APEEJAY COMMON PRE-BOARD EXAMINATION
SESSION 22-23
CLASS: XII SUBJECT: CHEMISTRY

TIME: 3 HOURS **MAX. MARKS: 70**

General Instructions:

Read the following instructions carefully.

a) There are **35** questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 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.

SECTION – A

Q1 The correct order of the stoichiometry's of AgCl formed when $AgNO_3$ in excess is treated with complexes: $CoCl_3.6NH_3$, $CoCl_3.5NH_3$, $CoCl_3.4NH_3$ respectively is 1

(a) 3AgCl, 1AgCl, 2AgCl
(b) 3AgCl, 2AgCl, 1AgCl
(c) 2AgCl, 3AgCl, 2AgCl
(d) 1AgCl, 3AgCl, 2AgCl

Q2 K_H value for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility. 1

(a) HCHO < CH_4 < CO_2 < Ar
(b) HCHO < CO_2 < CH_4 < Ar
(c) Ar < CO_2 < CH_4 < HCHO
(d) Ar < CH_4 < CO_2 < HCHO

1

Q3 The decreasing order of boiling point of the following alcohols is

(a) 3-methylbutan-2-ol > 2-methylbutan-2-ol > pentan-1-ol
(b) Pentan-1-ol > 3-methylbutan-2-ol > 2-methylbutan-2-ol
(c) 2-methylbutan-2-ol > 3-methylbutan-2-ol > pentan-1-ol
(d) 2-methylbutan-2-ol > pentan-1-ol > 3-methylbutan-2-ol

Q4 If the standard electrode potential of an electrode is greater than zero , then we can infer that it's 1

(a) reduced form is more stable compared to H_2 gas.
(b) oxidised form is more stable compared to H2 gas.
(c) reduced and oxidized forms are equally stable .
(d) reduced form is less stable than the H_2 gas.

Q5 The rate constant of a reaction A → B is 0.6×10^{-3} mole per second. If the concentration of [A] is 5 M, then what will be concentration of [B] after 20 minutes? 1

(a) 0.36 M
(b) 0.72 M
(c) 1.08 M
(d) 3.60 M

Q6 The number of moles of $KMnO_4$ that will be needed to react with one mole of SO_3^{2-} in acidic solution are 1

(a) 1
(b) 3/5
(c) 4/5
(d) 2/5

Q7 In the following sequence of reaction, the final product (Z) is 1

$$CH \equiv CH \xrightarrow[H_2O]{Hg^{2+}} X \xrightarrow[H_2O]{CH_3MgX} Y \xrightarrow{[O]} Z$$

(a) Ethanal
(b) Propan-2-ol
(c) Propanone
(d) Propanol

Q8 How many chiral compounds are possible on monochlorination of 2-methylbutane? 1

(a) 2
(b) 4
(c) 6
(d) 8

Q9 Among the following sets of reactants which one produces anisole? 1

(a) CH_3CHO : RMgX
(b) C_6H_5OH:NaOH, CH_3I
(c) C_6H_5OH: neutral $FeCl_3$
(d) $C_6H_5—CH_3$: CH_3COCl,$AlCl_3$

Q10 The electrophile involved in Riemer-Tiemann reaction of phenol with $CHCl_3$ in presence of NaOH is 1

(a) $:CCl_2$
(b) $^-CCl_3$
(c) ^+CHO
(d) $^+CHCl_2$

Q11 CH_3CH_2OH can be converted into CH_3CHO by _____. 1

(a) catalytic hydrogenation
(b) treatment with $LiAlH_4$

(c) treatment with pyridinium chlorochromate
(d) treatment with $KMnO_4$

Q12 The glycosidic linkage involved in linking the glucose units in amylose part of starch is 1
(a) C_1–C_4 β-linkage
(b) C_1–C_6 α-linkage
(c) C_1–C_4 α-linkage
(d) C_1–C_6 β-linkage

Q13 Reduction of CH_3CH_2NC with hydrogen in presence of Ni or Pt as catalvst gives 1
(a) $CH_3CH_2NH_2$
(b) $CH_3CH_2NHCH_3$
(c) $CH_3CH_2NHCH_2CH_3$
(d) $(CH3)3N$

Q14 The complex ion which has no d-electrons in the central metal atom is 1
(a) $[MnO_4]^-$
(b) $[Co(NH_3)_6]^{3+}$
(c)$[Fe(CN)_6]^{3-}$
(d) $[Cr(H_2O)_6]^{3+}$

Directions (Q. Nos. 15-18): Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer by choosing the correct option :

a) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
b) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.
c) Assertion is correct, but reason is wrong statement.
d) Assertion is wrong, but reason is correct statement.

Q15 **Assertion:** C_2H_5OH is a weaker base than phenol but is a stronger nucleophile than phenol. 1
Reason: In phenol the lone pair of electrons on oxygen is withdrawn towards the ring due to resonance.

