NAME:……..CLASS……SCHOOL:……..ADM.NO ……

233/1

CHEMISTRY PAPER 1

THEORY

2 HOURS

SCHOOL -BASED EXAMINATION

MARKING SCHEME

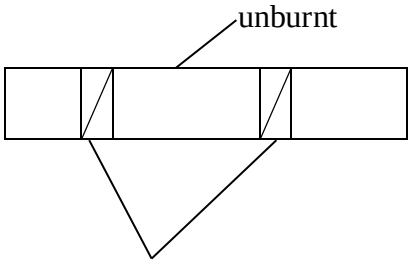
INSTRUCTIONS

- Answer **all** the questions in the spaces provided
- Mathematical tables and electronic calculators **may** be used
- All workings **must** be clearly shown where necessary

For Examiner's Use Only

Questions	Maximum Score	Candidates Score
1-25	80	

1. A wooden splint was slipped through a region of a particular flame in the laboratory and was burnt as shown in the diagram below:



a) Name the type of flame the splint was slipped through: (1mk)

-Non-luminous

b) Explain why the splint was burnt the way it is shown in the diagram(2mks)

-Middle part of the flame not hot

-Due to unburnt gas

-While the outerpart is hot due to complete combustion.

2. The electron arrangement of ion x^{3+} and Y^{2-} are 2.8 and 2.8.8 respectively.

a)In which group do X and Y belong (1mk)

X-group III

Y-group VI

b)State the atomic numbers of X and Y (1mk)

X- 2.8.3

Y- 2.8.6

c)Write the formula of compound formed when X and Y react. (1mk)

X_2Y_3

3. a)State Gay Lussacs law(1mk)

When gaseous read, they do so in volumes which bear simple ratio to one another and to the products if gaseous.

b)10cm^3 of a gaseous hydrocarbon C_2H_x required 30cm^3 of oxygen for complete combustion . If steam and 20cm^3 of carbon (IV) oxide gas were produced what is the value of X (2mks)

$C_2H_X + O_2 \longrightarrow 2CO_2 + 2H_2O$

10 30 20

1: 3 2

H=4

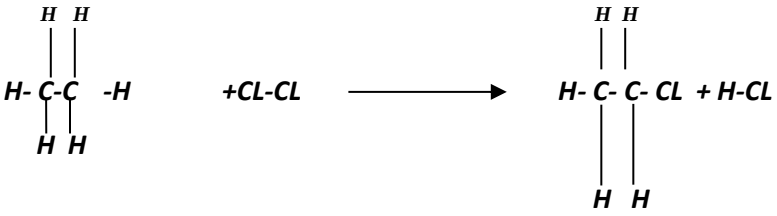
C_2H_4

4. Some average bond energies are given below

Bond	Energy in KJ/Mol
C-C	348
C-H	414
CL-CL	243
H-CL	340
C-CL	432

a) Calculate the energy change for the reaction below : (3mks)

$C_2H_6 + CL_2 \longrightarrow CH_3H_2CL_{(g)} + HCL_{(g)}$



Product 3075-3190 =-115 KJ/m

Reacts

C-H = 414X6

C-C =348

CL-CL=243

3075

b)Draw an energy level diagram for the above reaction (1mk)

C_2H_6+CL_2

Energy ***-115KG/MOL***

C_2H_5CL + HC

Reaction path

5.The equation below shows a reversible reaction.

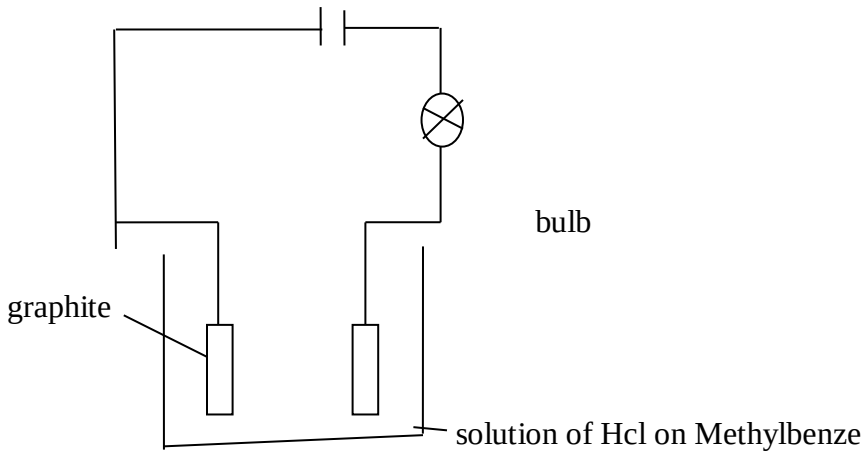
H_3O + + HSO_4^- $\rightleftharpoons$ H_2O + H_2SO_4)

i) Identify the acid in the forward reaction and explain. (2mks)

