SAMIA SUB-COUNTY JOINT EXAMINATION 2021
CHEMISTRY PAPER 1
MARKING SCHEME

1.

   a. Time taken for half the amount of radio isotope to decay
     (1mk)

            1   2   3
   b. 100   50   25   12.5   (1mk)
      3=15.6years

      1=$\underline{15.6}$ =5.2 years   (1mk)
         3

2.

  - Pass a magnet through the mixture to attract iron which is magnetic. Lead (ii)carbonate and sodium carbonate remains.   (½mk)
  - Add water to the mixture of sodium carbonate and lead(ii)carbonate and stir. (1mk)
  - Sodium carbonate dissolves unlike lead(ii)carbonate
  - Filter to obtain lead(ii)carbonate as the residue to rinse it, allow to dry   (½mk)
  - Run water through the residue to rinse it, allow to dry.   (½mk)
   (reject : dissolve the mixture in water)

3.

   a. $H^+_{(aq)} + OH^-_{(aq)}$ $H_2O_{(l)}$ (1mk)
   b. Y2 complete neutralization/end point   (1mk)

      Y1 and Y2 neutralization is taking place producing heat   (1mk)
      Y2 and Y3 reaction has come to end; products are cooling releasing heat to the surrounding   (1mk)

4.

   a. Exp 1-No change on the dry cloth (½mk) due to the absence of hypochlorous acid (½mk)
     Exp 2-The cloth turns to white /bleached due to the presence of chloric (i)acid/hypochlorous acid.   (1mk)
   b. $Cl_{2(g)} + H_2O_{(l)}$ $HCl_{(aq)} + HOCl_{(aq)}$ (1mk)
     Dye $+ HOCl_{(aq)}$ (Dye $+O) + HCl_{(aq)}$ (1mk)

5.

  a. Group VI, period 2   (1mk)
  b. A_2B_3 (1mk)

6.

     i. No effect on position of equilibrium. The volume of gaseous reactants and products is the same.   (1mk)
     ii. There is more formation of iron(iii)oxide, magnesium is more reactive than iron thus reacts

with steam at the expanse of iron and this lowers concentration of water molecules. (1mk)

iii.Equilibrium shifts to the left, steam will react with Mg i.e remove steam. (1mk)

7.
  i.   A   (1mk)
  ii. B   (1mk)
  iii. C   (1mk)
8.
  i.A white solid was formed (1mk) inside combustion tube closer to the cotton wool soaked in concentrated hydrochloric acid. Ammonia is less dense hence diffuse faster.   (1mk)

  ii. $NH_{3(g)} + HCl_{(g)}$ $NH_4Cl_{(s)}$ (1mk)

9. a.   Fluorine   (1mk)
        Potassium   (1mk)

   b.Anode $2F^-_{(l)}$ $F2_{(g)} + 2e^-$ (1mk)
     Cathode $2K^+_{(l)} + 2e^-$ $2K_{(l)}$
10. a. Froth floatation
       Concentrating the mineral ore by making impurities to sink at the bottom.   (1mk)
       Tin   (1mk)
11. Acetylene /Hydrogen   (1mk)
12. a. Dative bond/Coordinate bond   (1mk)
       Covalent bond   (1mk)
    b.8 electrons   (1mk)
13. Value of n in the formula
       Moles of NaOH=$\frac{15.6*0.16}{1000}$ =0.002496moles   (½mk)

       Mole ratio of acid: base =1:2
       Thus moles of acid =$\frac{0.002496}{2}$ =0.001248moles   (½mk)

       If 25cm³   0.002428moles
       1000cm³ $\frac{1000*0.001248}{25}$ =0.04992M   (½mk)

       Thus RFM; $\frac{6.3}{0.04992}$ = 126   (½mk)

       $H_2C_2O_4.nH_2O$=126,
90+18n=126,
18n=36

n=2   (1mk)

14.
   a. Fractional crystallization   (1mk)
   b. Observation 10g of potassium Chlorate (18-8=10g)crystallizes while no KNO_3 crystallizes. (1mk)
   Reason : The solubility of one salt has no effect on the solubility of other salt.   (1mk)

15.
   a. Butanoic acid   (1mk)
     Butane   (1mk)
   b.

                          (1mk)

16. Add excess lead(ii) carbonate to the nitric(v) acid: warm to form lead(ii) nitrate, water and carbon (iv)oxide   (1mk)

   $PbCO_{3(s)} + 2HNO_{3(aq)}$ $Pb(NO_3)_{2\ (aq)} + H_2O_{(l)} + CO_{2(g)}$

     -   Filter off excess lead(ii) carbonate   (½mk)
     -   To the filtrate, add dilute hydrochloric acid and stir   (½mk)
     -   Filter to obtain lead(ii)chloride as residue. All the residue to dry   (½mk)
17.
     i. Magnesium burns with a white bright flame. White solid formed
       White residue is formed   (1mk) (Any one)

     ii.Potassium will react explosively   (1mk)

     iii.If magnesium is heated first it reacts with air in the setup, to generate steam that reacts with
       magnesium.   (1mk)
18.
     i. Zinc/Zinc metal   (1mk)
     ii. $Zn(NH_3)^{2+}_4$ (1mk)
     iii. $Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$ $BaSO_4(s)$ (1mk)

19. a.E.M.F=$E_{reduction}$-$E_{oxidation}$

(-0.44)-(-0.76)

   -0.44 + 0.76=+0.32V   (2mks)

  b.

Iron spoon cathode

Silver anode

AgNO$_3$(any soluble salt of Ag)

20. a. Frasch process   (1mk)

  b. To melt sulphur deposit   (1mk)

  c. – Vulcanization

    - Manufacture of sulphuric acid

    -Any other/Sulphur based drugs   (Any two correct)   (1mk)

21. Fume chamber   (1mk)

  To dissolve /remove carbon (iv) oxide   (1mk)

  Carbon /coke   (1mk)

22. a. Compress to 2000 ATM then cool to -200ºC. Then carry out fractional distillation.(2mks)

  b. Any appropriate diagram but labeled   (2mks)

23. Heat change that occurs when 1M of a substance is made from its constituent elements under STP conditions.   (1mk)

  ii. Heat of combustion = -2296 + -2686   (1mk)

               = -4976KJmol^{-1} (1mk)

24. a. i. Magnessium hydrogen carbonate and calcium hydrogen carbonate   (1mk)

    ii. Calcium sulphate, calcium chloride, magnesium sulphate, magnesium chloride. (1mk)

b.By boiling during which magnesium or calcium ions are precipitated out as their respective carbonate   (1mk)

c.Results to the formation of kettle fur/furring which reduces heat and electrical conductivity of the boilers hence reduced efficiency.   (1mk)

d. Formation of scum with soap which leads to soap wastage and destruction of some fabrics such a

as silk   (1mk)

25. Aluminium has more protons in nucleus than sodium; leading into higher nuclear charge hence nuclear attraction; thus leads to stronger metallic bond in aluminium than in sodium.

26. Value of X=143   (½mk)

Y=56   (½mk)

27. –Cause respiratory problems   (½mk)

- Leads to formation of acidic rain which has adverse effects on living organism.