Sodium hydroxide reacts with chlorine to form bleaching powder. Write a balanced equation
          for the reaction (1mk)

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8.   The electronic arrangement of elements are represented by letters A to D are as follows
       A:2.8.6   B:2.8.2   C:2,8,1   D2:8.8
       (a) Select the element which forms
          (i)Double charged cation (1mk)

………………………………………………………………………………………………..

(ii) A soluble carbonate. (1mk)

       ………………………………………………………………………………………………..

       (b) Which element has the shortest atomic radius? (1mk)

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9.   Describe how a sample of Lead (II) chloride can be prepared using the following reagents dilute

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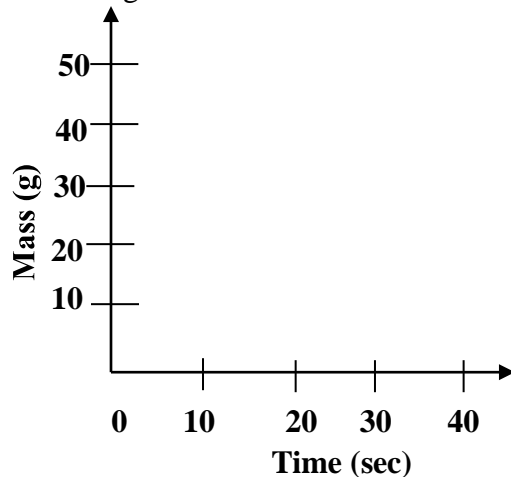**E-mail:** infosnkenya@gmail.com | ORDER ANSWERS ONLINE at www.schoolsnetkenya.com

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nitric (V) acid; dilute hydrochloric acid and lead carbonate   (3mks)

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10.   A radioactive element of mass 50g has a half-life of 10 seconds

(a) Sketch a graph of mass against time to show how the element mass varies with time   (2mks)

(b) Give **one** use of radioactive in industries   (1mk)

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11.   State and explain **one** disadvantage of using hard water in boilers   (2mks)

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12.   Hydrogen sulphide gas was passed through a solution of iron(III) chloride

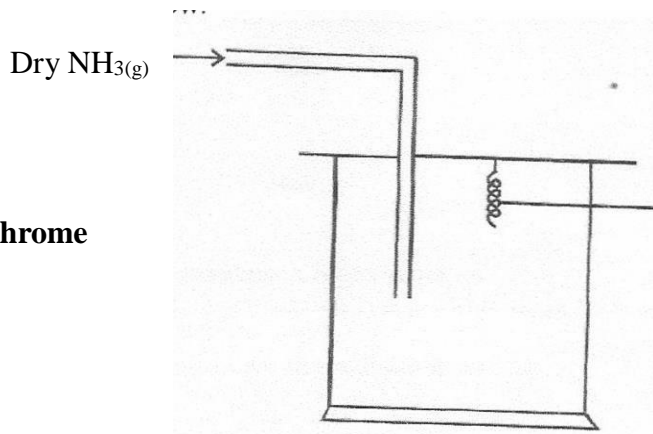(i) State and explain the observations made   (2mks)

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(ii) Write an ionic equation for the reaction taking place in (i) above   (1mk)

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13.   The apparatus below was set up to show the catalytic oxidation of ammonia. Study the diagram and answer the questions that follow

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Dry $NH_{3(g)}$ →

Hot nichrome wire

(i) Write an equation for the reaction that takes place in the gas jar (1mk)

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………………………………………………………………………………………………..

(ii) What is the role of hot nichrome wire? (1mk)

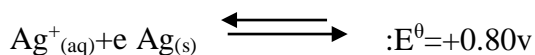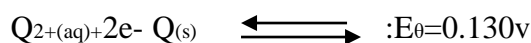………………………………………………………………………………………………..

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(iii) Write the formula of the complex ion formed when excess ammonia gas is passed through a solution containing Zn^{2+} ions. (1mk)

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14. A solution of silver nitrate was put in a container made of metal Q for 1 day. Given that:

$Q^{2+}_{(aq)} + 2e^- \rightleftharpoons Q_{(s)}$: $E_\theta = 0.130v$

$Ag^+_{(aq)} + e \rightleftharpoons Ag_{(s)}$: $E^\theta = +0.80v$

Determine whether or not a reaction occurred between silver nitrate and metal Q (2mks)

………………………………………………………………………………………………..

………………………………………………………………………………………………..

15. The table below shows the solubility of salt at various temperatures

Temperature	Solubility g/100g of water
0	36
40	30
80	25
110	20

What would happen if a sample of a saturated solution of the salt 40^oC is heated to 80^oC?

