NAME: …………………………………..    INDEX NO: ………………………………

SCHOOL: ……..………………………….    DATE : ……………………………………..

STUDENT'S SIGNATURE:…………………

**233/1**

**CHEMISTRY**

**PAPER 1 2020**

**THEORY**

**2 HOURS**

## Instructions to Candidates

a) Write your name and admission number in the spaces provided.

b) Answer all the questions in the spaces provided.

c) Mathematical table and electronic calculator may be used.

d) All working must be clearly shown where necessary.

e) Students should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

### For Examiner's Use Only

| Question | Maximum Score | Candidate's Score |
|----------|---------------|-------------------|
|          |               |                   |
|          |               |                   |
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1. It is advisable to use non-luminous flame of a Bunsen burner for heating instead of the luminous flame. Give two reasons why this is so. (2 Marks)

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2. Explain why the melting points of metallic elements in a group decrease down the group.

   (3 Marks)

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3. When 8.53 grams of Sodium Nitrate were heated in an open test-tube, the mass of oxygen produced was 0.83g.

   i)    Write the balanced equation for the reaction. (2 Marks)
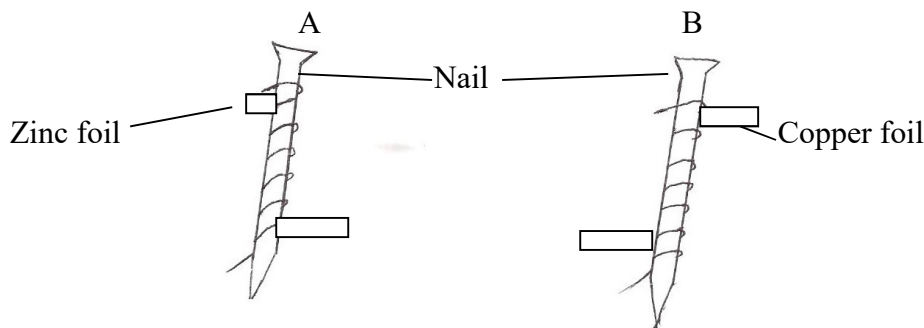
   …………………………………………………………………………………………………..

   ii)   Calculate the percentage of Sodium Nitrate that was converted to Sodium Nitrite. (Na=23, N=14, O=16). (2 Marks)

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4. The diagram below represents two iron nails with some parts tightly wrapped with Zinc and Copper foils respectively.

Given that Zinc is the most reactive and Copper the least reactive;

a) State the observations that would be made at the exposed parts of the nails A and B after being left in the open for a long time. (2 Marks)

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b) Name the process being illustrated above. (1 Mark)

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5. Calculate the mass of marble chips that produces $11.2cm^3$ of Carbon (IV) Oxide at r.t.p when reacted with dilute hydrochloric acid.

(Molar gas volume = $24.0dm^3$, C=12, O=16, Ca=40) (3 Marks)

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6. a) Starting with Calcium Carbonate, describe how a solid sample of Calcium Sulphate can be prepared. (3 Marks)

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b) Give one use of Calcium Sulphate. (1 Mark)

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7. Give the systematic names of the following: -

i) $CH_3CH_2CH \quad CH \ CH_3$ (1 Mark)

$\quad\quad\quad CH_3 \ CH_3$

ii) $CH_3CH = CH \ CH \ CH_3$ (1 Mark)

$\quad\quad\quad Br$

iii)     $H - C \equiv C - CH_2 - C \equiv C - CH_3$ ____                    (1 Mark)
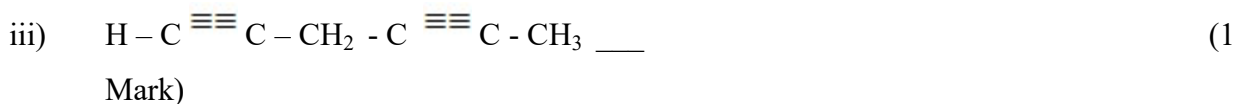
8. The diagram below represents an incomplete set up for the preparation for a dry sample of gas R.

