

The Times Secondary School

Dillibazar, Kathmandu

First Terminal Examination – 2080

Grade:- XII

Set A

Full Marks:-75

Stream:- Science

Pass Marks:-30

Subject:- Chemistry

Time: 3hrs

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate the full marks.

Group A

Choose the best alternative to the following questions. [1×11=11]

- What is the normality of 0.3 M phosphorous acid (H_3PO_3)
a. 0.1 b. 0.3 c. 0.6 d. 0.9
- When 50 ml of 6N H_2SO_4 is mixed with 100 ml of 3N NaOH, the resulting solution will be
a. acidic. b. basic. c. neutral. d. Strongly acidic.
- In a standard Hydrogen electrode, the concentration of H^+ ion is
a. 0.1M. b. 1M c. 10M. d. not fixed
- The pH of 10^{-8} M aq. solution of HCl is
a. Less than 7 b. More than 7 c. 8 d. 5
- Which of the following is used for synthesis of secondary alkyl halide from unsymmetrical alkene?
a. Victor Meyer method b. Williamson synthesis
c. Markovnikov's synthesis d. Wurtz synthesis
- When $\text{C}_2\text{H}_5\text{OH}$ is heated with PCl_5 , the product is
a. CH_3COCl b. CH_3OH
c. $\text{C}_2\text{H}_5\text{Cl}$ d. $\text{C}_3\text{H}_7\text{Cl}$
- The first product of oxidation of primary alcohol is
a. Ester b. Nitrocompounds c. Aldehyde d. Carboxylic acid
- The order of basic strength of amine is
a. $3^\circ > 2^\circ > 1^\circ$ b. $2^\circ > 1^\circ > 3^\circ$ c. $2^\circ > 3^\circ > 1^\circ$ d. $3^\circ > 1^\circ > 2^\circ$
- Reduction of nitrobenzene in presence of Sn/HCl gives
a. Chlorobenzene b. Aniline
c. Phenol d. None.
- Which ion gives colored solution?
a. Zn^{++} . b. Fe^{++} c. Ag^+ . d. Cu^+
- Copper pyrite is concentrated by
a. Leaching b. froth floatation c. Gravity separation d. Electrolytic

Group B

[8×5=40]

Short question answers group

- Volumetric analysis is one of the most common and commanding quantitative analysis used in laboratory, industry, pharmaceutical and

forensic technologies to prepare exact concentration of solution and to estimate weight of dissolved solute on solution with the fixed volume.

- What is the major differences between acidimetry and alkalimetry. [1]
- Define seminormal solution with one example of it. [1]
- How can you prepare 250 ml of decinormal oxalic acid solution? [1]
- Among 60 g/L NaOH and 3 N NaOH and 2 M NaOH, which one has higher concentration? [2]

OR

Titration is a quantitative analysis used in food industries, pharmaceutical industries, dairy industries, college laboratory etc.

- Define titrant and titrand. [1]
- Explain about primary and secondary substances. [2]
- If 2.45 g H_2SO_4 is dissolved in 500 mL solution. Find out: [2]
 - g/L
 - Molarity
 - Normality
 - % concentration

- Strength of acid and base is generally calculated in term of pH and pOH.
 - Explain the Lewis concept of acid and base.
 - Why AlCl_3 is considered as Lewis acid but not Arrhenius acid?
 - How value of K_w differs according to temperature assuming 1×10^{-14} at 25°C .
 - Find the pH of the 0.004N HNO_3 assuming the complete dissociation of HNO_3 . [1+1+1+2]
- Can we store CuSO_4 solution in iron vessel? If not, why? (Given $E_{\text{Cu}^{++}/\text{Cu}}^0 = 0.34\text{v}$ and $E_{\text{Fe}^{++}/\text{Fe}}^0 = -0.44\text{v}$) [2]
The standard electrode potential (st reduction potential) for the following electrodes are $\text{Ag} = 0.80\text{v}$ $\text{Ni} = -0.25\text{v}$ [1+1+1]
 - Represent suitable Galvanic cell indicating cathode and anode
 - Write reactions taking place at each electrode and overall redox reaction.
 - Calculate standard emf of the cell.
- Answer the following questions.
 - Mn has various oxidation state. Why? [1]
 - What is spectrochemical series? [1]
 - Give any 4 common complex formed by transitional metals. [2]
 - Many transition metals acts as catalysts in different reactions. How transition metals acts as catalysts. [1]
- Copper metal generally known as 'Tama' in Nepali can be found in free as well as combined state. . Explain the roasting and smelting process during the extraction of copper. [1.5+3.5]
- Explain Markonikov's rule. Give reactions how haloalkene is prepared starting from:
 - Propene
 - Propanol [2+1.5+1.5]

