

NAME.....ADM NO: .....

STUDENT'S SIGNATURE.....DATE.....

SCHOOL.....

**233/2 FORM FOUR**

**CHEMISTRY**

**THEORY**

**Paper 2**

**ENTRY 2020 EXAMS.**

**Time: 2 Hours**

**FORM FOUR CHEMISTRY 233/2**

**INSTRUCTIONS TO CANDIDATES**

- Write your Name and Index No. in the spaces provided.
- Sign and write the date of examination in the spaces provided.
- Answer ALL the questions in the spaces provided.
- All working must be clearly shown where necessary.
- Mathematical tables and silent electronic calculators may be used.

**EXAMINERS USE ONLY**

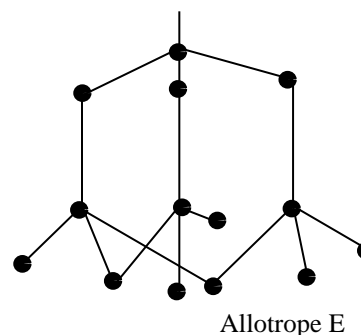
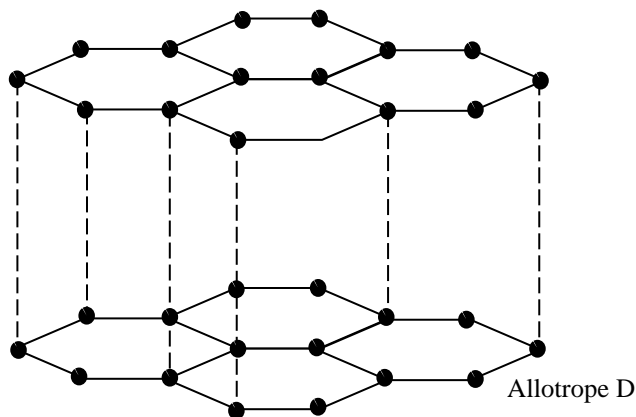
QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	08	
2	10	
3	13	
4	10	
5	14	
6	11	
7	14	
Total	80	

*This paper consists of 9 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing*

1. (a) Carbon has two allotropes. What is meant by the allotropy? (1 mark)

.....

(b) The following diagrams show the structures of two allotropes of carbon. Study them and answer the questions that follow.



(i) Name the allotrope D and E (2 marks)

.....

(ii) Give **one** use of **D**. (1 mark)

.....

(iii) Which allotrope does not conduct electricity? Explain. (2 marks)

.....

.....

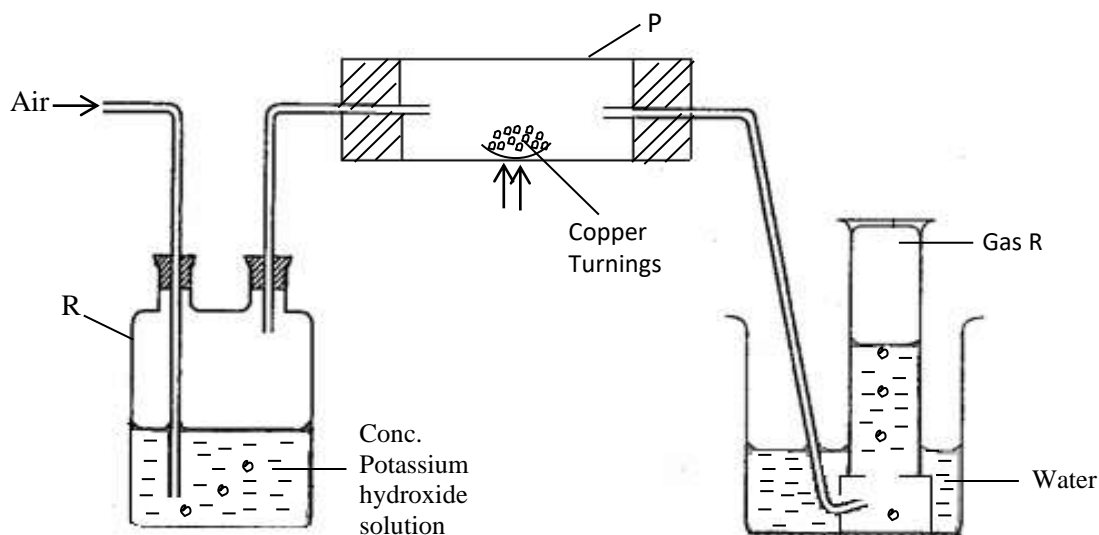
(c) State **two** properties of carbon (IV) oxide that make it suitable for use in fire extinguishers. (2 marks)