   a) Complete the diagram to show how a sample of dry gas R can be collected.    (3 Marks)

Ammonium Chloride——
        +
Calcium Hydroxide                                              R

        Heat ↑↑↑
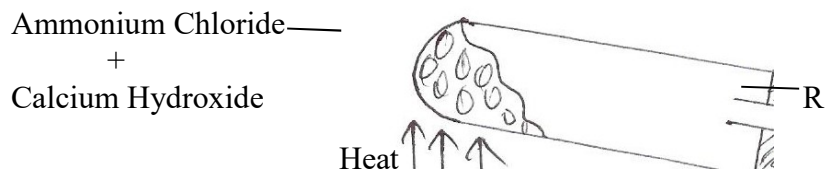
   b) Write a chemical equation for the reaction that produces gas R.            (1 Mark)

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9. Study the information in the table below and answer the questions that follow.

   | Liquid | Boiling point °C |
   |--------|-----------------|
   | Propanone | 56 |
   | Water | 100 |
   | Ethanoic acid | 118 |

   Suggest with an explanation the most suitable method for separating the mixtures.

   i)     Propanone and water.                                            (1 Mark)

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   ii)    Ethanoic acid and water.                                        (1 Mark)

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10. Analysis of a sample of neon gas in a mass spectrometer gave the following results.
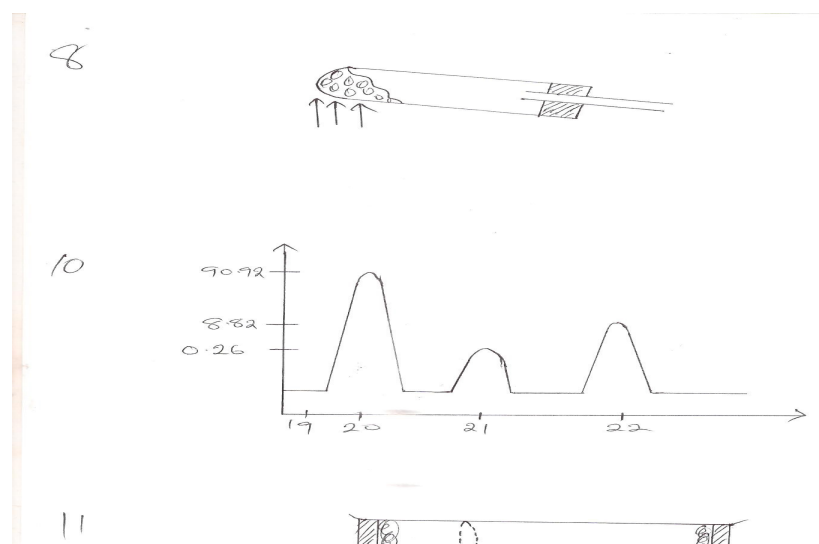


a) Given that the atomic number of neon is 10. Write down the symbols of the isotopes.

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(1 ½ Marks)

b) Which of the isotope is commonly found?                                    ( ½ Mark)

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c) Calculate the R.A.M. of neon.                                              (2 Marks)