Q16 **Assertion:** Aryl halides undergo nucleophilic substitution reactions with ease. 1
Reason: The carbon halogen bond in aryl halides has partial double bond character.

Q17 **Assertion**: Order of the reaction can be zero or fractional. 1
Reason: We cannot determine order from balanced chemical equation.

Q18 **Assertion:** Cu^{2+} iodide is not known. 1
Reason: Cu^{2+} oxidises I^- to iodine.

SECTION B

Q19 (a) For a reaction A + B → P, the rate is given by Rate = k[A] $[B]^2$ 2

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

(ii) What is overall order of reaction if 'A' is present in large excess?

(b) A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction.

(log 2 = 0.301, log 3 = 0.4771, log 4 =0.6021)

Q20 (i) What is the coordination number of Fe in $[Fe(EDTA)]^-$? 2

(ii) Write the formula for the following complex: Potassium trioxalato chromate(III)

Q21 a) Name the alkene which will yield 1-chloro-1-methylcyclohexane by its reaction with HCl. Write the reactions involved. 2

b) Cyanide ion acts as an ambident nucleophile. From which end it acts as a stronger nucleophile in aqueous medium? Give reason for your answer.

Q22 Explain , with the help of an example :- 2

a) Zwitter ion

b) Glycosidic Linkage

Q23 a) Write the structures of the main products when benzene diazonium chloride reacts with the following reagents: 2

(i) CuCN/KCN (ii) H_2O (iii) CH_3CH_2OH

b) Arrange the following: $C_2H_5NH_2$, C_2H_5OH, $(CH_3)_3N$ (in increasing order of the boiling point.)

Q24 Calculate the freezing point of solution containing 0.5g of KCl dissolved in 100g of water, assuming KCl to be 92% ionized . 2

(Kf of water =1.86Kkg/mol Atomic mass of K=39,Cl=35.5)

Q25 Give reason for the following: 2

a. During the electrophilic substitution reaction of haloarenes, para substituted derivative is the major product.

b. The product formed during S_N1 reaction is a racemic mixture.

OR

a. Name the suitable alcohol and reagent, from which 2-Chloro-2-methyl propane can be prepared.

b. Out of the Chloromethane and Fluoromethane, which one has higher dipole moment and why?

SECTION -C

Q26 A strip of nickel metal is placed in a 1 molar solution of $Ni(NO_3)_2$ and a strip of silver metal is placed in Ja 1-molar solution of $AgNO_3$. An electrochemical cell is created when the two solutions are connected by a salt bridge and the two strips are connected by wires to a voltmeter. 3

i. Write the balanced equation for the overall reaction occurring in the cell and calculate the cell potential.

ii. Calculate the cell potential, E, at 25 °C for the cell if the initial concentration of $Ni(NO_3)_2$ is 0.100 molar and the initial concentration of $AgNO_3$ is 1.00 molar.

$[E^\circ_{Ni^2/Ni} = -0.25\ V;\ E^\circ_{Ag^+/Ag} = 0.80\ V;\ \log 10^{-1} = -1]$

Q27 For the reaction $2NO(g) + Cl_2(g) \rightarrow 2NOCl(g)$, the following data were collected. All the measurements were taken at 263 K: 3

Exp. No.	Initial [NO] (M)	Initial [Cl_2] (M)	Initial rate of disappearance of Cl_2
1	0.15	0.15	0.60
2	0.15	0.30	1.20
3	0.30	0.15	2.40
4	0.25	0.25	?

(a) Write the expression for rate law.

(b) Calculate the value of rate constant and specify its units.

(c) What is the initial rate of disappearance of Cl_2 in experiment no. 4?

Q28 (i) Draw the geometrical isomers of complex $[Pt(NH_3)_2Cl_2]$. 3

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 < P$.

(iii) Write the hybridization and magnetic behaviour of the complex $[Ni(CO)_4]$. (At. No. of Ni =28)

OR

Give the formula of each of the following coordination entities:

(i) Co^{3+} ion is bound to one Cl^-, one NH_3 molecule and two bidentate ethylene diamine (en) molecules.

(ii) Ni^{2+} ion is bound to two water molecules and two oxalate ions. Write the name and predict magnetic behaviour of each of the above coordination entities. (At. nos. Co = 27, Ni = 28)

Q29 How are the following conversions carried out? (Write the reactions and conditions in each case) : 3

(i) Ethanol to Propan-2-ol

(ii) Phenol to Acetophenone

iii) Phenol to Aspirin

Q30 a) Illustrate the following reactions giving suitable example in each case: 3

(i) Coupling reaction (ii) Acetylation of amines

(b) Describe a method for the identification of primary, secondary and tertiary amines. Also write the chemical equations of the reactions involved.

