**ELDORET DIOCESE EXAM 2021**

**NAME…………………………..………………DATE ……………………………………...**

**INDEX NO.……….……….…………………...…..… SIGNATURE ……………..………**

**233/2**

**CHEMISTRY**

**(THEORY)**

**PAPER 2**

**THEORY**

1. The grid below shows part of the periodic table. Study it and answer the questions that follow. The letters do not represent the true symbols of the elements.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | |  |
|  |  |  |  |  |  | A |  |  |
| I | B |  | C |  | D |  | E |  |
| F | G |  |  |  |  | H |  |
|  |  |  |  |  |  |  |  |

1. Which element forms an ion of charge - 2? Explain your answer **2marks**

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(b) What is the nature of the oxide formed by element C? **1mark**

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1. How does the reactivity of H compare with that of E? Explain. **2marks**

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1. Write the chemical equation for the reaction between B and chlorine? **1mark**

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1. Explain how the atomic radii of the following compare; **2marks**
2. F and G

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1. B and G

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1. The oxides of B and D are separately dissolved in water. State the effect of each product on litmus paper. **2marks**

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1. 20cm3 of a solution of a hydroxide of I completely neutralizes 17.5cm3 of 0.5M sulphuric (VI) acid. Calculate the concentration in moles/litre of solution of the hydroxide of I **3marks**
2. a) Sulphur occurs naturally in two different forms called allotropes;
3. What are allotropes? **1mark**

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1. The two allotropes of sulphur are stable at different temperatures, as shown in the equation below.

Above 95.50C

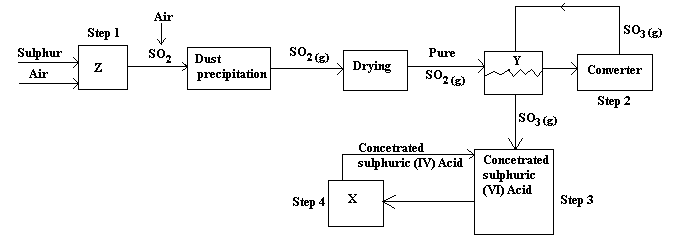
Rhombic sulphur Monoclinic sulphur

Below 95.50C

Give a name to the temperature 95.50C **1mark**

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b) Below is a flow chart diagram for the contact process for the manufacture of sulphuric (VI) acid.



1. Give the name of chambers labeled **1 ½ mark**

X

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Y

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Z

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1. State the three conditions in the converter. **1 ½ mark**

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1. Explain why gases are passed through ; **2marks**

I – The dust precipitator and drying power

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1. II- The chamber labeled Y Write the balanced equations for the reactions in;**3marks**

Step 2:

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Step 3:

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Step 4:

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1. Calculate the volume of sulphur (VI) oxide gas in litres that would be required to produce 178kg of Oleum in step 3. (Molar gas volume at s.t.p.=22.4l, H=1, O=16, S=32) **3marks**

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1. Below is a scheme of some reactions of propanol. Study it and answer the questions that follow.

Q

Y

Z

CH3CH2CH3

CH3CH2CH2CL

Propanol

CH3CH2CH2OH

Polymerisation

HBr

Step I

Step III

Step II Conc. H2SO4

1600C

1. State the reagents and conditions required to effect step I **3marks**

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1. Draw the structural formulae and name product Z. **1mark**

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1. Name product Q **1mark**

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1. Explain how product Y can be distinguished from the product formed after step I has taken place. **2marks**

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1. What name is given to the process in Step II and step III **2marks**

Step II

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Step III

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1. (i) Define the term hydrocarbon **1mark**

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(ii) Draw the structure of 1, 2 – dibromopropane **1mark**

4.

1. What is the molar heat of combustion of a substance? (1mark)

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1. The experiment below was set up to determine the molar heat of combustion of methanol.



The following data was obtained from the above experiment.

