CLASS: XII

**Max. Marks:70**   **Time: 3 hours**

General Instructions:

Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case-based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 marks each.
(g) All questions are compulsory.
(h) Use of log tables and calculators is not allowed.

SECTION-A

Q1. Which is the correct IUPAC name for $CH_3-CH-CH_2-Br$?   (1)

C_2H_5
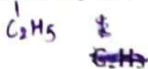
(a) 1-Bromo-2-ethylpropane   (b) 1-Bromo-2-ethyl-2-methylethane
(c) 1-Bromo-2-methylbutane   (d) 2-Methyl-1-bromobutane

Q2. The basic character of the transition metal monoxide follows the order   (1)

a. $CrO > VO > FeO > TiO$ b. $TiO > FeO > VO > CrO$

c. $TiO > VO > CrO > FeO$ d. $VO > CrO > TiO > FeO$

Q3. An organic compound X on treatment with PCC in dichloromethane gives compound Y. Compound Y reacts with I_2 and alkali to form triiodo methane. The compound 'Y' is: (1)

a. CH_3CH_2OH b. CH_3CH_2CHO

c. CH_3COCH_3 d. CH_3COOH

Q4. Ethyl alcohol can be prepared from Grignard reagent by the reaction of   (1)
a. HCHO   b. RCN

c. R_2CO d. RCOCl

Q5. Which of the following ion has the electronic configuration is $3d^6$ (1)
a. Ni^{3+} b. Mn^{3+}
c. Fe^{3+} d. Co^{3+}

Q6. Which of the following reactions of glucose can be explained only by its cyclic structure?
(1)

(a) Glucose forms pentaacetate.

(b) Glucose reacts with hydroxylamine to form an oxime.

(c) Pentaacetate of glucose does not react with hydroxylamine.

(d) Glucose is oxidised by nitric acid to gluconic acid.

Q7. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their: (1)

a) More extensive association of carboxylic acid via Vander waals force of attraction.

b) Formation of carboxylate ion.

c) Formation of Intermolec

d) Formation of Intramolecular Hydrogen bonding.

Q8. DNA and RNA contain four bases each. Which of the following bases is not present in RNA?

(1)

(a) Adenine

(b) Uracil

(c) Thymine

(d) Cytosine

Q9. Which of the following reactions is appropriate for converting acetamide to methanamine:

(1)

(a) Hoffmann bromamide reaction

(b) Stephen reduction

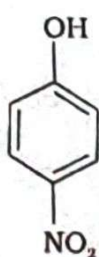(c) Gabriel phthalimide synthesis

(d) Carbylamine reaction

Q10. Which of the following orders of relative strengths of acids is correct?

(1)

(a) $ClCH_2COOH > FCH_2COOH > BrCH_2COOH$

(b) $ClCH_2COOH > BrCH_2COOH > FCH_2COOH$

(c) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

(d) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH$
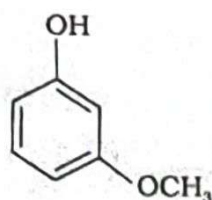
Q11. Mark the correct order of decreasing acid strength of the following compounds. (1)
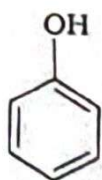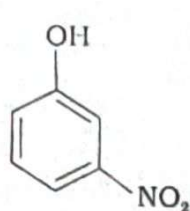

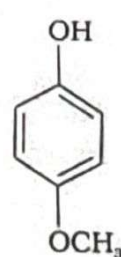(a)   (b)   (c)   (d)   (e)

(a) e > d > b > a > c

(b) b > d > a > c > e

(c) d > e > c > b > a

(d) e > d > c > b > a

Q12. For the reaction 3A ⟶ 2B, rate of reaction + d[B] is equal to

(1)

$\dfrac{}{dt}$

(a) $\dfrac{-3}{2}\dfrac{d[A]}{dt}$

(b) $\dfrac{-2}{3}\dfrac{d[A]}{dt}$

(c) $\dfrac{-1}{3}\dfrac{d[A]}{dt}$

(b) $+2\dfrac{d[A]}{dt}$

ASSERTION REASONING QUESTIONS

In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct answer out of the following choices.

