



TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION

CHEMISTRY 2

132/2

(For both School and Private Candidates)

TIME: 3 HOURS

Thursday, 7th March 2024 a.m.

Instructions

1. This paper consists of **six (6)** questions.
2. Answer **five (5)** questions.
3. Each question carries **twenty (20)** marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
6. Write your Examination Number on every page of your answer booklet(s).
7. For calculations you may use the following constants:
 - Universal gas constant, $R=8.314\text{Jmol}^{-1}\text{k}^{-1}$ or $0.0821\text{dm}^3\text{atmmol}^{-1}\text{k}^{-1}$
 - Avogadros constant = $6.022 \times 10^{23}/\text{mol}$.
 - Atomic masses:
Ag=108, Cl=35.5, C=12, O=16, Na=23, Ca=40, F=19, S=32, Cr=52, N=14.

1. (a) A non-ideal solution B is formed between carbondisulphate and acetone.
 - (i) Will this solution exhibit a positive or negative deviation from Raoult's law? Explain your answer. **[02 marks]**
 - (ii) Draw a vapour pressure against mole fraction curve of the solution in (i) above. **[03 marks]**
 - (iii) Explain by using two (2) points how a solution A (mixture of nitric and water) differ from a solution B above. **[02 marks]**
 - (b) An organic compound W is two times more soluble in ether than in water. Determine the mass of the compound extracted when 100cm³ of aqueous solution containing 1g of the compound is shaken with:
 - (i) 100cm³ of ether once **[03 marks]**
 - (ii) Two successive quantities of 50cm³ of ether each. **[04 marks]**
 - (c) State two (2) applications of fractional distillation. **[02 marks]**
 - (d) At a pressure of 760mmHg a mixture of nitrobenzene (C₆H₅NO₂) and water boils at 99°C. The vapour pressure of water at this temperature is 733mmHg. Find the proportion of water and nitrobenzene in the distillate obtained by steam distillation of impure nitrobenzene. **[04 marks]**
2. (a) Briefly explain two points emphasized by each of the following theories of chemical kinetics:
 - (i) Collision theory
 - (ii) Arrhenius theory **[02 marks]**
 - (b) (i) The rate of production of C is 13 moles/s. Calculate the rate of consumption of B and the rate of production of D in the equation

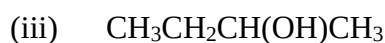
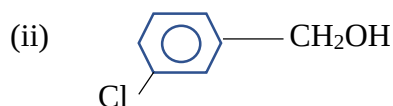
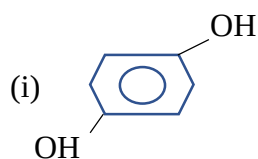
$$3A + 2B \rightarrow 4C + D.$$
[03 marks]
 - (ii) The decomposition of nitrogen dioxide was investigated at 300°C and the following concentrations were obtained:

Time in sec	0	100	200	300
[NO ₂] in M	0.010	0.00650	0.00500	0.00400

 Deduce the order of reaction with respect to NO₂ using the half-life period method. **[03 marks]**
 - (c) (i) Why dilute hydrochloric acid is not used to acidify potassium permanganate during redox titration?
 - (ii) In iodometry titrations starch indicator is added near to the end of titration. Explain

