

Adm No..... Name..... Class.....

FORM THREE CHEMISTRY PAPER 1

TERM 3 2104

Time 2 Hours

INSTRUCTIONS

1. Answer ALL the questions in the spaces provided
2. Mathematical tables and electronic calculators may be used
3. All working must be clearly shown where necessary.

1. Explain why hydrogen has oxidation states of +1 and -1 in its compounds. (2mks)

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2. Excess iron filings were allowed to rust in 1dm³ of moist air and the volume of the remaining air was measured each day.

Day	0	1	2	3	4	5	6	7	8
Volume of air cm ³	1000	950	900	860	840	820	800	800	800

(a) Why did the volume of air remain constant from day six? (1 mark)

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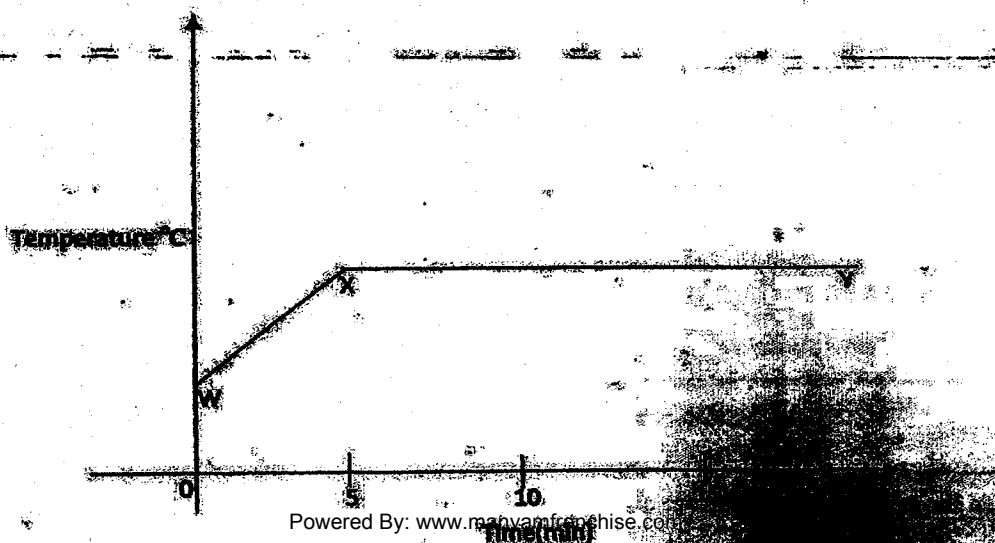
(b) Determine the percentage of oxygen in air using the data given in the table. (1 mark)

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(c) Give two reasons why air is a mixture but not a compound. (1 mark)

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3. The graph below shows a curve obtained when water at 20°C was heated for 15 minut



(a) What happens to the water molecules between points W and X (1 mark)

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(b) In which part of the curve does a change of state occur? (1 mark)

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(b) Explain why the temperature does not rise between point X and Y. (1 mark)

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4. Aluminium metal is a good conductor and is used for overhead cables. State any other two properties that make aluminium suitable for this purpose. (2 marks)

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5. 5.04g of a mixture of anhydrous sodium carbonate and sodium hydrogen carbonate when heated to a constant mass, give 4.11g of residue.

(a) Write an equation for the reaction that takes place when the mixture is heated. (1 mark)

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(b) Calculate the percentage of anhydrous sodium carbonate in the mixture. (2 marks)

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6. Yellow phosphorous reacts with chloride gas to form a yellow liquid. The liquid fumes when exposed to air. Explain these observations. (2 marks)

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7. Hydrated copper (II) sulphate exists as a blue crystals and anhydrous copper (II) sulphate is a white powder. Describe a laboratory experiment that can be used to show that the action of heat on hydrated copper (II) sulphate is reversible action. (3 marks)

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8. (a) Give the formula of an oxide which reacts with both dilute hydrochloric acid and hot concentrated sodium hydroxide solution. (1 mark)

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(b) Give the formulae of the products formed when the oxide in (a) above reacts with excess hot concentrated sodium hydroxide. (1 mark)

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9. In experiment, sulphur (IV) oxide was bubbled into water followed by chlorine gas. The resulting clear solution gave a white precipitate when mixed with acidified barium nitrate solution. Explain these observations. (3 marks)

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10. Starting with 50cm³ of 2M sodium hydroxide, describe how a sample of pure sodium sulphate crystals can be prepared. (3mks)

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11. A sealed glass tube containing air at s.t.p. was immersed into water at 100°C. Assuming there was no increase in the volume of the glass tube due to the expansion of the glass, calculate the pressure of the gas inside the tube.
(Standard pressure = 760mmHg, standard temperature 273K) (3 marks)

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12. (a) A sample of hydrogen gas was found to be a mixture of two isotopes



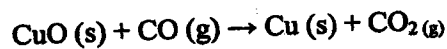
- (b) Determine the relative molecular mass of the molecule formed, when each of these isotopes is burnt in oxygen. (O = 16) (2 marks)
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13. Starting with red roses, describe how,

- (a) A solution containing the red pigment may be prepared. (3 mark)
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- (b) The solution can be shown to be an indicator. (1 marks)
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14. Dry carbon (II) oxide gas reacts with heated copper (II) oxide as shown in the equation below.