11. Study the diagram below and answer the questions that follow.

White ring



Cotton wool soaked in
Concentrated Hydrochloric acid

Cotton wool soaked in Concentrated
solution of X
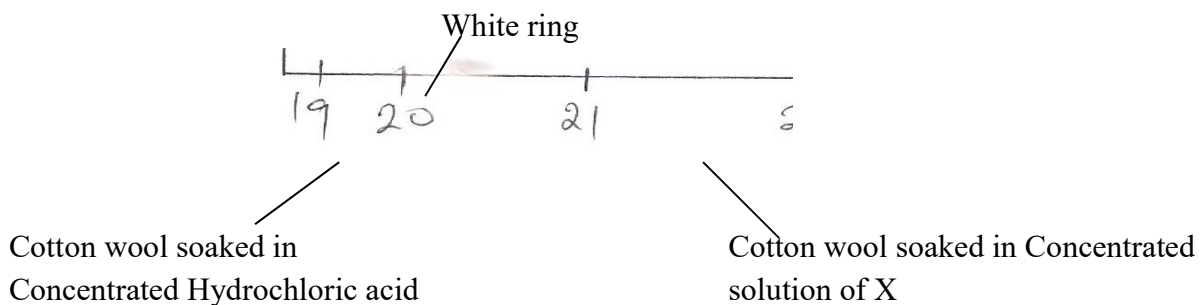
a) Explain why the cotton wools were soaked in the concentrated solutions of hydrochloric acid and X. (1 Mark)

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b) Why did the white ring form near the end with hydrochloric acid? (1 Mark)

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c) Equal volumes of hydrogen chloride and gas X required 30 seconds and 20 seconds respectively to diffuse through a jet of the same size. Calculate the molecular mass of gas X (H=1, Cl=35.5). (3 Marks)

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12. The diagram below shows the combustion of propane gas.



Prepare gas
From generator

Gas P to sanction pump

Substance X
Ice cold water
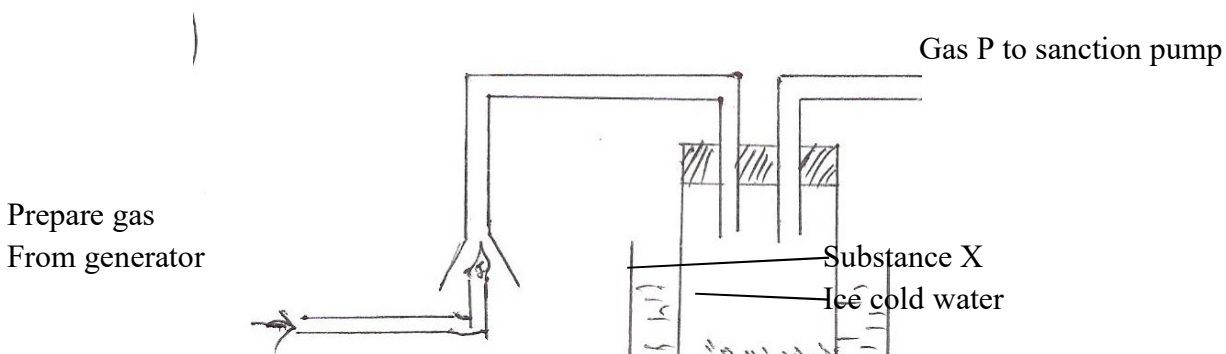
a) Identify substance X. (1 Mark)

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b) Write the equation for the complete combustion of propane gas. (1 Mark)

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c) What is the purpose of ice cold water in the experiment? (1 Mark)

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d) The pH of substance X was found to be less than seven (7). Explain this observation.

(1 Mark)

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13. The table below has information about elements E, F, G and H. (Letters not actual symbols)

| Element | Electron arrangement | Atomic radii | Ionic radii |
|---------|---------------------|--------------|-------------|
| E | 2.2 | 0.110 | 0.046 |
| F | 2.7 | 0.071 | 0.136 |
| G | 2.8.1 | 0.157 | 0.102 |
| H | 2.8.2 | 0.136 | 0.065 |

a) Which two elements have similar chemical properties? Explain. (2 Marks)

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b) Identify a non-metal. Explain. (2 Marks)

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c) Write a chemical formula for the oxide of E. (1 Mark)

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14. A solution of dilute Sulphuric acid is made by dissolving 2.45g of concentrated sulphuric acid in 240cm$^3$ of solution. Calculate the molarity of the hydrogen ions in the solution. (3 Marks)

(S=32, H=1, O=12) (L = 6.0 $\times\times$ 10$^{23}$)

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15. The diagram below shows the preparation and collection of Sulphur (IV) Oxide gas.



