HISSAN CENTRAL EXAMINATION - 2079 (2022)

Class: XII   **F.M: 75**

Time: 3hrs

CHEMISTRY (3021 Set B)
(11 Marks Objective + 64 Marks Subjective)

GROUP A   **Time: 25 Minutes**

Attempt all questions.

Multiple Choice Question:

Circle the correct answer.   **[11 × 1 = 11]**

1. Which is the suitable indicator used for the titration of hydrochloric acid against standard Na_2CO_3 solution?
   a) Phenolphthalein   b) Methyl orange
   c) Litmus   d) $KMnO_4$

2. When a solution having pH 5 is 100-fold diluted, the resultant pH of the diluted solution is
   a) less than 7   b) greater than 7
   c) equal to 7   d) always constant at 5

3. The half-life period of the first order reaction is 2.31 minutes. The rate constant of the reaction is
   a) 0.2 min^{-1} b) 0.3 min^{-1} c) 2 min^{-1} d) 3 min^{-1}

4. Acetic anhydride is obtained from ethanoyl chloride by the reaction of
   a) P_2O_5 b) CH_3COONa c) CH_3COOH d) Al_2O_3

5. A reacts with water to give phenol as the major product. A is,
   a) chlorobenzene   b) aniline
   c) bromobenzene   d) benzene diazonium chloride

6. The order of reactivity of alkyl halides towards elimination reaction is
   a) $3° > 2° > 1°$ b) $2° < 1° > 3°$ c) $3° > 1° > 2°$ d) $1° > 2° > 3°$

7. Mercury (I) Chloride is commonly called as
   a) Cinnabar   b) Nessler's reagent
   c) Calomel   d) Corrosive sublimate

8. Nitrobenzene on heating with Zn dust in aqueous NH_4Cl gives
   a) Aniline   b) Phenyl hydroxylamine
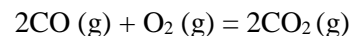   c) Nitrosobenzene   d) Hydrazobenzene

9. Which one of the followings is Gilman reagent?
   a) RMgX   b) R_2Cd c) R_2CuLi d) RLi

10. Which of the following is the main ore of silver?
    a) horn silver   b) argentite   c) quicksilver   d) lunar caustic

11. Enthalpy change in the given reaction is termed as
    $2CO\ (g) + O_2\ (g) = 2CO_2\ (g)$
    a) Enthalpy of reaction   b) Enthalpy of formation
    c) Enthalpy of combustion   d) Enthalpy of fusion

Attempt all questions.

Short questions: **[8 × 5 = 40]**

1. a.   (i) Define redox titration with an example.   [1]

    (ii) Deduce normality equation for titration.   [1]

    b.   To a 10 ml of $\frac{M}{10}$ H_2SO_4 solution, 20 ml of water is added. 10 ml of this diluted acid solution required 20 ml of NaOH solution for complete neutralization. Find the normality of NaOH solution.   [3]

OR

a.   Define half-life period of reaction.
If the half-life of reaction doubles by doubling the concentration reactant, find the order of reaction.   [1+1]

b.   Rates of first order reaction are 0.0179 and 0.0143 mol L^{-1} min^{-1} after 10 min and 20 min respectively after its initiation from 1 molar concentration. Find the value of rate constant and half life time of the reaction.   [3]

2. Water gas is prepared by passing steam over red hot coke as
$C(s) + H_2O(g) \longrightarrow H_2(g)+ CO(g)$
Given the following data

Substance	$\Delta H_f°$ (KJ mol^{-1})	$S°$ (JK^{-1} mol^{-1})
C(s)	0	5.74
H_2O (g)	-241.8	188.71
H_2 (g)	0	130.52
CO (g)	-110.52	197.56

Using these data

(i) Calculate $\Delta H°$ and $\Delta S°$ of the reaction.   [1+1]

(ii) Calculate $\Delta G°$ and equilibrium constant (K) of the reaction at 1000°C.
Given R = 8.314 jmol^{-1}K^{-1}.   [1+1]

(iii) Find the temperature at which the reaction attains equilibrium.   [1]

3. Iron is an important metal and mainly extracted from its ore haematite. The metallurgy of iron involves various steps.

    a.   Name the steps involved in which the metal is concentrated

    b.   Write the chemical reaction occurring in zone of reduction during smelting process.

    c.   Give differences between cast iron and wrought iron.   [1+2+2]