.....

.....

.....

2. A study the diagram **below** that is used to prepare a gas **Q**.



A. (i) What component of air is eliminated in wash bottle labeled **R**? (1 mark)

.....

(ii) Write the equation for the reaction that eliminates the component of air in (i) **above**. (1 mark)

.....

(iii) What component of air is removed in hard glass tube labeled **P**? (1 mark)

.....

(iv) Identify gas **Q**. (1 mark)

.....

B. In an experiment 1.54g of nitrogen reacted with 3.53g of oxygen to form a compound. (N = 14, O = 16)

(i) Calculate the moles of nitrogen and oxygen that reacted. (2 marks)

.....  
 .....

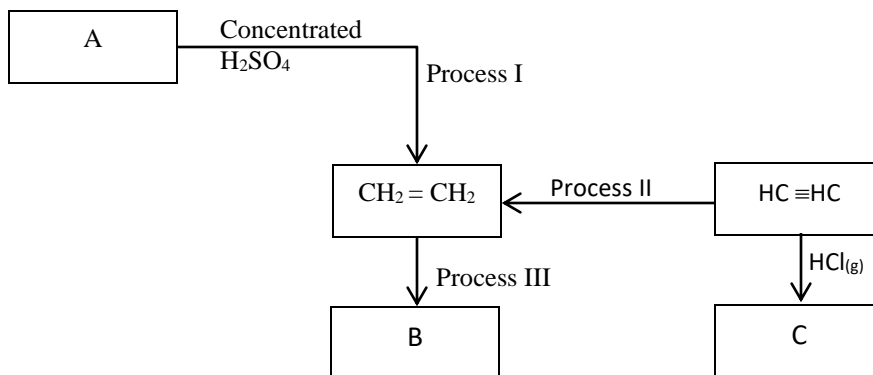
(ii) Determine the simplest formula of the compound formed between nitrogen and oxygen. (2 marks)

.....  
 .....

(iii) Comment on the melting and boiling points of the compound in **B(ii) above**, explain. (2 marks)

.....  
 .....

3. Study the flow chart and answer the questions that follow:-



a) (i) Name process I (1 mark)

(ii) Give the conditions necessary for process I to occur. (1 mark)

(iii) Name compound C. (1 mark)

(iv) Name the reagent **A** (1 mark)

.....

b) Give the general formula of the homologous series to which **A** belongs. (1 mark)

.....

c) Molecules of  $\text{CH}_2 = \text{CH}_2$  polymerize to form a large molecule **B** called polymer.

(i) Draw the structure of the polymer **B**. (1 mark)

(ii) Give the name of the molecule formed in **c (i) above**. (1 mark)

.....

d) An organic compound **T** contains 50% oxygen, 12.5% hydrogen and 37.5% carbon. The compound has a relative molecular mass of 32.

(i) Determine the molecular formula of the compound **T**. (4 marks)

.....

.....

