

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION, NOVEMBER 1994

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 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 Index Number on every page of your answer book provided.

This paper consists of 4 printed pages.

SECTION A

Answer ALL questions in this section.

For each question, choose and write the letter of the most correct or best answer in the answer page at the end of this question paper and attach it to the answer book provided for submission.

1. (i) When a metal atom becomes an ion it
 - A. loses electrons and becomes oxidised
 - B. loses electrons and becomes reduced
 - C. gains electrons and becomes oxidised
 - D. gains electrons and becomes reduced
- (ii) One of the following substances is used in the manufacture of lead pencils.
 - A. Lead
 - B. Coal
 - C. Charcoal
 - D. Graphite
- (iii) The ionic equation for the reaction between hydrochloric acid and sodium hydroxide is
 - A. $\text{Na}^+ + \text{Cl}^- \longrightarrow \text{NaCl}$
 - B. $\text{Na}^+ + \text{OH}^- \longrightarrow \text{NaOH}$
 - C. $\text{H}_3\text{O}^+ + \text{OH}^- \longrightarrow 2\text{H}_2\text{O}$
 - D. $\text{H}_3\text{O}^+ + \text{Cl}^- \longrightarrow \text{HCl} + \text{H}_2\text{O}$
- (iv) The extraction of iron in the blast furnace gives slag as one of the products. This slag consists of
 - A. molten sand
 - B. molten calcium silicate
 - C. iron pyrites
 - D. molten iron
- (v) The addition of ammonium sulphate to a soil corrects the deficiency of the following elements in that soil:
 - A. nitrogen and oxygen
 - B. sulphur and oxygen
 - C. nitrogen and hydrogen
 - D. sulphur and nitrogen

- (vi) One of the following sets of laboratory apparatus contains direct measuring items.
- Crucible, Kipp's apparatus and volumetric flask
 - Test tube, beaker and gas jar
 - Thistle funnel, separating funnel and beaker
 - Burette, pipette and measuring cylinder
- (vii) A 5% by weight of a solution of sodium hydroxide has a molarity of
- 5.00M
 - 1.25M
 - 0.05M
 - 0.125M
- [H = 1, O = 16, Na = 23]
- (viii) A galvanised iron is one which is coated with
- Tin
 - Zinc
 - Copper
 - Silver
- (ix) "When gases react with one another, they do so by volumes that are in the ratios of small whole numbers." This is the statement of
- Charles's law
 - Avogadro's hypothesis
 - Gay-Lussac's law
 - Law of constant composition
- (x) A reading of -0°C corresponds, on the Kelvin scale, to
- 273
 - 0
 - 273
 - 373
- (xi) All elements in the periodic table are arranged in groups according to
- their order of discovery
 - the similarity in their chemical and physical properties
 - order of increasing number of electrons in their outer most shells
 - the atomic sizes starting with the element with the largest atomic size.

- (xii) The raw materials for the manufacture of sodium carbonate in the solvay process are
- Sodium sulphate, nitric acid and noble gases
 - Water, calcium chloride and ammonia
 - Carbon dioxide, saturated sodium chloride and ammonia
 - Ammonia, water and noble gases
- (xiii) The passage of an electric current through a solution in order to decompose it is known as
- oxidation
 - ionisation
 - neutralization
 - electrolysis
- (xiv) The burning back of the bunsen burner occurs when the
- air hole is closed
 - air hole is open
 - gas supply is too high
 - bunsen burner is overheated
- (xv) A substance that can be used to remove colouring matter in brown sugar is
- wood charcoal
 - animal charcoal
 - lamp black
 - bleaching agent
- (xvi) Which of the following processes reduces the amount of carbon dioxide in the air?
- Breathing
 - Photosynthesis
 - Burning of petrol
 - The manufacture of quicklime
- (xvii) The quantity of electricity needed to deposit 1 mole of aluminium in the electrolysis of aluminium III sulphate is
- 386000 coulombs
 - 289500 coulombs
 - 193000 coulombs
 - 96500 coulombs
- [1 Faraday = 96500 coulombs]