- (d) Electrolysis of two cells in series was done using a current of 2A for 75.39 minutes. The first cell contains CuSO_4 solution and the second cell contains $\text{X}_2(\text{SO}_4)_3$. If the mass of the metal deposited at the cathode of the second cell was 1.62g;
- Calculate the volume of oxygen gas collected at anode of the first cell at S.T.P.
 - Deduce the element X in $\text{X}_2(\text{SO}_4)_3$. **[06 marks]**
- (e) Calculate the e.m.f and equilibrium constant at standard temperature of a Nickel-Silver cell if the nickel salt solution used is 2.5M and the silver salt solution is 0.1M. Given that:
- $$E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25\text{V} \text{ and } E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80\text{V}.$$
- [04 marks]**
3. (a) Briefly explain the following
- The solubility of lead (II) chloride in water decreases but increases in concentrated hydrochloric acid.
 - Aqueous ammonium carbonate can precipitate some metals as metal carbonates but the presence of ammonium chloride in the solution often prevents the precipitation. **[04 marks]**
- (b) A saturated solution of CaF_2 was found to contain 0.0168g/dm^3 of CaF_2 at 298K. Calculate the solubility product of CaF_2 . **[05 marks]**
- (c) A buffer solution contain 0.15mol dm^{-3} of ammonia and 0.09mol dm^{-3} of ammonium chloride at 298K. Given that the pK_b of ammonia is 4.75. Calculate the pH of the buffer solution. **[05 marks]**
- (d) Describe four (4) ways that can be used to prevent corrosion. **[06 marks]**
4. (a) With reason(s), explain the trend of atomic radii across a period and down a group. **[02 marks]**
- (b) Why does the electronegativity generally decrease down the group? **[02 marks]**
- (c) Why first member in each group A elements acquire peculiar characteristics? Give two (2) reasons. **[02 marks]**
- (d) Describe three (3) diagonal relationship between lithium (Li) and magnesium (Mg). **[06 marks]**
- (e) Briefly explain the extraction of aluminium from bauxite under the following guidelines:
- Purification of ore by Serpeck's method. **[03 marks]**
 - Mechanism of electrolytic reduction of pure alumina. **[05 marks]**

5. (a) By using IUPAC system name the following compounds



- (b) How is the structure of phenol related to its

- (i) Acidity
- (ii) Higher reactivity as compared to toluene.
- (iii) Solubility in water [06 marks]

- (c) Explain the following phenomena:

- (i) Carboxylic acids have higher boiling point than alcohols with comparable molecular masses. [02 marks]
- (ii) Although propanol and acetone have the same molar mass, the boiling point of acetone is higher than that of propanol. [02 marks]

- (d) Show how you can convert the following in not more than two (2) steps.

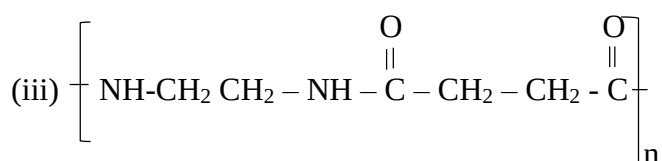
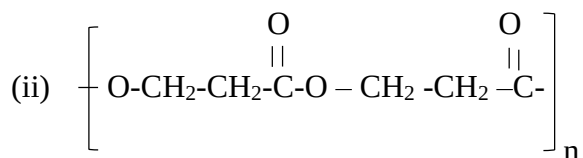
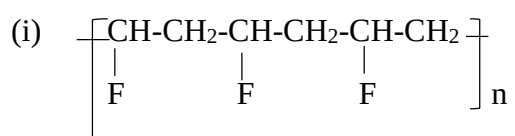
- (i) Propanol to propanoic acid
- (ii) But-2-yne to butan-2-one
- (iii) But-2-yne to acetic acid [06 marks]

6. (a) Briefly explain three (3) chemical properties of transition elements. [03 marks]

- (b) Write the structures of the following compounds:

- (i) Dichlorobis (ethylenediamine) platinum (II).
- (ii) Sodium tetrachloronickelate (II)
- (iii) Ammonium diaquabis (oxalato) nickelate (II)
- (iv) Hexaammine iron (III) hexacyanochromate (III)
- (v) Aquabis (ethylenediamine) cyanocobalt (III) ion. [05 marks]

(c) What monomer(s) must be used to produce the following polymers?



[06 marks]

(d) You are provided with the following monomers, draw the structure of the polymer which can be formed by each monomer and give one use of each polymer drawn.

(i) Ethene ($\text{CH}_2=\text{CH}_2$)

(ii) Phenylethene ($\text{C}_6\text{H}_5-\text{CH}=\text{CH}_2$)

(iii) Chloroethene $\left[\begin{array}{c} \text{CH} = \text{CH}_2 \\ | \\ \text{Cl} \end{array} \right]$

[06 marks]

Wabillah Taufiq