(a) Both A and R are correct and R is the correct explanation of A.
(b) Both A and R are correct but R is not explanation of A.
(c) Assertion (A) is correct but Reason (R) is incorrect.
(d) Assertion (A) is incorrect but Reason (R) is correct.

Q13. Assertion: Phenols are more reactive towards electrophilic substitution reaction compared to benzene.

(1)

Reason: -OH group in phenol increases the electron density in ortho and para position due to +M effect.

Q14. Assertion (A): The half- life for a zero-order reaction is independent of the initial concentration of the reactant

(1)

Reason (R): For a zero-order reaction, Rate = k

Q15. Assertion (A): mercury cell does not give steady potential (1)

Reason (R): in the cell reaction, ions are not involved

Q16. Assertion: When aqueous solution of sodium chloride is electrolysed, chlorine gas is not produced at anod (1)

Reason: It is due to the overpotential for oxidation of water to oxygen.

SECTION B. (2 marks each)

Q17. Write the structures and names of the compounds formed when compound 'A' with molecular formula, C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$. (2)

Q18. (i) Deficiency of which vitamin causes night blindness? Write two food source rich in that vitamin.

(ii) What happens when D-glucose reacts with Br_2 water?

Q19. Write the products of the following reactions (2)

(i) $CH_3COCH_3 \xrightarrow{Zn-Hg/.Con.-HCl}$?

(ii) $CH_3-CO-Cl + H_2 \xrightarrow{Pd-BaSO_4/S}$?

OR

Q19. Do the following conversions in not more than two steps: (2)

Benzoic acid to Benzene

(i)   Propan-1-ol to 2-Bromopropanoic acid

Q20.   (i) Define molal elevation constant. (2)

(ii) Why the boiling point of a solution is always higher than the boiling point of pure solvent?

OR

(i) RBC'S shrink when placed in saline water but swell in distilled water. Give reason.

(ii) Why the people at high altitude suffer with the problem of Anoxia?

Q21. For a reaction A + B→P, the rate is given by rate= k[A] [B]² (2)

i) How is the rate of a reaction affected if the concentration of B is doubled?

ii) what is the overall order of the reaction if A is present in large excess?

SECTION C (3 marks each)

Q22. Give reason why- $3 \times 1=(3)$

(i) Aryl halides are less reactive towards nucleophilic substitution reaction than Alkyl halide?

(ii) Alkyl chloride react with aqueous KOH leads to the formation of alcohols but in presence of alcoholic KOH leads to formation of alkenes.

(iii) Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 reaction.

Q23. (i) Draw structures of geometrical isomers of $[Pt(NH_3)_2Cl_2]$ and state the isomer which is used in treatment of the cancer.

(ii) In a coordination entity, the electronic configuration of central metal ion is $t_2g^3eg^1$. Is the coordination compound high spin or low spin. Identify the nature of ligand.

(iii)A compound is formed when excess of KCN is added to aqueous solution of copper sulphate. Why is it that no precipitate of copper sulphide is obtained when H_2S gas is passed through this solution?