OR

Why carbonyl compound undergo nucleophilic addition reaction? The dehydration of an alcohol A gives an alkene B, which on ozonolysis gives C and D. The compound C and D are obtained by the oxidation of 1° and 2° alcohol having 3/3 C-atom. Identify A,B,C and D with suitable reaction.[1+4]

7. Ethyl alcohol is common alcohol and has various uses in medical field. It can be prepared by the fermentation of sugar molasses.
- What is fermentation? [1]
 - Write chemical reaction for the conversion of cane-sugar into ethyl alcohol. [1]
 - How ethanol gives esterification reaction? [2]
 - Why boiling point of ethanol is higher than other aliphatic hydrocarbon which has comparable molecular mass? [1]
8. Give proper reasons:
- Why amino group is protected before nitration?
 - Why amino group is ortho or para directing?
 - Aniline is weaker base than aliphatic amine. [2+2+1]

Group C

[8×3=24]

Long question answer group.

9. Normality and molarity are used to express the concentration of solution in volumetric analysis.
- Differentiate between molarity and normality. [1]
 - Derive normality equation starting from laws of chemical equivalence.[2]
 - What weight of oxalic acid crystal is needed to prepare the 250 mL of 0.1 N solution? [1]
 - 0.8 gm of divalent metal was dissolved in 100 ml of 1.28N HCl solution and the solution was diluted to 200ml. 50 ml of this diluted solution required 54.6ml of 0.22N NaOH for complete neutralization. Find the atomic mass of metal. [4]
10. There are variety of electrochemical cells available these days. We are entirely dependent of electrochemical cells these days.
- Define electrochemical cell. [1]
 - What do you mean by secondary cell? [1]
 - Explain about the Lead storage battery along with reaction. [3]
 - Can a solution of 1M copper sulphate be stored in a vessel made up of Nickel? If not why? Also find the emf from the given data. Given : Standard reduction potential of Nickel and copper are - 0.25V, and 0.34V and respectively. [3]

- Write oxo process for conversion of ethene into propanol. [2]
- Draw structure of all possible structural isomeric alcohols of $C_4H_{10}O$ with IUPAC names. How these isomers are distinguished by Victor Meyer method. Explain. [4]
- Convert propan-2-ol to propan-1-ol. [2]

11. In chemistry lab, you are given a bottle containing a mixture of primary, secondary and tertiary amine. [4+2+2]
- How would you separate each of these amines in pure form.
 - Explain about the basicity of these amines.
 - How does ethanamine reacts with $CHCl_3$ in presence of aq. KOH?

The End

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Group A

Choose the best alternative to the following questions.. [1×11=11]

1. What is the normality of 0.3 M sulphuric acid (H₂SO₄)
a. 0.1 b. 0.3 c. 0.4 d. 0.9
2. When 50 ml of 5N H₂SO₄ is mixed with 100 ml of 3N NaOH, the resulting solution will be
a. acidic. b. basic. c. neutral. d. Strongly acidic.
3. The pH of 10⁻⁸ M aq. solution of HCl is
a. Less than 7 b. More than 7 c. 8 d. 5
4. Which of the following is used for synthesis of secondary alkyl halide from unsymmetrical alkene?
a. Victor Meyer method b. Williamson synthesis
c. Markovnikov's synthesis d. Wurtz synthesis
5. In a calomel electrode, the concentration of H⁺ ion is
a. 0.1M. b. 1M c. 10M. d. not fixed
6. Reduction of nitrobenzene in presence of Sn/HCl gives
a. Chlorobenzene b. Aniline
c. Phenol d. None.
7. When C₂H₅OH is heated with PCl₃, the product is
a. CH₃COCl b. CH₃OH
c. C₂H₅Cl d. C₃H₇Cl
8. The first product of oxidation of primary alcohol is
a. Ester b. Nitrocompounds c. Aldehyde d. Carboxylic acid
9. The order of basic strength of amine is
a. 3°>2°>1° b. 2°>1°>3° c. 2°>3°>1° d. 3°>1°>2°
10. Which ion gives colorless complex?
a. Zn⁺⁺. b. Fe⁺⁺ c. Cr⁺⁺⁺. d. Cu⁺⁺
11. After concentration copper pyrite undergoes:
a. Leaching b. froth floatation c. Roasting d. Electrolytic reduction

Group B[8×5=40]

Short question answers group

1. Volumetric analysis, any method of quantitative chemical analysis in which the amount of a substance is determined by measuring the volume that it occupies or

in broader usage, the volume of second substance that combines with the first in known proportion more correctly called titrimetric analysis.

