CBSE QUESTIONS PAPER – 2022 (56/3/2)
SUBJECT: CHEMISTRY
TERM-II

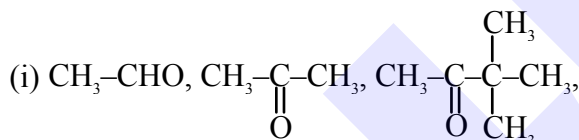**Time : 2 Hours**   **Max. Marks : 35**

General Instructions:

Read the following instructions carefully.

(i)   This question paper **contains 12 questions**. All questions are **compulsory**.

(ii)   This question paper is divided into **three Sections – Section A, B and C.**

(iii)   **SECTION A - Q. No. 1 to 3** are very short answer type questions carrying **2 marks** each.

(iv)   **SECTION B - Q. No. 4 to 11** are short answer type questions carrying **3 marks** each.

(v)   **SECTION C - Q. No. 12** is case based question carrying **5 marks**.

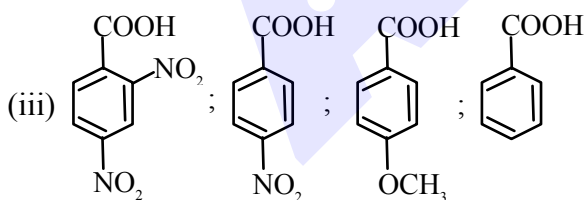**(vi)**   **Use of log tables and calculators is NOT allowed.**

SECTION-A

1. **Arrange the following compounds in increasing order of their property as indicated in bracket : (Any two)**

(i) $CH_3–CHO$, $CH_3–\underset{O}{\overset{}{C}}–CH_3$, $CH_3–\underset{O}{\overset{}{C}}–\underset{CH_3}{\overset{CH_3}{C}}–CH_3$,

                     (reactivity towards HCN)

(ii) **$CCl_3–COOH$, $CF_3–COOH$, $(CH_3)_3C–COOH$**

       (acid strength)

(iii)   **[1×2=2]**

                  (acid strength)

2. An Organic compound (A) with molecular formula C_3H_7NO on heating with Br_2 and KOH forms a compound (B). Compound (B) on heating with $CHCl_3$ and alcoholic KOH produces a foul smelling compound (C) and on reacting with $C_6H_5SO_2Cl$ forms a compound (D) which is soluble in alkali. Write the structures of (A), (B), (C) and (D).   **[2]**

3. Define conductivity for the solution of an electrolyte. Why does the conductivity of a solution decreases with dilution ?   **[2]**

SECTION-B

4. Account for the following :
   (i) Cr^{2+} is a strong reducing agent.
   (ii) Ti^{3+} is coloured whereas Sc^{3+} is colourless in aqueous solution.
   (iii) Zn, Cd and Hg are not called transition elements. **[1×3=3]**

5. (a) Differentiate between the following :
   (i) Adsorption and Absorption
   (ii) Lyophobic sol and Lyophilic sol
   (iii) Multimolecular Colloid and Macromolecular colloid **[1×3=3]**

   OR

   (b) (I) Define the following terms :
   (i) Zeta Potential
   (ii) Coagulation
   (II) Why a negatively charged sol is obtained when $AgNO_3$ solution is added to KI solution ? **[3]**

6. **(a)** What happens when
   (i) Propanone is treated with CH_3MgBr and then hydrolysed ?
   (ii) Ethanal is treated with excess ethanol and acid ?
   (iii) Methanal undergoes Cannizzaro reaction ? **[1×3 =3]**

   OR

   (b) Write the main product in the following reactions :
   (i) $2CH_3COCl + (CH_3)_2Cd \longrightarrow$
   (ii) $CH_3CH_2CHO \xrightarrow{Zn(Hg)/Conc.HCl}$
   (iii) —COONa + NaOH $\xrightarrow[\Delta]{CaO}$ **[1×3=3]**

7. What is Lanthanoid contraction ? What is the cause of Lanthanoid contraction ? Write two consequences of Lanthanoid contraction. **[3]**

