MARKING SCHEME

233/1
CHEMISTRY
Paper 1
THEORY

March /April 2020
Time: 2 Hours

ARISE AND SHINE TRIAL 1 EXAM
March/April-2020

1. [a]. Under what condition does the Bunsen burner produce luminous flame?[1 marks]
- When the air hole is closed

[b]. Luminous flame is yellow and sooty. Explain.   [2 mark]
- It consist of hot glowing carbon particles that gives out 1ight√(1mk)on cooling the carbon particles form soot√(1mk)

2.(a). Distinguish between isotopes and allotropes   [2 marks]
- Isotope- Atoms of the same element with some atomic number but different mass number (1mk)√

- Allotropes – Different crystalline forms of an element in same physical state√ (1mk)

(b). Name one allotrope of Sulphur that is stable at temperature above 96ºC   (1 mark)
- Monoclinic √(1mk)

3. Sodium metal burns with a yellow flame in excess oxygen forming yellow solid. The yellow solid react with water to form gas F.
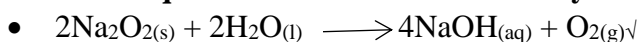**(a). Name the yellow solid   [1 mark]**
- Sodium peroxide √ (1mk)

(b). Identify gas F   (1 mark)
- Oxygen gas √ (1mk)

(c). Write an equation for the reaction of the yellow solid with water.   (1 mark)
- $2Na_2O_{2(s)} + 2H_2O_{(l)} \longrightarrow 4NaOH_{(aq)} + O_{2(g)}$√

       (i). Missing state symbols penalize √½

       (ii). Equation not balanced award O

4. (a). State Boyle's law.   (1 mark)
- Volume of a fixed mass of a gas is inversely Proportional to its pressure at constant temperature √(1 mk)

(b). Explain why the pressure of a fixed mass of a gas increases with increase in temperature in a fixed volume container. **(2 marks)**

- Increase in temperature increases the kinetic energy of gas particles √½

- This increases the number of collisions per unit time √1,this results in increase in pressure √1
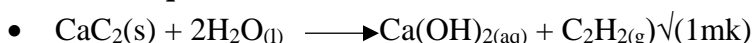
$$√½ \text{ mk}$$

5. The set up in figure 1 can be used to prepare ethyne gas. Use it to answer the questions that follow.
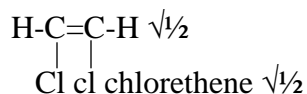
[a]. Name substance A **[1 mark]**

- water√(1)

[b]. Write an equation for the reaction which occurred in the flask **[1 mark]**

- $CaC_2(s) + 2H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)} + C_2H_{2(g)}$ √(1mk)

  - Penalize ½ for missing or wrong state symbol

  - Award O if the equation is not balanced

(c). Draw and name the structure of the compound formed when one mole of ethyne reacts with one mole of chlorine gas. **(1 mark)**

H-C=C-H √½

Cl cl chlorethene √½

6. starting with zinc carbonate solid describe how zinc hydroxide can be prepared in the laboratory. **[3 marks]**

- Add excess zinc carbonate √ ½ to dilute Hcl/HNO₃ or H₂SO₄. Filter√ ½ to the filtrate add controlled volume of sodium hydroxide solution √½ ,Filter √ ½ ,wash the residue with distilled water ½ √acid dry between filter papers √½

  NB aqueous Ammonia can be used instead of sodium hydroxide

7. 24.0cm³ of 0.18M hydrochloric acid was added to 0.38g of sodium carbonate solid. Calculate the mass of sodium carbonate that did not react. (0=16, Na=23 C=12) **[3 marks]**

R.F.M of Na_2CO_2 = 106 ½

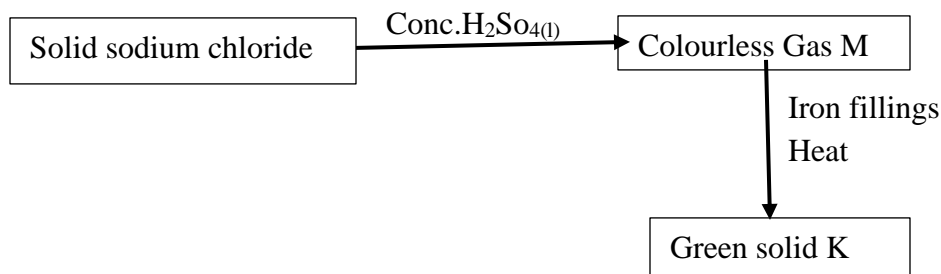- Moles of Hcl = $\frac{24 \times 0.18}{1000}$ = 0.00432 moles √½