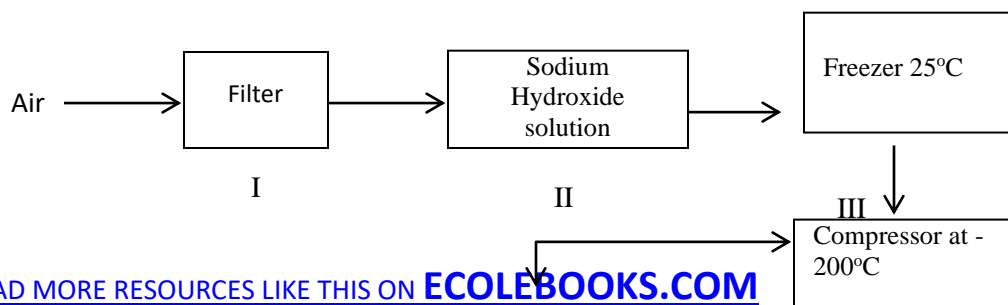
.....

.....

(ii) Draw the structural formula of the compound. (1 mark)

.....

4. Study the flow chart **below** and answer the questions that follow.





a) (i) Name the substances removed in steps **I**, **II** and **III**. (3 marks)

.....

.....

.....

(ii). Name the gases obtained with respect to their boiling points. (3 marks)

- 196°C
- 186°C
- 183°C.

.....

.....

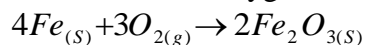
.....

b) With the aid of labeled diagrams explain how you would show that for rusting to occur, oxygen is necessary. (2 marks)

.....

.....

c) Iron reacts with oxygen according to the equation **below**.



How many moles of  $Fe_2O_3$  would be formed if 1kg of iron reacts with excess oxygen?

(Fe = 56, O = 16).

(2 marks)

.....

.....

5. The grid **below** represents periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

		A
--	--	---

B			G		H	E	C
	J		I	L			
D						M	

I (a) Indicate on the grid the position of an element represented by letter N whose electronic configuration of a divalent cation is 2:8:8. (1 mark)

.....

(b) Name the bond formed when **D** and **H** react. Explain your answer. (2 marks)

.....

.....

(c) Write an equation for the reaction between **B** and water. (1 mark)

.....

(d) How do the atomic radii of **I** and **L** compare. Explain. (2 marks)

.....

.....

(e) In terms of structure and bonding explain why the oxide of **G** has lower melting point than oxide of **L**. (2marks)

.....

II Study the information given **below** and answer the questions that follow:

Formula compound N	NaCl	MgCl <sub>2</sub>	Al <sub>2</sub> Cl <sub>6</sub>	SiCl <sub>4</sub>	PCl <sub>3</sub>	SCl <sub>2</sub>
B.P(°C)	1470	1420	Sublimes	60	75	60
M.P(°C)	800	710	At 800°C	-70	90	-80

(a) Why is the formula of aluminium chloride given as  $Al_2Cl_6$  and not  $AlCl_3$ ? (1 mark)

.....

(b) Give **two** chlorides that are liquid at room temperature. Give a reason for the answer. (2 marks)

.....

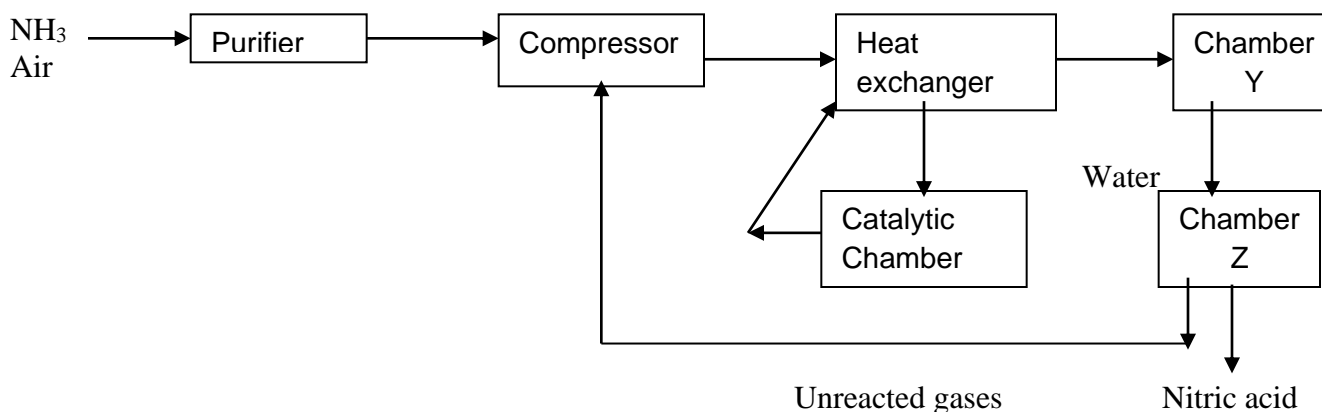
.....