Q24. Following data are obtained for the reaction:

$N_2O_4 + \rightarrow 2NO_2 + \frac{1}{2} O_2$

t/s	0	300	600
$[N_2O_5]$ / molL^{-1}	1.6×10^{-2}	0.8×10^{-2}	0.4×10^{-2}

i) Show that it follows a first order reaction. (2)
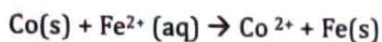
ii) Calculate the half-life. (1)

(Given log 2= 0.3010; log4 =0.6021)

Q25. (a) Using E^0 values of X and Y given below, predict which is better for coating the surface of iron to prevent corrosion. (1)

Given $E^0{}_{X^{2+}/X} = -2.36V$, $E^0{}_{Y^{2+}/Y} = -0.14V$, $E^0{}_{Fe^{2+}/Fe} = -0.44V$

(b) Predict whether the following reaction would occur spontaneously at 298 K . (2)

$Co(s) + Fe^{2+} (aq) \rightarrow Co^{2+} + Fe(s)$

Given $[Co^{2+}] = 1.0M$ $[Fe^{2+}] = 1.0M$

$E^0 Fe^{2+}/Fe = -0.44V$

OR

Q25 (a) Iron does not rust even if the Zinc coating is broken is a galvanized Iron pipe but rusting occurs much faster if the tin coating over iron is broken. Explain. (1)

(b) In a galvanic cell, the following cell reaction occurs: (2)

$Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+} (aq) + 2Ag (s)$ $E^0cell = + 1.56 V$

(i) Is the direction of flow of electrons from zinc to silver or silver to zinc?

(ii)How will concentration of Zn^{2+} ions and Ag^+ ions be affected when the cell functions?

Q26 (i) Write the acid catalysed mechanism of Hydration of Ethene.

(ii) Write the equation of the nitration of anisole.

Q27. Arrange the following: 3(1)

(i)   Ethanal, Propanal, Butanal, Butanone (increasing order of reactivity towards nucleophilic addition reaction)
(ii)   Why does benzoic acid not undergo Friedel-Craft reaction?
(iii)   Write a test to differentiate between smallest chain ketone and hexan-3-one.

OR

Q27 (i) p – tolualdehyde, Benzaldehyde, p- nitrobenzaldehyde , Acetophenone, (increasing order of reactivity towards nucleophilic addition reaction)

(ii) Carboxylic acids do not give characteristic reactions of carbonyl group

(iii) Write the products formed and name of the reaction: when benzaldehyde reacts with Conc. NaOH/H_2O

OR

Q28. Answer the following: 3(1)

a) What is meant by a peptide linkage?

b) What are essential and non-essential amino acids in human food?

c) State one difference between Fibrous protein and Globular protein.

SECTION D. (4 MARKS EACH)

Q29. Ravi set up an experiment to find resistance of aqueous KCl solution for different concentrations at 298K using a conductivity cell connected to a wheat-stone bridge. He fed the Wheatstone bridge with the A.C. power in the audio frequency range 550 to 5000 cycles per second. Once the resistance was calculated from null point he also calculated the conductivity k and molar conductivity λ_m and recorded his readings in tabular form.

S.No.	Conc.(M)	K (S cm-1)	Λ_m (S cm2mol-1)
1.	1.00	111.3 x 10-3	111.3
2.	0.10	12.9 x 10-3	129.0
3.	0.01	1.41 x10-3	141.0

Answer the following questions:

(i) If Ravi had used HCl instead of KCl then would you expect the Λ_m values to be more or less than those per KCl for a given concentration. Justify. (1)

(ii) Why does conductivity decrease with dilution? (1)

OR

(ii) How does molar conductivity varies with dilution for strong and weak electrolytes. (1)

(iii) If Λ^0_m KCl is 150.0 S cm² mol⁻¹, calculate the degree of dissociation of 0.01 M KCl. (2)

Q30. **Read the passage given below and answer the following questions:**
To explain bonding in coordination compound various theories were proposed. One of the important theory was valence bond theory. According to that, the central metal ion in the complex makes available a number of empty orbitals for the formation of coordination bonds with suitable ligands. The appropriate atomic orbital of the metal hybridized to give a set of equivalent orbitals of definite geometry.

The d-orbitals involved in the hybridization may be either inner d-orbitals i.e., (n-1)d or outer d-orbitals i.e., nd.