Mole ratio Na_2CO_3 : Hcl

1 : 2 √ ½

Moles of Na_2CO_3 = $\frac{0.00432}{2}$ = 0.00216 moles √½

2

Mass of Na_2CO_3 = 0.00216 x 106 = 0.22896g√1

Mass of Na_2CO_2 that remained =0.38-0.22896g

=0.15104g √½

8. The reaction scheme below represent the preparation of gas M.

```
┌──────────────────────┐   Conc.H₂So₄(l)   ┌──────────────────────┐
│ Solid sodium chloride │ ────────────────▶ │  Colourless Gas M    │
└──────────────────────┘                    └──────────────────────┘
                                                      │  Iron fillings
                                                      │  Heat
                                                      ▼
                                            ┌──────────────────────┐
                                            │   Green solid K      │
                                            └──────────────────────┘
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 [a]. Identify gas M and solid K

Gas M : Hydrogen chloride gas √ [½ mark]

Green solid K: Iron (II) chloride (½ mark)
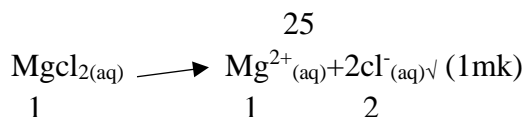
[b]. Describe a chemical test for gas M (2 marks)

- Introduce a glass rod dipped √1
- Concentrated ammonia solution√ into gas M, dense white fumes √are formed indicating presence of hydrogen chloride gas

9. (a). 0.95g of Magnesium Chloride was dissolved in 250cm³ of water. Calculate the molar concentration of Chloride ions in the solution. (Mg=24 Cl=35.5) (3 marks)

Moles of magnesium chloride =0.95 =0.01moles√ ½

Molarity of $Mgcl_2$ $\underline{0.01x1000}$ = 0.04M √½

25

$Mgcl_{2(aq)} \longrightarrow Mg^{2+}_{(aq)}+2cl^{-}_{(aq)}$√ (1mk)

 1   1   2

0.04

Moles of Cl- =0.04x2 = 0.08M √1

10. (a). What is an acid-base indictor? (1 mark)

- Acid base indicator-substance that have definite colour in an acid and different definite

colour in a base

(b). Describe how the pH of a soil sample can be determined in the laboratory. (2 marks)

Add water √½ mk to soil sample in a beaker, stir decont the mixture into a test tube. Add

universal indicator solution √½ mk to soil solution match colour √½ mk of mixture with

universal indicator chart and record pH value √½ mk

11. In an experiment, Hydrogen sulphide gas was bubbled into a solution of iron (III) chloride. State and explain the observations made. **(3 marks)**
Yellow iron (III) chloride solution changes to pale green Iron (II) chloride √½ mk yellow solid formed √½ mk hydrogen sulphide gas reduces Iron (III) ions to iron (II) ions 1mk and it is oxidized to Sulphur 1mk
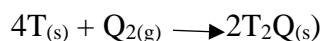
12. The diagram below represents part of the periodic table. Use it to answer the questions that follow. The letters are not the actual symbols of the elements. [2 mark]

M						Q		
T	V		W					

 [a]. Write the Electronic arrangement for the stable ion formed by M. **[1 marks]**
            2

(b). Write an equation for the reaction between T and Q. **(1 mark)**

$4T_{(s)} + Q_{2(g)} \longrightarrow 2T_2Q_{(s)}$ – must be balanced

                              - Wrong or missing state symbols penalize (1/2 mk)

(c). Compare the melting pointing of element T and V. **(1 mark)**

- V has higher melting point than T √1mk

- V has stronger metallic bond than T (½ mk)