- a. Define titration. [1]
- b. What are primary and secondary standard solutions? Give examples [2]
- c. Titration between acidified KMnO₄ and oxalic acid is redox or acid - base? Why? [1]
- d. Which indicator is used in this titration? Why? [1]

OR

Answer the following questions:

- a. Differentiate end point and equivalence point of titration. [2]
 - b. What is acidity of base and basicity of acid. [1]
 - c. If 20 ml of 0.5 N NaOH is mixed with 30 mL of 0.3 N HCl, is the resulting solution acidic or basic? Calculate the normality of the solution. [2]
2. Various concepts are in existence to determine the acid and base. How Bronsted Lowry concept explains acid and base? Use this concept to explain the conjugated acid and conjugate base. Why Ostwald's law of dilution is used for weak electrolytes only? Find the pH of 0.001 M KOH solution. [1+1+2+1]
 3.
 - a. What is standard oxidation potential and standard reduction potential of an electrode? [1]
 - b. Can a solution of 1M copper sulphate be stored in a vessel made up of Nickel? If not why? Given : Standard reduction potential of Nickel and copper are - 0.25V, and 0.34V and respectively. [2]
 - c. Predict the feasibility of the following reaction. [2]
$$2\text{Fe}^{3+} + \text{Sn}^{2+} \longrightarrow 2\text{Fe}^{2+} + \text{Sn}^{4+}$$

Given that: $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.77\text{v}$ and $E^\circ_{\text{Sn}^{4+}/\text{Sn}^{2+}} = 0.13\text{v}$
 4. Transition elements are defined as elements that have partially filled d-orbitals.
 - a. What is d-orbital degeneracy? [1]
 - b. K₄[Fe(CN)₆] is a complex salt formed by iron. Write the complex ion and ligand present in it. [1]
 - c. d-orbital splitted into two energy levels, name those energy levels and explain. [1]
 - d. Give a possible reason for a fact that Zn⁺⁺ does not form any colored complex. [2]
 5. Copper metal is used for copper plating which is the technique used for prevention of some other metal from corrosion. Explain the bessemerisation and refining process of copper during extraction. [3+2]

6. Answer the questions in brief.
- Oxo process is important method to prepare alcohols in industries. Write a chemical reaction for it. [1]
 - Starting from CH_3MgBr how would you prepare - 2-methylpropan-2-ol? [1]
 - Identify A, B, C and D in the following sequence of reaction. [2]
- $$A \xrightarrow{\text{PBr}_3} B \xrightarrow{\text{KCN}} C \xrightarrow{\text{H}_2\text{O} / \text{H}^+} D$$
- What is the trend of solubility of alcohol members? [1]
7. Explain Markovnikov's rule. Give reactions how haloalkane is prepared starting from:
- Propene
 - Propanol [2+1.5+1.5]

OR

Why carbonyl group is polar in nature? The dehydration of an alcohol A gives an alkene B, which on ozonolysis gives C and D. The compound C and D are obtained by the oxidation of 1° and 2° alcohol having 3/3 C-atom. Identify A, B, C and D with suitable reaction. [1+4]

8. There are three possible isomeric amines of $\text{C}_3\text{H}_9\text{N}$. Draw the structural formula and separate these isomers by using Hoffman's method. [1.5+3.5]

Group C [8×3=24]

Long question answer group.

9. Normally equation is applied to all cases of any complete reaction as well in dilution of same solution but molarity equation may not be possible in all cases. Give your complete information to the following questions.
- What is deci-normal solution? [1]
 - Derive normality equation starting from laws of chemical equivalence. [2]
 - How can we prepare 500 mL of decinormal solution of oxalic acid? [1]
 - 0.3 gm of divalent metal was dissolved in 100 ml of 1.28N HCl solution and the solution was diluted to 200ml. 50 ml of this diluted solution required 54.6ml of 0.22N NaOH for complete neutralization. Find the atomic mass of metal. [4]
10. What is SHE? Why it is called so? Describe the working principle of SHE acting as both anode half and cathode half cell. [1+1+3]
- Standard electrode potential for the following electrodes are $\text{Ag} = 0.80\text{v}$ $\text{Ni} = -0.25\text{v}$ [3]
 - Represent suitable Galvanic cell indicating cathode and anode

- Write reactions taking place at each electrode and overall redox reaction.
- Calculate standard emf of the cell.

OR

Aromatic amine is called 'Aniline' in which the amine group is ortho or para directing. [2+2+1+3]

- Explain the reason why amine group of aniline is ortho or para directing.
- How would you convert aniline into phenol?
- Show your familiarity with coupling reaction of aniline?
- What happens when
 - Aniline is shaken with aq. bromine?
 - Aniline is treated with $\text{NaNO}_2 + \text{HCl}$ in cold?

11.

- Write the structural formulae of isomeric alcohols having molecular formula $\text{C}_4\text{H}_{10}\text{O}$ with their IUPAC names. How these isomer are distinguished by Victor Meyer's method? Explain. [1+3]
- Write about explanatory note on large scale preparation of ethyl alcohol with reference to hydroboration oxidation and fermentation of sugar. [4]

The End