Answer the following questions:

a) Write the formula for the complex: Pentaamminenitrito-O-Cobalt (III) ion and also write coordination no of central metal atom in linkage isomer of above complex. (2)

b) What is meant by chelate effect? (1)

OR

b) Explain that $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$ are ionization isomers. (1)

c) $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain. (1)

Section E (5 MARKS EACH)

Q31. (i) State Raoult's law for the solution containing volatile component. (1)

(ii) Two liquid A & B are having boiling point 140⁰C & 180⁰C respectively. Identify which liquid will have a higher vapour pressure at 100⁰C. (1)

(iii) Why a person suffering from high blood pressure is advice to take minimum quantity of common salt. (1)

(iv) Calculate the freezing point of an aqueous solution containing 10.50 g of $MgBr_2$ in 200g of water (Molar mass of $MgBr_2 = 184$ g mol^{-1}, = for water = 1.86 K kg mol^{-1}). (2)

OR

Q31. (i) Why is increase in temperature observed on mixing chloroform and acetone. (1)

(ii) Define Azeotropes. What type of Azeotrope is formed by negative deviation from Raoults law. (2)

(iii) Calculate the molarity of 9.8 % (w/w) solution of H_2SO_4 if the density of the solution is 1.02 g/ml. (Molar mass of $H_2SO_4 = 98$ g/mol). (2)

Q32. (a) Transition elements generally form coloured compounds. Why? (1)

(b) Generally, there is an increase in density of elements from titanium (Z = 22) to copper (Z = 29) in the first series of transition elements. Why? (1)

(c) Transition elements and their compounds are generally found to be good catalysts in chemical reactions. Explain. (1)

(d) Complete the following chemical equations: (2)

    (i) MnO_4^{-} (aq) + $S_2O_3^{2-}$ (aq) + H_2O (l) →

    (ii) $Cr_2O_7^{2-}$ (aq) + Fe^{2+} (aq) + H^{+} (aq) →
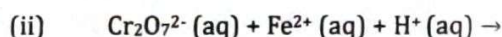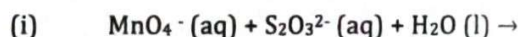
OR

Q32. (a) When chromite ore $FeCr_2O_4$ is fused with NaOH in presence of air, a yellow coloured compound (A) obtained which on acidification with dilute sulphuric acid gives a compound (B) Compound (B) on reaction with KCl forms an orange coloured crystalline compound (C).

Write the formulae of (A), (B) & (C). (3)

b. (i) Why enthalpy of atomization of transition element are high? (1+1)
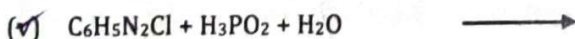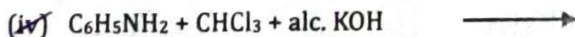(ii) Why transition elements form alloys?

Q33. Account for the following: 5(1)

(i) Aniline does not undergo Friedel-Crafts reaction.

(ii) pKb of methylamine is less than that of aniline.

(iii) Aniline on nitration gives considerable amount of meta product along with ortho and para

(iv) $C_6H_5NH_2 + CHCl_3 +$ alc. KOH   ⟶

(v) $C_6H_5N_2Cl + H_3PO_2 + H_2O$ ⟶

OR

Q33. a). Three isomeric amines A, B and C have the molecular formula $C_3H_9NC_3H_9N$. Compound A on reaction with benzene sulphonyl chloride forms a product which is soluble in NaOH. Compound B on reaction with benzene sulphonyl chloride forms a product which is insoluble in NaOH and compound C does not react with benzene sulphonyl chloride. Identify A, B and C. (3)

b). Arrange the following in the order of given property indicated: (1+1)

1). $C_2H_5NH_2$, $(C_2H_5)_2$ NH, $(C_2H_5)_3$N   (Decreasing basic strength in aqueous solution)

2). Aniline, p - Toluidine & p nitro Aniline (Increasing pKb value)

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