13. Study the set-up below and answer the questions that follow.

State and explain the observation made when the switch is closed. (2 marks)

- No deflection on the ammeter 1mk

- Ammonia in methylbenzene does not ionize 1mk hence does not conduct on electric current

14. (a). Define molar heat of combustion. **(1 mark)**

- Molar heat of combustion –It is the enthalpy change that occur when one mole of a substance is completely burned in oxygen under standard condition

(b). X g of element Q was completely burned in air. The heat evolved was used to hear 250cm³ of water. The temperature of water rose from 32ºC to 50ºC. Molar heat of combustion of element Q is -360 kJmol⁻ .Calculate the value of X. (Density of water is 1gcm⁻³ and specific heat capacity of water is 4.2kJ mol⁻³ R.A.M of Q=24) **(2 marks)**

Heat change = $\underline{250g \times 4.2kJmol^{-1} \times 1824g}$ of Q⟶360kJ
          1000 $\underline{24 \times 18.9}$⟵———18.9kg
                      360 √ ½   =1.26g √½
     =18.9kJ √ ½

15. A sample of water is suspected to contain chloride ions. Describe an experiment that can be carried out to determine the presence of chloride ions. **[3 mark]**
To a sample of water in a test tube add Lead (II) nitrate solution 1mk and warm the mixture √½ .A whit precipitate √½ formed that dissolves √½ mk warming

16. In contact process, Sulphur (IV) oxide reacts with oxygen to from Sulphur (VI) oxide in presence of a catalyst.
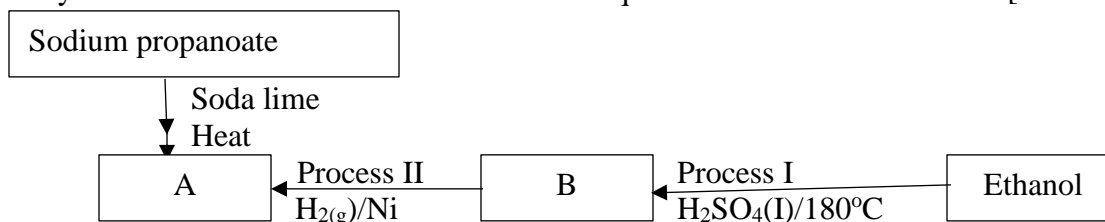
(a). Name the preferred catalyst for this reaction. **(1 mark)**

    Vanadium (V) oxide √1mk

(b). Give two uses of sulphuric (VI) acid **(2 marks)**
- Used to make fertilizers e.g. ammonium sulphate
- Used in Lead acid accumulators
- Use to make points
- Used to make detergent   mark the first two

17. Study the reaction scheme below ad answer the questions that follow. **[1 mark]**

a). **Identify substances** (1 mark)
    A-Ehane √½
    B- Ethene √½

[b]. **Name process I** [1 mark]
- Dehydration √1mk

(c). **Name another substance produced when Sodium Propanoate react with Soda lime.** (1 mark)
- Sodium carbonate √1mk

18. The solubility curve of potassium nitrate is shown below.

[a]. **Determine the solubility of potassium nitrate at 40ºC** [1 mark]
- 60g/100g of H_2O √1mk

[b]. **Determine the molar concentration of saturated potassium nitrate at 40ºC**
(K = 39.0, O =16.0 N=14.0 and density of water 1g/cm^3 (2 marks)

    Molarity of KNo_3 of 40ºc

    60g of KNo_3 100cm^3

        ?←1000cm$_3$

$\underline{60 \times 1000}$ = 600g/litre √1mk
   100
R.f.m of KNo_3 =39+14+48=101 √$^1/_2$ mk

Molarity of KNo_3 = $\underline{600}$ = 5.9406M ½
        101

19. Sample of urine from three participants W, X and P at an international sports meeting were spotted onto a chromatography paper alongside two from illegal drugs,A_1 B_2. A Chromatogram was run using methanol. The figure below shows the chromatogram.

(a). **Identify the athlete who had used an illegal drug.** (1 mark)
- X

(b). **Which drug is more soluble in methanol. Give a reason.** (2 marks)
- B_2 √½ mk. It has moved greater distance from the baseline √½ mk

20. State and explain the change in mass that occur when the following substances are separately heated in open crucibles.