Mass of burner + methanol before burning = 62.74g

Mass of burner + methanol after burning = 62.36g Final temperature of water = 38.50C

Initial temperature of water = 23.50C

Volume of water used = 100cm3

1. From the above results work out the molar heat of combustion of methanol. (3marks)

(Density of water =1g/cm3, C = 12, O=16, H= 1.0)

Specific heat capacity of solution 4.2Kj K-1g K-1)

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1. Write a thermo chemical equation for this reaction. (1mark)

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1. Explain why the value obtained in (i) above may be lower than the actual value. (1mark)

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1. Study the data given below

C3H8(g)  + 5O2(g) 3CO2(g) + 4H2O(l) ΔH = - 2209 KJmol-1

H2(g) + ½ O2(g) H2O(l) ΔH = -286KJmol-1

C(s) + O2(g) CO2(g) ΔH = -406KJmol-1

Use this information to find the heat of formation of propane. (3marks)

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1. What do you understand by the term heating value of a given fuel? (1mark)

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1. State two factors you consider when choosing a fuel. (1mark)

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5.

1. Magnesium ribbon was reacted with steam as shown in the diagram below.



* + 1. State two observations in the boiling tube. (2marks)

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* + 1. Describe how you test for gas x (2marks)

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* + 1. State one industrial use of the product formed in the boiling tube at the end of the experiment. (1mark)

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1. 1. Explain what is meant by the term neutralisation. (1mark)

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* 1. Starting with 50cm3 of 2M nitric (v) acid, describe how you would prepare crystals of sodium nitrate. (3marks)

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1. Complete the table below. (1mark)

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| --- | --- | --- |
| Indicator | Colour in | |
| Acidic solution | Alkaline solution |
| Phenolphthalein | \_\_\_\_\_\_\_\_\_\_ | Pink |
| Methyl Orange | Pink | \_\_\_\_\_\_\_\_\_\_ |

1. When magnesium is burnt in air two reactions take place forming two different compounds. Write down the equations for the two reactions. (2marks )

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6. The set up below is used to measure the change in mass during the course of the reaction between dilute hydrochloric acid (Excess) and marble chips at 220C.



Changes in mass were noted at one minute intervals and were as follows;

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time (Min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Loss in mass (g) | 0.26 | 0.46 | 0.60 | 0.69 | 0.73 | 0.73 | 0.73 |

1. Write an equation for the reaction taking place in the flask. (1mark)

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1. Give a reason why the mass of the flask charged with time? (1mark)

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1. What is the role of cotton wool at the mouth of the flask? (1mark)

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1. Explain why it is not advisable to use dilute sulphuric (VI) acid with marble chips in this experiment (1mark)

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1. Plot a graph of loss in mass (vertical axis) against time. Label the curve 220C (3marks)



1. On the same axis in (e) above sketch the graph you would expect to obtain if the experiment was repeated at 350C. Label the curve 350C. (1mark)
2. State what would happen if the marble chips were replaced with the same mass of marble powder. Explain your answer. (1mark)

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1. Determine the volume of carbon (IV) oxide produced if 0.12g of marble chips was reacted with excess dilute hydrochloric acid. (Experiment done at room temperature and pressure. Molar gas volume at r.t.p = 24dm3,Ca = 40.0,O = 16, C = 12.0) (2marks)

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7. In an experiment ,0.71g of hydrated sodium carbonate (Na2CO3.XH2O) was treated with dilute nitric v acid and the gas evolved was carbon iv oxide which was measured using a syringe at stp.The volume of carbon iv oxide obtained was 56cm3

a.Write the equation for the reaction between anhydrous sodium carbonate and dilute nitric v acid (1mk)

b. Calculate the number of moles of carbon iv oxide gas collected at s.t.p (molar gas volume at stp=22,400) (2mks)

c.Calculate the mass of anhydrous sodium carbonate reacted (3mks)

d.Calculate the mass of water in 0.715g of hydrated sodium carbonate (1mk)

e. Determine the R.F.M of hydrated sodium carbonate, hence the value of X (3mks)