(c) Give a reason why  $Al_2Cl_6$  has a lower melting point than  $MgCl_2$  although both Al and Mg are metals.

(1mark)

(d) Which of the chlorides would remain in liquid state for the highest temperature range explains why? (2marks)

6. The following is a flowchart that shows the industrial preparation of nitric (v) acid.



a) What happens in the heat exchanger? (1mark)

.....

b) Write an equation for the reaction that takes place in the catalytic chamber and name the catalyst. (2marks)

.....

c) What happens in chamber Y? (2marks)

.....

d) How is the required temperature in the process maintained? (2marks)

.....

.....

e) Write an equation for the overall reaction that takes place in chamber Z. (1mark)

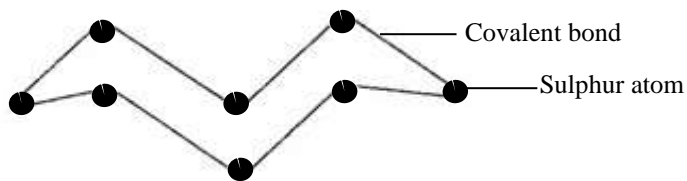


f) The final product from the process contains 65% of nitric acid. How is the concentration of nitric (v) acid increased  
(1mark)

g) It is important to purify the gases before reacting them. Give a reason. (1mark)

h) Identify **one** impurity which is eliminated in the purifier. (1mark)

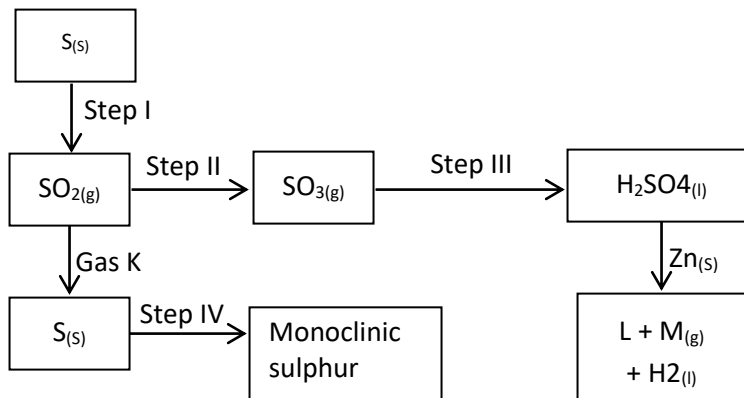
7. (i) Study the structure **below**.



a) What observation is made when the molecule above is heated to a temperature of 113°C? (2 marks)

b) Write an equation for the reaction of the atom of the above structure with hydrogen. (1 mark)

(ii) Study the flow chart **below** and answer the questions that follow.



(a) Name:

(i) Gas **K** (1 mark)

.....

(ii) Gas **M** (1 mark)

.....

(b) (i) State the observation made in step **I**. (2 marks)

.....

.....

(ii) Step **I** and step **III** occurs in contact process. State optimum conditions necessary for step **II** to occur. (2 marks)

.....

.....

(iii) Name the reagent used in step **IV**. (1 mark)

.....

(iv) Explain why water is not used in step **III**. (1 mark)

.....

(c) Write an equation to show how pollution effect of sulphur (IV) oxide is controlled in contact process. (1mark)

.....

(d) Explain the role of sulphur in vulcanization of rubber. (2 marks)

.....

.....