H_3O^+

Explain because it has donated a proton

ii)Study the diagram below and answer the questions that follow:



a)What observation was made during the experiment? Explain ($1^1/_2$ mk)

- ***Bulb does not light***
- ***Hcl in methylbenzene is not ionized***

b) What observation would be made if the solution of hydrogen chloride in methylbenzene was replaced with a solution of hydrogen chloride in water? Explain ($1^1/_2$ mk)

-Bulb will light

-Hcl in water is ionized

6. Use the equation below to answer the questions that follow:

$K^{+(g)} + Cl^{-}_{(g)} \longrightarrow Kcl_{(s)} \quad \Delta H_1 = -701$ KJ /Mol

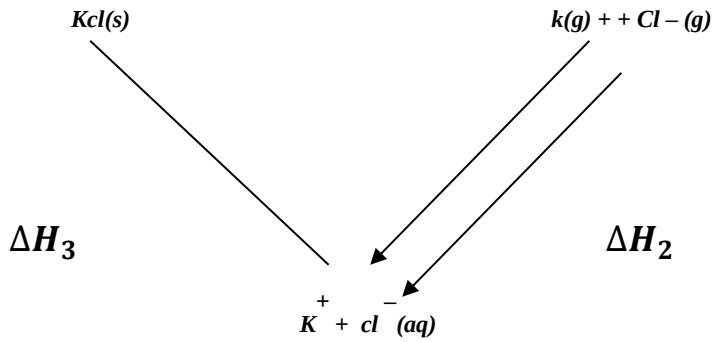
$KCL_{(s)} + Cl^{-}_{(g)} \xrightarrow{H_2O} K^{+}_{(aq)} + CL^{-} \quad \Delta H_2 = +15$KJ/mol

i) What is the name of ΔH_1 (1mk)

-lattice energy

ii)Draw an energy cycle and use it to calculate the heat change for the process. (3mks)

$K^{+}_{(g)} + Cl^{-}_{(g)} \xrightarrow{H_2O} K+ (aq) + Cl^{-}_{(aq)}$



$\Delta_{H3} = \Delta_{H1} + \Delta_{H2}$

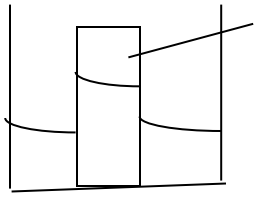
$15 = 701 + H_2$

$15 - 701 = \Delta H_2$

ΔH_2 = = - 686 KJ/Mol

7. A sample of water is suspected to contain sulphate ions . Describe an experiment that can be earned out to determine the presences of sulphate ions. (3mks)
   - ***Add $Ba(NO_3)_2$) / Bacl2 to the suspected water.***
   - ***A white ppt will be formed***
   - ***To the mixture above add dil Hcl if white ppt persist- it contain SO_4^{2-} ions***
8. A water trough, aqueous sodium hydroxide, burning candle, watch glass and a graduated gas jar were used in an experimental set up to determine the percentage of

active part of air. Draw a well labeled diagram of the set up at the end of the experiment. (3mks)



9. 5g of calcium carbonate were allowed to react with $25cm^3$ of 1m Hcl until there was no further reaction. Calculate the mass of calcium carbonate that remained un reacted. (3mks)

$CaCo_3$+2Hcl ⟶ $Cacl_2$ + CO_2 + H_2O

1 mole =1000

?=25

=0.025moles

Mole ratio of $CaCo_3$: Hcl

Moles of $CaCo_3$ = $\frac{0.025}{2}$ =0.0125

0.0125 moles

1 mole= 106g

0.0125=?