Explain (2mks)

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16.   The equation given below represents a redox reaction

$Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$
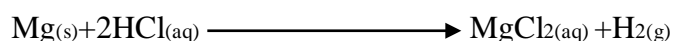
(i) Write the equation of the reduction process   (1mk)

………..

(ii) Which substances is oxidized?   (1mk)

………..

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17.   When a current of 1.5 amperes was passed through cell containing M^{2+} ions on metal M for 15
        minutes the mass of the cathode increased by 0.26g. (1F=96500C)

(i) Calculate the quantity of electricity used   (1mk)

(ii) Determined the relative atomic mass of metal M   (2mks)

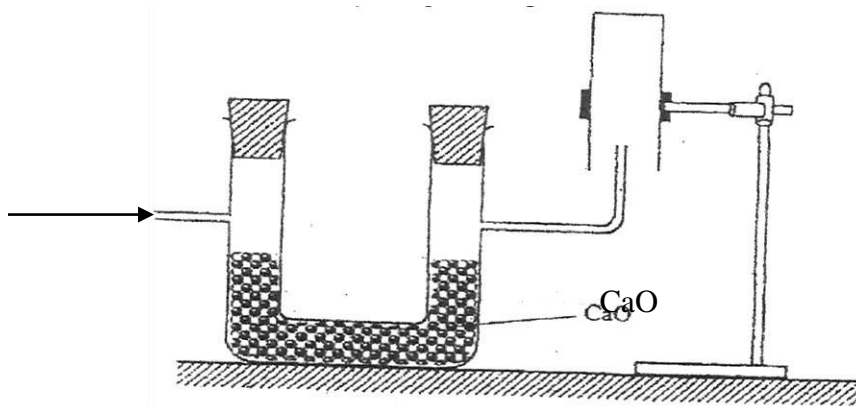18.   State any **two** differences between luminous and non-luminous flames   (2mks)

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19.   (a) State Graham's law of diffusion   (1mk)

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(b) The molar masses of gas **U** and **V** are 16.0 and 44.0 respectively. If the rate of diffusion of
U through the porons materials is 12cm$^{3-1}$. Calculate the rate of diffusion of V through the
same materials   (2mks)

20.   The set up below was used to collect a dry sample of a gas

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Give **two** reasons why the set-up cannot be used to collect carbon (IV) oxide gas (2mks)

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………………………………………………………………………………………………..

21.   Dilute sulphuric acid does not react fully with calcium carbonate while dilute hydrochloric acid reacts fully with calcium carbonate liberating carbon (IV) oxide. Explain (2mks)

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22.   On complete combustion of 0.5g of a hydro carbon; 1.257g of carbon (IV) oxide and 0.514g of water were produced. If the relative molecular mass of the hydrocarbon is 84, determine the molecular formula ($C=12, H=1, O=16$) (3mks)

21.   The conversion of SO_2 to SO_3 in the contact process is shown by the equation

$$2SO_{2(g)} + O_{2(g)} \longrightarrow 2SO_{3(g)} \quad \Delta H = -197KJ$$
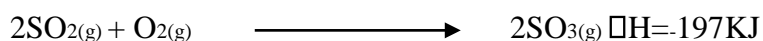
(a) What would be the effect of?

   (i) Increasing the concentration of Oxygen (1mk)

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………………………………………………………………………………………………..

   (ii) Increasing the temperature (1mk)

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(b) Write an equation for the sulphuric (VI) acid from Oleum (1mk)