- (a) Name the process undergone by the copper (II) oxide. (1 mark)
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- (b) Give a reason for your answer in (a) above. (1 mark)
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- (c) Name another gas that can be used to perform the same function as carbon (II) oxide gas in the above reaction. (1 mark)

15. State and explain what would happen if a dry red litmus paper was dropped in a gas jar of dry chlorine. (2 marks)

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16. The products formed by action of heat on nitrates A, B and C are shown below.

Nitrate	Products formed
A	metal oxide + nitrogen (IV) oxide + oxygen
B	Metal + Oxygen + nitrogen (IV) oxide
C	Metal nitrate + oxygen

(a) Arrange the metal elements in order of increasing reactivity. (1 mark)

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(b) Which element forms a soluble carbonate? (1 mark)

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(c) Given an example of element B. (1 mark)

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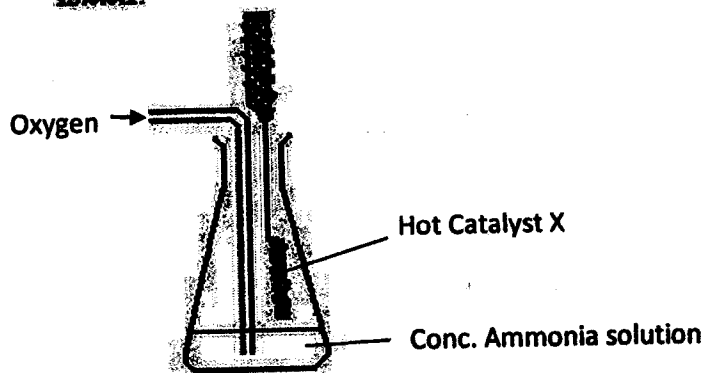
17. (a) write the electron arrangement of elements G and W whose atomic numbers are 12 and 17 respectively. (NB. The letters are not actual symbols of the elements). (1mk)

(c) Write the formula of the compound formed when elements G and W react. (1mk)

(d) What type of bond will be formed in the compound formed when element G and W react? (1mk)

18. Study the diagram below and answer the questions given below.

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(a) The reaction between ammonia and oxygen in the presence of the catalyst continues without further heating. Explain. (1 mark)

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(b) Name catalyst X. (1 mark)

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(c) Write an equation for the reaction which takes place in the flask. (1 mark)

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19. (a) Give the formula of an oxide which reacts with both dilute hydrochloric acid and hot concentrated sodium hydroxide solution. (1 mark)

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(b) Give the formulae of the products formed when the oxide in (a) above reacts with excess hot concentrated sodium hydroxide. (1 mark)

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20. Starting with 50cm³ of 2M sodium hydroxide, describe how a sample of pure sodium sulphate crystals can be prepared. (3 mks)

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21. A certain compound has the following composition by mass. Carbon 26.09%; hydrogen 13.04% and the rest is oxygen.

(a) calculate the empirical formula of the compound. (2 mks)

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(b) Given that the relative molecular mass of the compound is 46, determine its molecular formula of the compound.

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22. A sample of hydrogen gas was found to be a mixture of two isotopes



Determine the relative molecular mass of the molecule formed, when each of these isotopes is burnt in oxygen. (O = 16) (2 marks)

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23. Complete the table below.

(2 marks)

Species	Number of electrons	Number of Neutrons
${}^{31}_{15}\text{P}^{3-}$		

24. Starting with red roses, describe how,

(3 mark)

(a) A solution containing the red pigment may be prepared.

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(b) The solution can be shown to be an indicator.

(1 marks)

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25. Explain the process; "Sacrificial protection of iron from rusting"

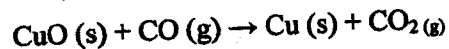
(2mks)

26. Calculate the percentage mass of copper in copper (II) carbonate can
NB, Cu = 63.5; O = 16; C = 12

(3 marks)

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27. Dry carbon (II) oxide gas reacts with heated copper (II) oxide as shown in the equation below.



(d) Name the process undergone by the copper (II) oxide.

(1 mark)

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(e) Give a reason for your answer in (a) above.

(2 mark)

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- (f) Name another gas that can be used to perform the same function as carbon (II) oxide gas in the above reaction. P(1 mark)

28. State and explain what would happen if a dry red litmus paper was dropped in a gas jar of dry chlorine. (2 marks)

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Give two physical properties of substances that

- (i) Have a metallic structure (2 marks)

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- (ii) Have a molecular structure (2 marks)

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29. Draw the structural formula and name possible isomers of organic compounds with the following molecular formula. C_3H_7Br (2 marks)