SECTION-D

Q31 Read the passage given below and answer the following questions: Polysaccharides may be very large molecules. Starch, glycogen, cellulose, and chitin are examples of polysaccharides. Starch is the stored form of sugars in plants and is made up of amylose and amylopectin (both polymers of glucose). Amylose is soluble in water and can be hydrolyzed into glucose units breaking glycosidic 4

bonds, by the enzymes. It is straight chain polymer. β -amylopectin is a branched chain polymer of several D-glucose molecules. 80% of amylopectin is present in starch. Plants are able to synthesize glucose, and the excess glucose is stored as starch in different plant parts, including roots and seeds. The starch that is consumed by animals is broken down into smaller molecules, such as glucose. The cells can then absorb the glucose. Glycogen is the storage form of glucose in humans and other vertebrates, and is made up of monomers of glucose. It is structurally quite similar to amylopectin. Glycogen is the animal equivalent of starch. It is stored in liver and skeletal muscles. Cellulose is one of the most abundant natural biopolymers. The cell walls of plants are mostly made of cellulose, which provides structural support to the cell. Wood and paper are mostly cellulosic in nature. Like amylose, cellulose is a linear polymer of glucose. Cellulose is made up of glucose monomers that are linked by bonds between particular carbon atoms in the glucose molecule. Every other glucose monomer in cellulose is flipped over and packed tightly as extended long chains. This gives cellulose its rigidity and high tensile strength—which is so important to plant cells. Cellulose passing through our digestive system is called dietary fiber.

Based on the above passage, answer the following questions:

(i) Glycogen is a kind of polysaccharide and is the storage form of glucose present in humans and other vertebrates. Where is it stored in animals?

(ii) What can you infer about the characteristic of amylose?

(iii) Whenever glucose levels drop in our body, a bipolymer breaks down to release glucose. Name this bipolymer and it is structurally similar to which polymer?

OR

Which polymer is important to plant cells? How?

Q32 **Read the passage given below and answer the following questions:** 4

The four colligative properties of the dilute solutions help in calculating the molecular mass of the solute which is often called observed molecular mass. It may be same as the theoretical molecular mass (calculated from the molecular formula) if the solute behaves normally in solution. In case, it undergoes association or dissociation, the observed molar mass gives different results. The nature of the solute in solution is expressed in terms of van't Hoff factor (i) which may be 1 (if the solute behaves normally), less than 1 (if the solute associates) and more than 1 (if the solute dissociates). The extent of association or dissociation is represented by which is:

$\alpha = i-1/(1/n-1)$ or $\alpha = i - 1/ n-1$ (for dissociation)

Based on the above passage, answer the following questions :

(i) What is common in all the four colligative properties?

(ii) What is the expected value of van't Hoff factor for $K_4[Fe(CN)_6]$, when it completely dissociates in water?

(iii) What is the value of degree of dissociation for a dilute solution of 0.1M K_2SO_4 in water?

OR

In the determination of molar mass of A + B using colligative property, what will be the van't Hoff factor if the solute is 40% dissociated?

SECTION E

Q33 a) Write the Nernst equation and emf of the following cell 5

$Mg(s) / Mg^{2+}(0.001M) // Cu^{2+} (0.0001M) / Cu(s)$ at 298 K

$E^{O}_{Mg2+/Mg} = -2.34$ V $E^{O}_{Cu2+/Cu} = 0.34$ V

a) Solution of two electrolytes A and B are diluted .The molar conductivity of B increases 1.5 times while that of A increases 25 times .Which of the two is a strong electrolyte? Justify your answer.

OR

b) What type of a battery is lead storage battery? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery.

c) Calculate the potential for half-cell containing **0.10 M $K_2Cr_2O_7(aq)$**, **0.20 M $Cr^{3+}(aq)$** and **1.0 × 10^{-4} M $H^+(aq)$**

The half-cell reaction is **$Cr_2O_7^{2-}(aq) + 14\ H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) + 7H_2O(l)$** and the standard electrode potential of cell is given as E° = 1.33 V.

Q34 When an oxide of manganese (A) is fused with KOH in the presence of an oxidizing agent and dissolved in water, it gives a dark green solution of compound (B). Compound (B) disproportionate in neutral or acidic solution to give purple compound (C). An alkaline solution of compound (C) oxidizes potassium iodide solution to a compound (D) and compound (A) is also formed. Identify compounds A to D and also explain the reactions involved. 5

OR

When a chromite ore (A) is fused with sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of compound (B) is obtained. After treatment of this yellow solution with sulphuric acid, compound (C) can be crystallised from the solution. When compound (C) is treated with KCl, orange crystals of compound (D) crystallise out. Identify A to D and also explain the reactions

Q35 (a) Arrange the following compounds in an increasing order of their indicated property : 5

(i) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxy benzoic acid (acid strength)

(ii) CH_3CH_2CH (Br) COOH, CH_3CH (Br) CH_2COOH, $(CH_3)_2CHCOOH$, $CH_3CH_2CH_2COOH$ (acid strength)

(b) How would you bring about the following conversions :

(i) Propanone to Propene

(ii) Benzoic acid to Benzaldehyde

(iii) Bromobenzene to 1-phenylethanol