

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION
NOVEMBER 1995

032/1

CHEMISTRY

PAPER 1

(For Both School and Private Candidates)

TIME: 3 Hours.

1. This paper consists of sections A, B, and C.
2. Read the instructions given under each section very carefully.
3. The marks intended for section A and for each question in sections B and C are indicated in brackets.
4. Remember to write your Examination Number on every page of your answer book provided.

This paper consists of 8 printed pages.

SECTION A

For each question, choose and write the letter of the most correct or best answer in the answer book provided.

1. (i) The most probable valency of an element whose atomic number is 12 is
 - A. 0
 - B. 1
 - ✓ C. 2
 - D. 3
- (ii) A salt which on exposure to the air becomes covered with a liquid is
 - A. efflorescent
 - ✓ B. deliquescent
 - C. hygroscopic
 - D. hydrocytic
- (iii) One disadvantage of hard water is that it
 - A. contains mineral salts which are harmful to the body
 - B. causes increased tooth decay
 - C. causes corrosion of water pipes
 - ✓ D. requires more soap for washing.
- (iv) 30.1cm^3 of nitrogen at 28°C and 710mmHg are converted to S.T.P. The new volume of nitrogen is
 - A. 31.1cm^3
 - B. 29.9cm^3
 - C. 28.2cm^3
 - ✓ D. 25.5cm^3
- (v) One of the following substances is commonly used to determine the arrangement of metals in order of their reactivity
 - ✓ A. water
 - B. any salt
 - C. any non-metal
 - D. aluminium hydroxide.

$$\begin{array}{r}
 0.1821 \\
 \times 0.290 \\
 \hline
 0.299600 \\
 0.5000 \\
 0.2190 \\
 5.885 \\
 \hline
 5.1290 \\
 29.0 \\
 \hline
 29.0
 \end{array}$$

- (vi) A black powder, when heated alone, gave oxygen and a yellow residue. When heated with concentrated hydrochloric acid, chlorine gas was evolved. The black powder was
- A. powdered charcoal
 - B. lead oxide
 - C. cupric oxide
 - D. manganese dioxide.
- (vii) Before using a burette, it should be prepared by washing it with
- A. dilute bench acid, then water
 - B. cold water only
 - C. hot, then cold water
 - D. water, then the solution to be used.
- (viii) A standard solution of potassium hydroxide contains
- A. 17g of hydroxyl ions per given volume
 - B. one-equivalent of hydroxyl ions per litre
 - C. a known weight of alkali in a given volume
 - D. one molecular weight of alkali per litre.
- (ix) An example of a homologous series is found in the following
- A. acetylene, ethylene, ethane
 - B. propane, butane, pentane
 - C. charcoal, graphite, diamond
 - D. glucose, fructose, sucrose
- (x) A quantity of electricity is measured in
- A. amperes
 - B. coulombs
 - C. volts
 - D. watts
- (xi) An acid liquid when treated with copper, gave a colourless gas which turned brown. When treated with marble chips, it gave carbon dioxide. The acidic liquid was
- A. concentrated nitric acid
 - B. dilute sulphuric acid
 - C. concentrated sulphuric acid
 - D. dilute nitric acid.

- (xii) Substance B has a percentage composition of 54.6% carbon, 9.1% hydrogen, 36.3% oxygen. The empirical formula of substance B is
- CH_2O
 - CH_4O
 - $\text{C}_2\text{H}_4\text{O}$
 - $\text{C}_2\text{H}_6\text{O}$
- (xiii) Most salts have comparatively high melting points because they have
- crystalline structure
 - low pressures
 - high specific heats
 - strong electronic attractions between ions.
- (xiv) The balanced equation for the reaction: $\text{NH}_3 + \text{O}_2 \longrightarrow \text{NO} + \text{H}_2\text{O}$ is
- $4\text{NH}_3 + 5\text{O}_2 \longrightarrow 4\text{NO} + 6\text{H}_2\text{O}$
 - $3\text{NH}_3 + 2\text{O}_2 \longrightarrow 3\text{NO} + 6\text{H}_2\text{O}$
 - $2\text{NH}_3 + 3\text{O}_2 \longrightarrow 2\text{NO} + 6\text{H}_2\text{O}$
 - $\text{NH}_3 + 4\text{O}_2 \longrightarrow \text{NO} + 6\text{H}_2\text{O}$
- (xv) A hen's egg shell contains calcium
- sulphate
 - carbonate
 - chloride
 - nitrate
- (xvi) The most abundant metal in the earth's crust is
- iron
 - aluminium
 - calcium
 - sodium
- (xvii) The Kinetic theory of gases attempts to explain the behaviour of gases on the basis of the
- ionisation of their molecules
 - brownian movement
 - laws of Boyle, Charles, Gay Lussac and Avogadro
 - movement of their molecules.

(xviii) In a classroom experiment, air was passed over heated copper turnings in order to obtain some relatively pure nitrogen. Which impurities would you expect to be present in the relatively pure nitrogen gas which was collected over water?

- A. Argon, water vapour and helium
- B. Helium, carbon dioxide and carbon monoxide
- C. Oxygen, hydrogen and rare gases
- D. Rare gases, water vapour and carbon dioxide.

(xix) In which of the following reactions is a metal reduced but not oxidised?

- A. $\text{Zn} + \text{CuSO}_4 \longrightarrow \text{Cu} + \text{ZnSO}_4$
- B. $\text{H}_2\text{S} + 2\text{FeCl}_3 \longrightarrow \text{S} + 2\text{FeCl}_2 + 2\text{HCl}$
- C. $\text{Fe} + \text{S} \longrightarrow \text{FeS}$
- D. $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

(xx) The concentration of acetic acid in vinegar was determined by titrating the vinegar with 1.0M sodium hydroxide solution using phenolphthalein as indicator. It was found that 25cm^3 of the sodium hydroxide solution required 42.0cm^3 of vinegar for complete neutralization. Therefore, the concentration of the acetic acid, in grams per litre, in the vinegar was

- A. 4 g per litre
- B. 3 g per litre
- C. 2 g per litre
- D. 1 g per litre.