………………………………………………………………………………………………..
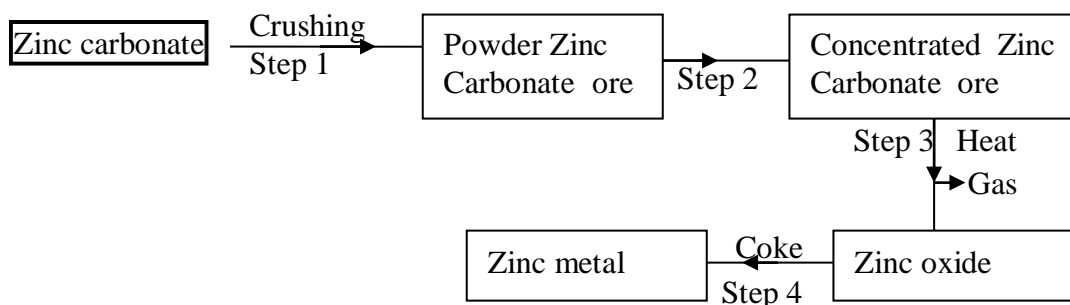
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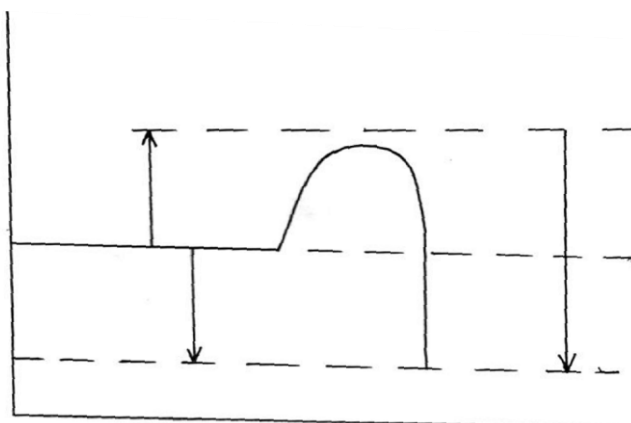
24. Sulphur burns in air to form sulpur (IV) oxide. A simple energy level energy level diagram for the reaction is given below. Study the diagram and answer the questions that follow:

ΔH_1
$S_{(g)} + O_{2(g)}$

ΔH_2
ΔH_3

Energy

$SO_{2(g)}$

Reaction co-ordinate

(a) What do the following represents? ΔH_1 and ΔH_3 (2mks)

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(b) Write an expression for ΔH_3 in terms of ΔH_1 and ΔH_2 (1mk)

…………………………………………………………………………………………………..

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25. Given the reaction below

$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$

State how the following factors affect the rate of reaction giving explanation (1mk)

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(a) Using Zinc powder instead of granules (1mk)

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…………………………………………………………………………………………………..

(b) Heating the reactants (1mk)

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26. The flow chart below shows steps used in the extraction of zinc from one of its ores

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Zinc carbonate →(Crushing Step 1)→ Powder Zinc Carbonate ore →(Step 2)→ Concentrated Zinc Carbonate ore

Concentrated Zinc Carbonate ore → Step 3 Heat → Gas → Zinc oxide

Zinc oxide →(Coke Step 4)→ Zinc metal

(a) Name the process that is used in step 2 to concentrated   (1mk)

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(b) Write an equation for the reaction which takes place in step 3   (1mk)

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………..…………………………………………………………………………………….. (c)

Name one use of zinc other galvanizing   (1mk)

…………………………………………………………………………………………………..

…………………………………………………………………………………………………..

27.   The set up below used to obtain a sample of iron

Carbon
Excess Iron (III) oxide
Oxygen →
Heat **Heat**
Gas
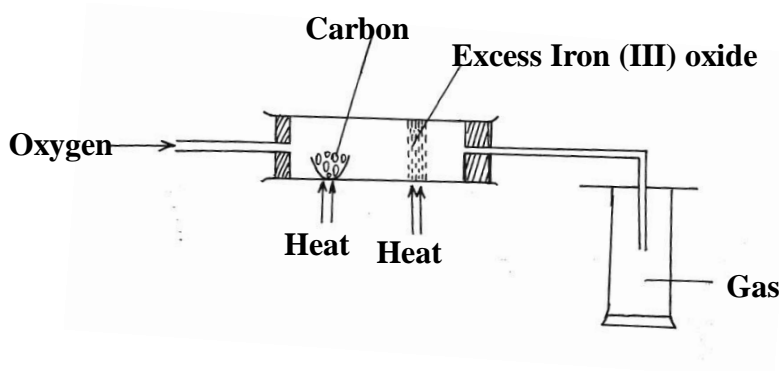
                                                                (a)   Identify the gas

collected   (½ mk)

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(b) What observation is made on the excess iron (III) oxide?   (½ mk)

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(c) Write equations for the two reactions that take place in the combustion tube   (2mks)

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28. The table below shows PH values of some solutions

Solution	A	B	C	D
PH values	13	7	1	6.5

(a) What solution reacts vigorously with Magnesium metal? (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

(b) Which solution is likely to be that of Lemon juice? (1mk)

…………………………………………………………………………………………..

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(c) Which solution forms complex ions with zinc (II) oxide? (1mk)

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29. When a few drops of aqueous ammonia were added to Copper (II) Nitrate solution a light blue precipitate was formed. On addition of more aqueous ammonia a deep blue solution was formed. Identify the substances responsible for the:

(a) Light blue precipitate (1mk)

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(b) Deep blue solution (1mk)

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30. Explain why there is general increase in the first ionization energies of the elements in period 3 of the periodic table from left to right (2mks)

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