**NAME:……………………………………………………….ADM:…………………..CLASS:……….**

**CHEMISTRY PP2**

**TERM 2 2022 OPENER EXAM FORM 4**

**JUNE 2022**

**TIME: 2 HOURS**

**ANSWER ALL THE QUESTIONS**

1. (a) The grid below represents part of the period table. Study the information in it and answer the questions that follow. The letters do not represents the actual symbols of the elements.

|  |  |  |
| --- | --- | --- |
|  |  | I |
|  | G  |  |  |  |  | A  |  | J |
| F | B | C |  | D |  | E  | K |
|  |  |  |  |  |  |  | L |
|  |  |  |  |  |  |  | H  | M |

1. Select an element that can form an ion with a change of -2. Give a reason for your answer. (2mks)
2. What type of structure would the oxide of G have? (1mk)
3. How does the reactivity of H and E compare? Give a reaction for your answer. (2mks)

(b) 1.3g of B reacts completely when heated in 1.2 litres of chlorine gas at s.t.p (molar gas volume at s.t.p is 22.4litres)

1. Write an equation for the reaction between B and chlorine (1mk)
2. Determine the relative atomic mass of B. (2mks)

(c ) Explain how you would expect the following to compare

1. Atomic radius of F and B. (2mks)
2. The PH value of the aqueous solution of the oxide of B and D. (2mks)
3. Study the information below and answer the questions (the letters do not represent the actual symbols of the elements.

|  |  |  |
| --- | --- | --- |
| elements | Electronic configuration | IE (kj/mol) |
| I | 2.1 | 519 |
| K | 2.8.1 | 494 |
| L | 2.8.8.1 | 418 |

1. What is Ionizations? (`1mk)
2. Explain why element L has the lowest Ionizations energy. (1mks)
3. Write an equation for the reaction between K and water. (1mk)
4. Using dots(.) and cross (x) show the bonding in the compound between I and Chlorine (1mk)
5. The flow chart below shows the stages involved in manufacture of H2SO4 acid by contact process. Study it and answer that questions that follow.

Purifier and drier

Chamber

Absorption Tower

Diluter VI

Catalytic chamber

Heat exchanger

 Air

Solid P SO2 SO2+O2

 Water Q Gas R

1. A part from sulphur, identify other substance that can be used as a Solid P. (1mk)
2. What is the function of the purifier? (1mk)
3. Give two functions of the heat exchanger. (1mk)
4. State the optimum conditions for the reaction to take place at the catalytic chamber. (1mk)
5. Name
6. Gas R. (1mk)
7. Substance Q. (1mk)
8. Write equations for the reaction taking place at the-;
9. Catalytic chamber. (1mk)
10. Absorption tower. (1mk)
11. Explain why Gas R cannot be dissolved in water to form sulphuric (VI) acid. (1mk)

1. Exhaust gases this process are passed through Chimneys lined with calcium hydroxide to avoid pollution.

(i) Name this process. (1mk)

(ii) Write the equation for the reaction taking place. (1mk)

1. State the observation made when concentrated Sulphuric (VI) acid is poured into a beaker containing sugar crystals. Name the property of conc sulphuric acid. (1mk)
2. (a) What is an unsaturated hydrocarbon compound (1mk)

(b) The scheme below shows a series of reactions starting with propanol. Study it and answer the questions that follow.

Solution A + Hydrogen gas

 Potassium metal

 Step I

CH3CH2COOH

Propanol

CH3CH 2COONa

 H + KMnO4

 Step II Step (IV) Butanol Step 3

 HCL Conc H2SO4,

COMPOUND E E

CH2=CHCH3

CH3CH3

 heat

 1 mole of Cl2

Product C + H2O

Compound D + HCl

hcl

 Compound B

 CH2-CH2- CH- n

(i) Name the type of reaction in step I and II (2mks)

(ii) Write the equation for the reaction that takes place in Step III (1mks)

1. Name the substance labelled A, C, D and E. (2mks)
2. Draw the structural formula of product C (1mk)
3. Name the process in step (IV) (1mk)
4. Name compound B and state the type of reaction involved in its formation. (2mks)
5. If the relative molecular mass of B is 35,700 determine the value of n. (2mks)
6. Acidified potassium Manganate (VII) solution oxidises Iron (ii) to Iron (III) as shown in the Ionic equation below. If 0.2M KMno4 solution is needed to react with 25cm3 of 0.1M Iron (II) ammonium Sulphate, Calculate the volume of KMno4 solution required. (3mks)

MnO4-(aq)  + 5Fe2+(aq) + 8H+(aq) Mn2+(aq) + 4H2O (l) + 5Fe3+(aq)

(b) 12g of a mixture of sodium Sulphate and Sodium Carbonate were mixed with distilled water in a flask and topped up to 100cm3. 25cm3 of this solution required 12.5cm3 of 0.2M Sulphuric (VI ) acid for complete reaction.

(i) Write down the chemical equation for the reaction that occurred between the mixture and Sulphuric (VI) acid . (1mk)

(ii) Calculate the number of moles of H2SO4 which reacted with the mixture. (2mks)

1. Determine the number of moles of the substances in the mixture that reacted with H2SO4 (2mks)
2. Determine the molarity of the substance in C above. (2mks)
3. What was the mass of Sodium Carbonate in the mixture? (2mks)
4. What was the percentage of Sodium Sulphate in Mixture. (2mks)
5. (a) What is meant by molar heat of neutralization (1mk)

(b) State Hess’s law. (2mks)

(c)Given the following molar heat of combustion of graphite, hydrogen and anthracene as

 HOC (graphite) = -394 kj/mol

 HoC(N2) = -286Kj/mol

 H0C(C14H10) = -7114 kj/mol

1. Write down the equation for formation of anthracene (1mks)
2. Draw an energy cycle diagram that links heat of formation of anthracene with heat of combustion of hydrogen, graphite and anthracene (3mks)
3. Calculate the standard heat of formation of anthracene. (2mks)

6. When excess Iron fillings were added to 25.0cm3 of 0.4M Copper (ii) Sulphate solution, temperature rose by 15.0oC. Other than rise in temperature,

a) State and explain any other observation made. (2mks)

b) Determine the molar heat change (C=4.2 J.gK- density of water=1g/cm3. (3mks)

c) Draw an energy level diagram to represent the above reaction. (2mks)

7. Consider the following reaction at equilibrium

a) PCl5 (g)  PCl3(g)+ Cl2(g)

b) Complete the table to show the effect of different factors on the position of equilibrium.

|  |  |
| --- | --- |
| Factor | Effect on Equilibrium position |
| 1. Decrease in pressure
 |  (1mks) |
| 1. Removing Chlorine
 |  (1mks) |
| 1. Adding Helium to the mixture
 |  (1mks) |

(b) Ammonia can be converted to nitrogen (ii) Oxide as shown in the equation below.

4NH3(g) + 5O2(g) 4NO(g) + 6H2O (g)

1. Explain how on increase in temperature would affect the yield of Nitrogen (II) Oxide. (2mks)
2. On the energy level diagram below, sketch the energy level diagram that would be obtained if the reaction is carried out in the presence of a platinum catalyst (2mks)

 Energy

 4NH3(g) + 5O2(g)

 4NO(g) + 6H2O(g)

Reaction path

c) The reaction below is in equilibrium

Br2(aq) + H2O(i) OBr- + Br-  +2H+

1. State and explain the effect on the equilibrium when the dilute hydrochloric acid is added. (2mks)

(ii) What is the effect of increasing hydrogen and Chlorine? Explain. (2mks)

H2(g) + Cl2(g) 2Hcl(g)