Solid T          Liquid U
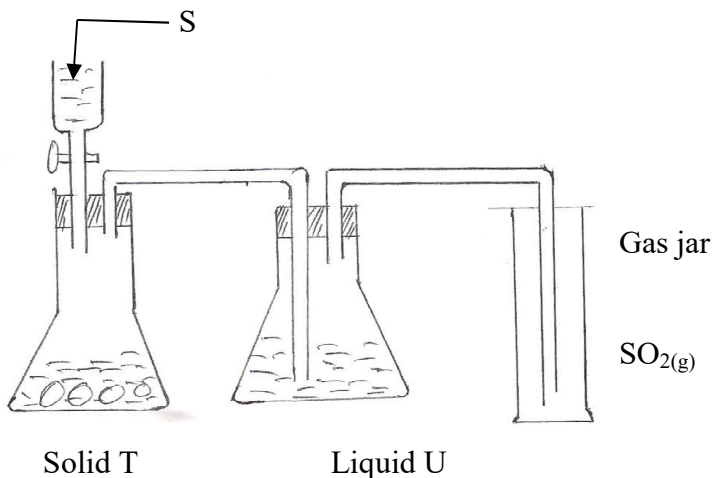
i)     Name the substance represented by letters.               (3 Marks)

        S: ................................................

        T: ................................................

        U: ................................................

ii)     Write the equation of the reaction taking place between T and liquid S.     (1 Mark)

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iii)     State and explain what would happen if dry red and blue litmus papers were placed in a gas jar of the collected sulphur (IV) oxide.           (2 Marks)

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16. Chlorine gas was bubbled through water for sometimes. The green yellow solution formed was poured into a long glass tube as shown below. Use the set up to answer the questions that follow.

Sun rays

Q

i) Which compounds are present in the yellow solution? (1 Mark)

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ii) Name substance Q. (1 Mark)

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iii) Write an ionic equation for formation of Q. (1 Mark)

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17. a) State Boyle's law. (1 Mark)

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b) At a temperature of 25°C, a gas occupies a volume of 300 litres and a pressure of 540mmHg. What would be the pressure if the gas at a temperature of 30°C occupies a volume of 600 litres. (* Marks)

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18. a) Draw dot and cross diagram to show bonding in carbon (IV) oxide gas. (2 Marks)

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b) Explain why graphite is a better lubricant compared to oil. (1 Mark)

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19. State the most appropriate technique used to obtain: -

i) Ammonium Chloride from mixture of Ammonium Chloride and Calcium Chloride.

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ii)    Water from salt solution.

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iii)   Kerosene from water – kerosene mixture.

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20. a)  State Gay Lussac's law.                                                                (1 Mark)

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b)  100cm3 of hydrogen gas was reacted with 150cm$^3$ of chlorine gas. Calculate the final
volume of gases of the resultant mixture.                                              (2 Marks)

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21. Study the set up below and answer the questions that follow.

X                                              Y

$GBr_{2(s)}$

Heat

a)  Identify the electrodes.                                                                (1 Mark)

    X: …………………………………………..
    Y: …………………………………………..

b)  Write the equation of the reaction at electrode Y.                                (1 Mark)

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c)  Why should the experiment be carried out in a fume chamber?                        (1 Mark)

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22. State two uses of helium gas. (1 Mark)

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23. Calculate the number of atoms in 4.6g of Sodium. ($Na = 23$, $L = 6.0 \times 10^{23}$). (1 Mark)

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24. The electron arrangement of ions $X^{3+}$ and $Y^{2-}$ are 2.8 and 2.8.8 respectively.

a) Write the electron arrangement of the elements. (1 Mark)

X : ………………………………………….

Y: …………………………………………..

b) Write down the formula of the compound that would be formed between X and Y. (1 Mark)

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