8. **(a)** **(i)** Which acid of the following pair would your expect to be stronger ?
   $F–CH_2–COOH$ or $CH_3–COOH$
   (ii) Arrange the following compounds in increasing order of their boiling points :
   CH_3CH_2OH, $CH_3–CHO$, $CH_3–COOH$
   (iii) Given simple chemical test to distinguish between Benzaldehyde and Acetophenone. **[1×3=3]**

   OR

   (b) **(i)** Which will undergo faster nucleophilic addition reaction ?
   Acetaladehyde or Propanone
   (ii) What is the composition of Fehling's reagent ?
   (iii) Draw structure of the semicarbazone of Ethanal. **[1×3=3]**

9.   **Give reasons :**

     (i)   Ammonolysis of alkyl halides is not a good methods to prepare pure primary amines.

     (ii)   Aniline does not give Friedel-Crafts reaction.

     (iii) Although $-NH_2$ group is o/p directing in electrophilic substitution reactions, yet aniline on nitration gives good yield of m-nitroaniline.   **[1×3=3]**

10.   (a)   Using valence bond theory, predict the hybridization and magnetic character of following :

        $[CoF_6]^{3-}$ [Atomic number of Co = 27]
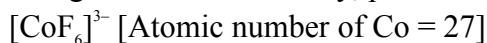
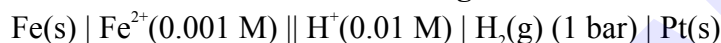   (b)   Write IUPAC name of the following complex :

        $[CoBr_2(en)_2]^+$
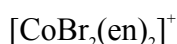
     (c)   How many ions are produced from the complex $[Co(NH_3)_6]Cl_2$ in solution ?   **[1×3=3]**

11.   **(a)   Calculate $\Delta_r G°$ and log K_C for the following cell :**

        $Ni(s) + 2Ag^+(aq) \longrightarrow Ni^{2+}(aq) + 2Ag(s)$

        Given that $E°_{cell}$ = 1.05 V, IF = 96,500 $Cmol^{-1}$ **[3]**

<div align="center">**OR**</div>

     (b)   Calculate the e.m.f. of the following cell at 298 K.

        $Fe(s) \mid Fe^{2+}(0.001\ M) \parallel H^+(0.01\ M) \mid H_2(g)\ (1\ bar) \mid Pt(s)$

        Given that $E°_{cell}$ = +0.44 V

        [log 2 = 0.3010   log 3 = 0.4771   log 10 = 1]   **[3]**

<div align="center">## SECTION-C</div>

12.   **Read the following passage and answer the questions that follow :**

     The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. A number of factors such as temperature, concentration of reactants, catalyst affect the rate of reaction. Mathematical representation of rate of a reaction is given by rate law :

<div align="center">Rate = $k[A]^x [B]^y$</div>

     x and y indicate how sensitive the rate is to the change in concentration of A and B. Sum of x + y gives the overall order of a reaction.

     When a sequence of elementary reactions gives us the products, the reactions are called complex reactions. Molecularity and order of an elementary reaction are same. Zero order reactions are relatively uncommon but they occur under special conditions. All natural and artificial radioactive decay of unstable nuclei take place by first order kinetics.

     (a)   What is the effect of temperature on the rate constant of a reaction ?

     (b)   For a reaction A + B Product, the rate law is given by, Rate = $k[A]^2 [B]^{1/2}$. What is the order of the reaction ?

     (c)   How order and molecularity are different for complex reactions ?

     (d)   A first order reaction has a rate constant $2 \times 10^{-3}\ s^{-1}$. How long will 6g of this reactant take to reduce to 2g ?

<div align="center">**OR**</div>

     The half life for radioactive decay of ^{14}C is 6930 years. An archaeological artifact containing wood had only 75% of the ^{14}C found in a living tree. Find the age of the sample.

     [log 4 = 6021   log 3 = 0.4771   log 2 = 0.3010   log 10 = 1]   **[1+1+1+2]**