1.325g

5-1.3225

=3.675g

10. Solutions can be classified as acids, bases or neutral. The table below shows solutions & their PH values.

Solution	PH value
K	1.5
L	7.0
M	14.0

a) Select any pair that would react to form a solution of PH 7 (1mk)

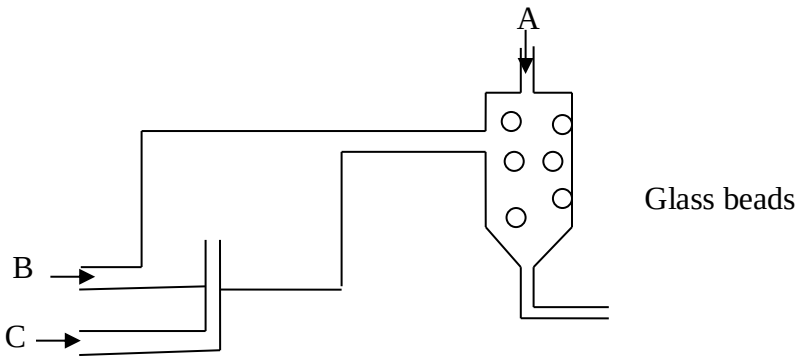
K and M

b) Identify two solutions that would react with Aluminium hydroxide. Explain. (2mks)

K and M

$Al(OH)_3$-is amphoteric

11. The Diagram below shows industrial manufacture of hydrochloric acid.



a) Name substance A , B and C (3mks)

A: Chlorine

B:Hydrogen

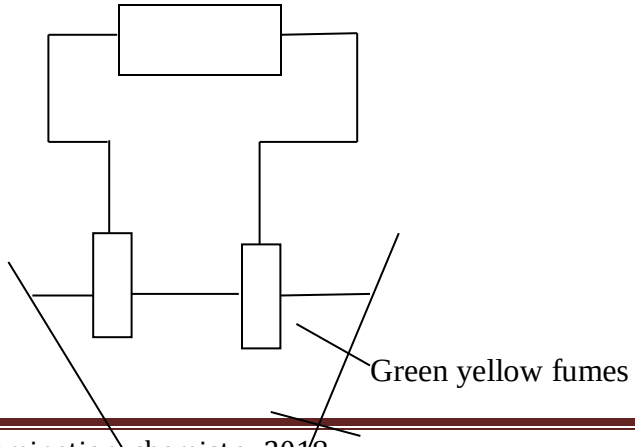
C:Water

b) What is the purposes of glass beads.(1mk)

Increase the surface area for dissolving hydrogen chloride gas.

12. Some sodium chloride was found to be contaminated with copper (II) oxide. Describe how a sample of sodium chloride can be obtained from the mixture. (2mks)
    - ***Add water to the mixture –Nacl dissolve while Copper (II) oxide does not dissolve.***
    - ***Filter the mixture to obtain Nacl as filtrate and CUO as residue.***
    - ***Evaporate the filtrate to obtain crystals of Nacl.***

13. Use the set up below to answer the questions that follows



Molten pb cl_2

a) On the diagram label the cathode (1mk)

b)Write the equation of the reaction on the anode. (1mk)

$2cl^-_{(l)} \longrightarrow cl_{2(g)} + 2e$

14. In the Haber process, the industrial manufacture of ammonia is given by the following equation.

$N_{2(g)} + 3H_{2\,(g)} \rightleftharpoons 2\,NH_{3\,(g)}$ $\Delta H = -92KJ/Mol$

Name the catalyst used in this process (1mk)

-Finely divided iron

What is the effect of the following in the yield of ammonia.

i) Increase in temperature (1mk)

Low yield of NH_3

ii)Decrease in pressure (1mk)

High yield of ammonia

15. The set up below was used to prepare hydrogen chloride gas and salt T.

Identify the following

Liquid M - Conc. H_2SO_4 ($^1/_2$mk)

Gas V – Hydrogen gas ($^1/_2$mk)

Salt T - Aluminium chloride ($^1/_2$mk)

a) Write balanced chemical equations for reaction that occur at f

i)Flask I (1mk)

$$Nacl + H_2SO_4 \longrightarrow NaHSO_4 + Hcl$$

ii)Combustion tube (1mk)

$$2AL_{(s)} + 3Cl_2 \longrightarrow 2Alcl_3(_s)$$

b)Name the process that formed salt T as shown in the diagram (1mk)

Sublimation

16. Give equation to show the reaction that take place when.

a)Iron react with steam (1mk)

$$3Fe + 4H_2O \quad Fe3O_4 + 4H_2$$

b) Magnesium reacts with dilute Hydrochloric acid (1mk)

$$Mg_{(s)} + 2Hcl_{(aq)} \quad Mgcl_{2(aq)} + H_{2(s)}$$

c)Give two industrial uses of the gas produced in the reaction in a & B above (1mk)

-Manufacture of ammonia

-Manufacture of Hcl

-Hydrogenation

17. In an experiment carbon (IV) oxide gas was passed over heated coke and the gas produced collected as shown in the diagram below.

i) Write an equation that cook place in the combustion tube. (1mk)

$CO_{2(g)} + C_{(s)} \longrightarrow 2CO_{(g)}$

ii) Name another substance that can be used instead of potassium hydroxide. (1mk)

Conc. -NaOH

iii) Describe a simple chemical test that can be use to distinguish carbon (II) oxide and carbon (IV) oxide (2mk)

Dubble the two gaseous through Ca(OH) $_{2(aq)}$

iv) Give one use of carbon (II) oxide.(1mk)

-Extraction of metals- reducing agent

18. Name the process which take place when (3mks)

a) Iodine changes directly from solid to gas.