(a). **Magnesium ribbon** [1 mark]
- Mass increase √½ mk Magnesium react with oxygen to form magnesium oxide √½ mk

(b). **Sodium carbonate** [1 mark]
- Mass does not change √ ½ mk sodium carbonate is not affected by heat √½ mk

21. With the help of a well labeled diagram, draw a set-up of an arrangement of assembled apparatus that can be used to prepare dry hydrogen gas, including the appropriate reagents. **[3 marks]**
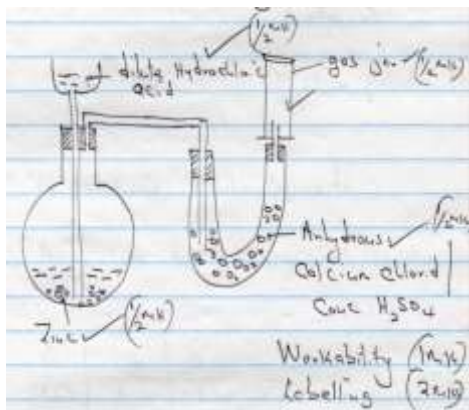
22. Dry arbon (II) oxide gas was passed over heated lead (II) oxide.

(a). Write an equation for the reaction. **(1 mark)**

- $PbO_{(s)} + CO_{(g)} \longrightarrow Pb_{(s)} + CO_{2(g)}$

    -Equation must be balance

    -missing or wrong state symbols penalize (½ mk)

(b). Give one industrial application of the above reaction. **(1 mark)**

- Carbon (II) oxide is used in extraction of less reactive metals

23. A student burnt magnesium ribbon in a gas jar full of Sulphur (IV) oxide gas

(i). State two observations made in the gas jar. **(2 marks)**
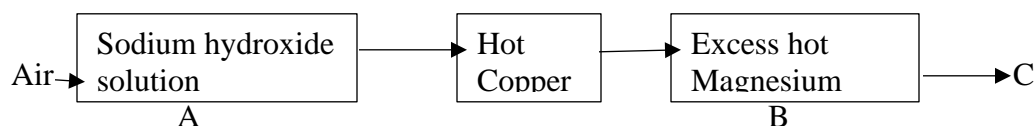
    - White solid formed√1

    -Yellow specks formed√1

(ii). Write an equation for the reaction that took place. **(1 mark)**

- $2Mg_{(s)} + SO_{2(g)} \longrightarrow 2MgO_{(s)} + S_{(s)}$

    -Equation must be balanced
    -wrong or missing state symbols penalize (½ mk)

24. Air was passed through reagent as shown below.

Air→	Sodium hydroxide solution A	→ Hot Copper	→ Excess hot Magnesium B	→C

(i).State the role of sodium hydroxide solution. **(1 mark)**

- To remove carbon (IV) oxide

(ii). Name one component in C. Explain. **(1 mark)**

Argon or Helium $\sqrt{}$½ mk. It is unreactive $\sqrt{}$½ mk

25. Analysis of a compound showed that it had the following composition. 69.42% Carbon, 4.13% Hydrogen and the rest Oxygen

Determine the empirical formula of the compounds. **(3 marks)**

C	H	O
$\underline{69.42}$	$\underline{4.13}$	$\underline{26.45}$
12	1	16 $\sqrt{}$1
$\underline{5.782}$	$\underline{4.13}$	$\underline{1.653}$
1.653	1.653	1.653x10 $\sqrt{}$1
3.49x10	2.49x10	1
$\underline{35}$	$\underline{25}$	$\underline{10}$
5	5	5 $\sqrt{}$½
7		2

$C_7H_5O_2 \sqrt{}$ ½
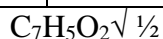
26. Study the reaction scheme below and answer the questions that follow. **[1 mark]**

(a).Identify

i. Black solid Q **(1 mark)**
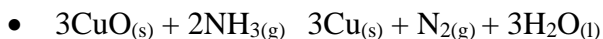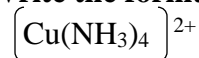
- Copper (II) oxide

ii. Gas A **(1 mark)**

- Nitrogen gas

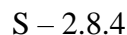**(b). Write an equation for the reaction between ammonia and black solid Q.** **(1 mark)**

- $3CuO_{(s)} + 2NH_{3(g)}$ $3Cu_{(s)} + N_{2(g)} + 3H_2O_{(l)}$

(c). Write the formula of the complex ion in deep blue solution. **(1 mark)**
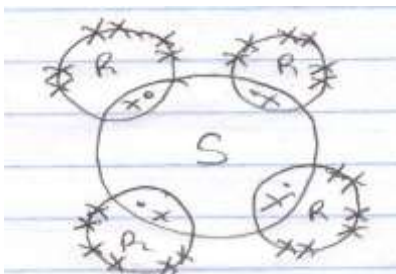
$\left[Cu(NH_3)_4 \right]^{2+}$

27. Element S has an atomic number of 14 and R has an atomic number of 17

(a). Write the formula of the ion of elements. **(1 mark)**

S – 2.8.4

b). Using dot (.) and cross (x) diagrams show how S an R combine to form a compound. (2 mark)

28. Explain why the following substances conduct an electric current.

A

(a). Aluminium metal   **[1mark]**

- It has delocalize electrons √1

(b). Molten magnesium chloride   **(1 mark)**

- It has mobile ions √1