4. a.   What happens when
        (i) cupric sulphate solution is warmed with glucose solution in alkaline medium.
        (ii) sodium cyanide solution is dropped over solid silver chloride.
        (iii) caustic soda solution is added drop by drop in zinc sulphate solution till excess.   [1+1+1]

   b.   How is Nessler's reagent prepared? Write its use with chemical equation.   [1+1]

5. An organic compound A reacts with acetone to produce sleep-inducing drug. The compound A undergoes slow oxidation with air to give poisonous gas.

    a. Give a chemical reaction for its preparation.

    b. Complete the following reactions sequence using proper reagents and compounds B and C.

    $$A \xrightarrow{reagent} C_2H_2 \xrightarrow{H_2SO_4/HgSO_4,\Delta} B \xrightarrow{dil.\ NaOH} C$$
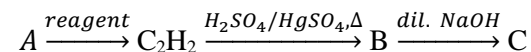
    c. Write IUPAC name of C.   [1+3+1]

OR

a.   Show your familiarity with
    (i) Sandmeyer reaction
    (ii)Wurtz-Fittig reaction   [1+1]

b.   Identify A, B and C in the following sequence of reactions.   [3]
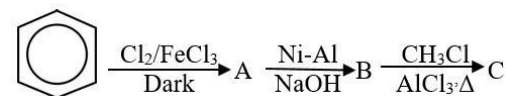
6. a.   Convert phenol into
        (i) O-nitro anisole   (ii) Phenolphthalein   [2+1]

    b.   Starting from phenol, how would you prepare picric acid? Write its major use.   [1+1]

7. a. Separate 1°, 2° and 3° amines from their mixture of Hoffmann's method.

    [3]

    b. Convert aniline to benzoic acid with necessary conditions.   [2]

8. a. Write down structures of primary and secondary alcohol of each from C_3H_8O.

    b. How is the primary alcohol converted into the secondary alcohol?

    c. Give a chemical test to distinguish them.   [2+2+1]

GROUP C

Attempt **all** long answer question.   [3×8=24]

9. a. (i) Define buffer solution with an example. Explain qualitatively the buffer action of a buffer solution.   [3]

    (ii) Explain the nature of pH titration curve and also the basis of selection of indicator in the titration of strong acid strong base reaction.   [2]

    b. To a 100 ml of 0.001 M HCl solution, 100 ml of a solution containing 17 mg of $AgNO_3$ is added. Find whether or not AgCl precipitates. If precipitation occurs find the mass of AgCl precipitated from the mixture. (K_{sp} = 1.7 × 10^{-10} & Ag = 108)   [1+2]

OR

    a. (i) How does single electrode potential originate and determine it by the use of standard H_2-electrode?   [2]

    (ii) What is meant by the standard reduction potentials of

    Cu^{2+} (aq)/Cu(s) = +0.34V and of Zn^{2+}(aq)/Zn(s) = -0.76 V at 25°C?

    [1]

    (iii) Construct galvanic cell from the given electrodes and calculate its standard cell potential.   [2]

    b. State first law of thermodynamics.

    Prove that (i) $\Delta E = Q_v$ at constant volume

    and (ii) $\Delta H = Q_p$ at constant pressure   [1+1+1]

10. a. Three isomers A, B and C have molecular formula C_3H_6O. The isomer A is alcohol, B is Ketone and C is aldehyde. Write their structures with IUPAC names.   [1+1+1]

    b. Suggest with chemical test with reaction that will allow you to show that

(i) A is an alcohol whereas B and C are not.

(ii) B and C are carbonyl compound whereas A is not.

(iii) C is aldehyde whereas A and B are not.   [1+1+1]

    c. Show your familiarity with chemical reaction for each of the following.

(i) DNP test

(ii) Perkin reaction   [1+1]

OR

    a. An unknown ester having molecular formula $C_5H_{10}O_2$ was hydrolyzed in presence of mineral acid to give carboxylic acid A and alcohol B. Treatment of B with PBr_3 gave alkyl bromide C. The compound C on treatment with KCN, a product D was formed which on acid hydrolysis gave carboxylic acid A. Give the structure and name of original ester. Identify A, B, C and D. Write chemical reactions involved.   [1+4]

    b. Write on

(i) Claisen condensation

(ii) Hofmann's bromamide reaction

(iii) Clemmensen reduction   [1+1+1]

11. a. What are the steps involved in the manufacture of portland cement? Give a simplified flow-sheet diagram.   [3+1]

    b. Write down the structural formula and major uses of

    i) Aspirin   ii) Penicillin   iii) Bakelite   iv) 2, 4-D   [1+1+1+1]

THE END