-Sublimation

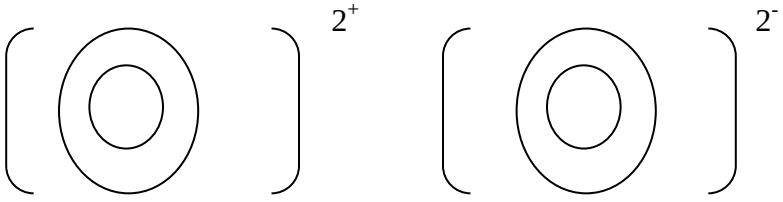
b) $Fe^{2+}_{(aq)}$ changes to $Fe^{3+}_{(aq)}$

-Oxidation

c) White sugar changes to black when mixed with excess conc. Sulphuric acid.

-dehydration

19 a) Using a dot (0) and cross (x) to represent the outermost electrons, draw diagrams to show the bonding in magnesium sulphide. ($1\frac{1}{2}$mks)



b) State the structure of the above compound ($\frac{1}{2}$mks)

-Giant ionic

c) Give two properties of substance with the above structure. (1mk)

-High Mpt & B.Pt

-Conduct electric current in molten /aqeous State

20 $10cm^3$ methane of gas diffuses through porous portions in 40 seconds. How long would it take 90 cm^3 of ozone to diffuse through the same partition (C=12, H=1, O=16) (3mks)

$\frac{10}{40}$=0.25

$$\frac{RA}{RB} = \sqrt{\frac{RB}{RA}}$$

$$\frac{0.25}{X} = \sqrt{\frac{48}{16}}$$

21 a) What is meant by solubility (1mk)

-Maximum amount of solute that can dissolve in 100g of solvent.

b) In an experiment to determine the solubility of solid X in water at 30^0C the following results were obtained

Mass of evaporating dish	26.2g
Mass of evaporating dish + saturated solution	42.4g
Mass of evaporating dish + dry solid X	30.4g

Using the information, determine the solubility of solid X at 30 ^{0} C in g/ 100 water. (2mks)

30.4

<u>26.2</u>

<u>4.2g</u>

4.2g is dissolving in 12g of solve

? 100

$=\frac{4.2x100}{12}$ ***=35g/100***

22 An element g has relative atomic mass of 69.39. Given that the element has two isotopes of atomic masses 60.15 and 70.15, calculate the relative abundances of each of the isotopes. (3mks)

X=60.15= x %

Y=10.15 =100-x%

$=\frac{(60.15)xX}{100}$***) + 70.15 (100-x) =69.39***

60.15x-70.15x+7015 =6939

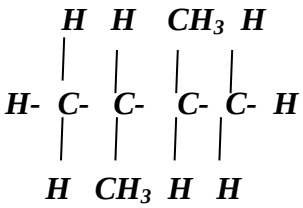
10x=76

X=7.6

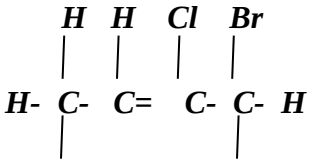
Y=92.4 %

23. Draw the open structures of the following substance (3mks)

i) 2,3-dimethylbutane

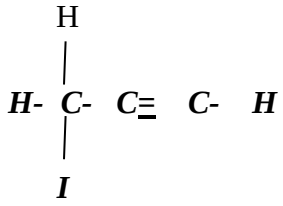


i) 1-bromo-2-dichlorobut-2 ene



H ***H***

ii) 3-iodopropyne



24. Define the following terms as used in chemistry. (2mks)

i) Activation energy

……

……

……

ii)Efflorescence.

-Process in which salt loses water of crystallization to the atmosphere to form powder.

25. Starting with copper (II) oxide describe how copper (II) sulphate crystals can be prepared. (2mks)

-Add dil H_2So_4 to excess CUO

- Evaporate the filtrate to obtain $CuSO_4$ crystal.

-Dry crystals between filter papers.