- (xviii) Red hot carbon can remove oxygen from both copper oxide and zinc oxide but not from magnesium oxide. Zinc can remove oxygen from copper oxide. On this evidence therefore, the order of activity of the three metals, putting the most reactive metal first, is:
 A. magnesium, zinc, copper
 B. copper, zinc, magnesium
 C. zinc, copper, magnesium
 D. magnesium, copper, zinc
- (xix) The expression "nitric acid is a strong acid" may best be explained as follows: It
 A. is very corrosive
 B. is highly ionised
 C. is a strong oxidizing agent
 D. dissolves all metals
- (xx) The empirical formula of a certain compound is CH_3 . Its vapour density is 30. Therefore its molecular formula is
 A. CH_4 B. C_2H_4 C. C_3H_6 D. C_4H_{12}
- (xxi) The school blackboard chalk is made of calcium
 A. hydroxide B. carbonate C. bicarbonate
 D. sulphate.
- (xxii) Carbon monoxide gas is poisonous because it
 A. combines with haemoglobin faster than oxygen
 B. paralyses the nervous system
 C. coagulates the blood
 D. blocks the lung's vessels
- (xxiii) Urban water supplies are treated with potash alum (a crystallised double salt of potassium sulphate and aluminium sulphate) in order to
 A. add mineral salts to the water
 B. soften the water
 C. prevent corrosion in water pipes
 D. remove bacteria from the water.
- (xxiv) An increase in temperature causes an increase of pressure of a gas enclosed in a container of constant volume because it:
 A. increases the mass of the molecules
 B. causes the molecules to combine together
 C. increases the average velocity of the molecules
 D. causes the molecules to break into atoms.

- (xxv) The process of refining crude oil consists mainly of
 A. removal of gaseous products from crude oil
 B. fractional distillation of crude oil
 C. decomposition of crude oil
 D. evaporation and condensation of crude oil
- (xxvi) The apparatus which is most suitable for the separation of immiscible liquids is
 A. filter funnel
 B. filter paper
 C. paper chromatography
 D. separating funnel
- (xxvii) A dative covalent bond is formed when one atom
 A. loses electrons
 B. gains electrons
 C. shares electrons
 D. donates electrons
- (xxviii) The percentage of water of crystallization in $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is
 A. 63.4% B. 51.22% C. 49.2% D. 47.3%
 [Mg = 24, S = 32, O = 16, H = 1]
- (xxix) When an egg shell is dropped into dilute hydrochloric acid, effervescence occurs because
 A. carbon dioxide gas is evolved
 B. hydrogen sulphide gas is evolved
 C. oxygen gas is evolved
 D. hydrogen gas is evolved
- (xxx) Crystals of electrovalent compounds always possess
 A. atoms held together by electrostatic forces
 B. molecules held together by covalent forces
 C. ions held together by electrostatic forces
 D. molecules as their structural units. (30 marks)

SECTION B

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

2. (a) Define each of the following:

- (i) Catalyst (ii) Titration (iii) Ion

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

- (i) Synthesis of water
 (ii) Preparation of oxygen from hydrogen peroxide
 (iii) Dilute hydrochloric acid and calcium carbonate

- (iv) Dilute sulphuric acid and barium chloride
(v) Dilute hydrochloric acid and potassium permanganate (8 marks)
3. (a) Name ONE (1) indicator you would choose for each of the following neutralization reactions.
- (i) Hydrochloric acid against ammonium hydroxide
(ii) Acetic (ethanoic) acid against sodium hydroxide.
- (b) With the aid of a diagram, explain how you would prepare a standard solution of a named substance in the laboratory.
- (c) 20cm^3 of sulphuric acid required 25cm^3 of 0.1M potassium hydroxide for complete neutralization.
Calculate
- (i) the molarity of the acid
(ii) the concentration, in grammes per litre, of the acid. (8 marks)
4. Elements K, L, M and N have atomic numbers 6, 8, 12 and 20 respectively.
- (a) Write the electronic configuration of each element.
(b) Write the normal valency of each element.
(c) Write the formula of the simplest compound and mention the type of bond formed when each of the following pairs of elements combine chemically.
- (i) K with L
(ii) K with M
(iii) M with N
(iv) N with L (8 marks)
5. (a) State Boyle's law.
(b) A sample of gas Z occupied a volume of 470cm^3 when measured at 740 mmHg and a temperature of 0°C . Gas Z was then expanded to a new volume of 570cm^3 at 0°C . Calculate the new pressure of gas Z.
(c) Give the name of the type of reaction represented by each of the following reactions:
- (i) $\text{C}_3\text{H}_8 (\text{g}) + 5\text{O}_2 (\text{g}) \longrightarrow 3\text{CO}_2 (\text{g}) + 4\text{H}_2\text{O} (\text{l})$
(ii) $2\text{Pb}(\text{NO}_3)_2 (\text{s}) \longrightarrow 2\text{PbO} (\text{s}) + 4\text{NO}_2 (\text{g}) + \text{O}_2 (\text{g})$
(iii) $\text{AgNO}_3 (\text{aq}) + \text{NaCl} (\text{aq}) \longrightarrow \text{AgCl} (\text{s}) + \text{NaNO}_3 (\text{aq})$ (8 marks)