(Na = 23, C = 12, O = 16, H = 1) @ $1\frac{1}{2}$ (30 marks)

SECTION B

Answer ALL questions in this section in the answer book provided.

2. (a) State the main raw material and the process involved in the manufacture of each of the following products.
- (i) Wood charcoal
 - (ii) Coke
 - (iii) Lamp black
 - (iv) Animal charcoal.

$$\begin{array}{r} 98 \\ 1784 \\ \hline 18.0 \end{array}$$

- 6 -

$$\begin{array}{r} 1.84 \\ 98 \\ \hline 0.15 \end{array}$$

(b) Give two uses for each of the following:

- (i) Graphite
- (ii) Diamond.

(8 marks)

3. (a) Industrial sulphuric acid is usually labelled as containing 98% of the acid and having a density of 1.84 g/cm^3 .

- (i) Calculate the molarity of this industrial sulphuric acid.
- (ii) Calculate the volume of this industrial sulphuric acid that will be required to prepare 2 dm^3 of 0.50 M sulphuric acid solution.

$$\begin{array}{r} 0.155 \\ 98 \overline{) 1.84} \\ \underline{860} \\ 784 \\ \underline{760} \\ 240 \end{array}$$

(b) Name the main product formed when

- (i) Hot concentrated sulphuric acid is added to cane sugar.
- (ii) Hot concentrated sulphuric acid is added to ethanol.

(8 marks)

4. With the aid of an equation in each case, record what would be observed when:

- (a) Chlorine gas is passed through potassium bromide solution in water
- (b) Chlorine gas is bubbled through a solution of iron (II) chloride.
- (c) Ammonia gas is passed through a gas jar containing hydrogen chloride.
- (d) A piece of sodium metal is dropped into a beaker of water containing some red litmus paper.

(8 marks)

5. (a) On heating, iron combines with sulphur to form iron (II) sulphide

- (i) Write a balanced chemical equation for this reaction.
- (ii) Calculate the mass of iron that will combine with 70 g of sulphur.

(b) Write the electronic configuration of atom A whose atomic number is 16.

(c) Use the electronic configuration of atom A in (b) above to predict its

- (i) valency
- (ii) period
- (iii) group

$$\begin{array}{r} 13.6 \\ 78 \\ \hline 17.3 \end{array}$$

(d) Predict the nature of bond formed (covalent or ionic) when atom A combines with

- (i) Magnesium
- (ii) Oxygen.

(8 marks)

(Fe = 56, S = 32)

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$$\begin{array}{r} 56 \\ 165 \\ \hline 105 \end{array}$$

$$\begin{array}{r} 32 \\ 96 \\ \hline 32 \end{array}$$

6. (a) Distinguish between a fertilizer and an organic manure.
- (b) List four (4) steps that are required in the preparation of land ready for seed growing.
- (c) Give at least four (4) reasons why a fertile soil is not necessarily productive.
- (d) Your school shamba soil requires 80kg of N per hectare so as to fulfil plant requirements of N. Calculate (in kg) the quantity of ammonium sulphate ($(\text{NH}_4)_2\text{SO}_4$) fertilizer required to meet this demand.

(14 marks)

7. (a) With the aid of balanced chemical equations wherever appropriate, briefly outline the extraction of Zinc from zinc blende.
- (b) Give three (3) main uses of zinc. (12 marks)

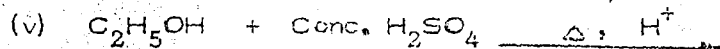
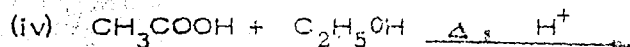
8. (a) Explain what is meant by
- (i) Cracking
 - (ii) Unsaturated hydrocarbons.

- (b) Give two examples of each of

- (i) a solid fuel
- (ii) a liquid fuel
- (iii) a gaseous fuel

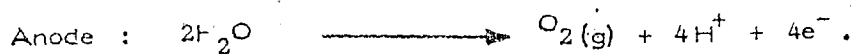
- (c) Name four (4) characteristics of a good fuel.

- (d) Complete and balance each of the following equations:



(1.2 marks)

- Cathode: $\text{Cu}^{2+} + 2e^- \longrightarrow \text{Cu}$



- (i) Draw a diagram showing the voltmeter in this electrolysis.
- (ii) What volume of oxygen measured at S.T.P. will be liberated at the anode in the time it will take to plate out 5.08g of copper onto the cathode?

(Electrochemical equivalent of copper = 0.00033

Gram - Molecular Volume (GMV) = 22.4 dm^3

1 Faraday = ----- = 96500 coulombs)

(12 marks)

10. (a) Name one key element present in all organic compounds.

- (b) Giving at least one example in each case, briefly explain the meaning of

- (i) Addition reaction
- (ii) Substitution reaction

- (c) Write a balanced chemical equation for each of the following reactions:

- (i) Ethanol, C_2H_6O , is reacted with sodium metal
- (ii) Propanol, C_3H_8O , and acetic acid, $C_2H_4O_2$ are warmed together in the presence of concentrated sulphuric acid.

- (d) With the aid of an equation, in each step, briefly explain how you would carry out the following conversions:

Ethene $\xrightarrow{\quad}$ Ethane $\xrightarrow{\quad}$ Ethanol

acetaldehyde $\longrightarrow$ acetic acid.

(12 marks)

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