SECTION C

Answer question SIX (6) and any other TWO (2) questions from this section in the answer book provided.

6. (a) What do you understand by the following terms?

- (i) Soil erosion
- (ii) Mulching
- (iii) Leaching
- (iv) Soil fertility
- (v) Soil pH.

(b) The weight of a fresh soil sample from your school's garden was 45g. The soil sample, on drying in an oven at 140°C , cooling in a desiccator and re-weighing, had a constant weight of 36g. What was the percentage of water in the soil sample?

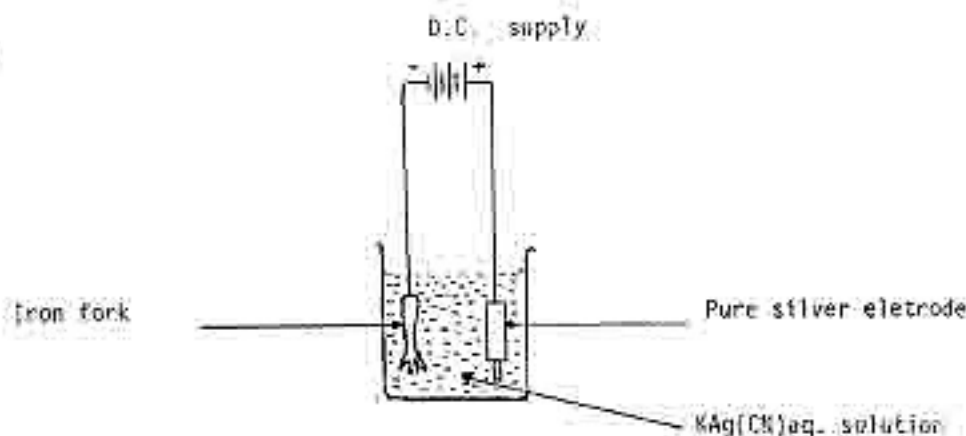
(14 marks)

7. (a) The Frasch process in the extraction of sulphur is essentially a physical process. With the aid of a diagram, briefly justify this statement.
- (b) Mention three (3) allotropes of sulphur.
- (c) How and under what conditions does element sulphur react with each of the following?
- (i) Carbon
 - (ii) Nitric acid
 - (iii) Iron filings.

8. (a) Define each of the following terms:

- (i) Electrolyte
- (ii) Anion
- (iii) Cation.

(b)



The above diagram represents an experiment whose aim was to electroplate an IRON FORK with silver.

The solution contained K^+ , Ag^+ and CN^- ions.

- (i) What electrode was the cathode?
- (ii) Was the process which took place at the ANODE reduction or oxidation?
- (iii) If after passing a constant current for 300 minutes the iron fork gained 2.16g of silver, calculate the number of coulombs and the current which flowed during that experiment.

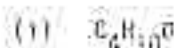
$$[1 \text{ Faraday} = 96500 \text{ coulombs, } Ag = 108]$$

- (iv) What is the importance of electroplating? (12 marks)

9. (a) An organic compound D has a composition of 52.18% carbon, 13.04% hydrogen, and 34.74% oxygen and its molecular weight is 46.

Determine its

- (i) empirical formula
 - (ii) molecular formula
- (b) Write the possible structural formulae and their respective chemical names that can be derived from each of the following:



10. (a) What do you understand by each of the following?

- (i) Reversible reaction
- (ii) Chemical equilibrium

- (b) What is a rate of a chemical reaction?

- (c) Giving an example in each case, explain briefly how each of the following affects the rate of a chemical reaction.

- (i) Temperature
- (ii) Concentration
- (iii) Physical states of reactants
- (iv) Light.

(12 marks)