INDIAN SCHOOL MUSCAT
SECOND PRE-BOARD EXAMINATION
CHEMISTRY

CLASS: XII   Sub. Code: 043   Time Allotted: 3 Hrs.

12.04.2021   Max. Marks: 70

General Instructions:

i.   There are 33 questions in this question paper. All questions are compulsory.

ii. Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.

iii. Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.

iv. Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.

v.   Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.

vi. There is no overall choice. However, internal choices have been provided.

vii. Use of calculators and log tables is not permitted.

SECTION A (OBJECTIVE TYPE)

1   Read the passage given below and answer the following questions: (1x4=4)

Ozone is being used in the field of water treatment, decolorisation, deodorization, organic synthesis, materials testing, disinfection, dry etching and cleaning processes in semiconductor industries, and other industrial areas. The advantages of using ozone over other chemicals are: its strong oxidizing power, its clean nature leaving only oxygen after the treatment, and electrical generation at the site. Ozone is also emitted from germicide lamps, copy machines, printers, welding, and other industrial processes. The working environment criteria for ozone are set at 0.05–0.1 ppm in most countries. Monitoring of ozone is therefore important from the viewpoint of workplace health and hygiene.

Choose the correct answer out of the following choices:

(i) Which option describes 'Ozone is thermodynamically unstable'?

     a) Gibbs energy and enthalpy –ve; entropy -ve

     b) Gibbs energy and enthalpy +ve; entropy +ve

     c) Gibbs energy and enthalpy –ve; entropy +ve

     d) Gibbs energy and enthalpy +ve; entropy -ve

(ii) Like ozone, SO_2

    a) Shows resonance and bleaches by oxidation

    b) Has an angular structure and equal bond lengths due to resonance

    c) Has equal bond lengths due to resonance and bleaches by reduction

    d) Is thermodynamically unstable and used as disinfectant

(iii) Which reaction explains the depletion of ozone in the upper atmosphere?

    a) $3O_2 \rightarrow 2O_3$

    b) $NO + O_3 \rightarrow NO_2 + O_2$

    c) $PbS + 4O_3 \rightarrow PbSO_4 + 4O_2$

    d) $2KI + H_2O + O_3 \rightarrow 2KOH + I_2 + O_2$

(iv) Ozone is used in ozonolysis of alkenes, which is an example of electrophilic addition reaction. The ozonide formed when hydrolysed in presence of zinc will yield products as

    a) Aldehydes   b) Ketones   c) Aldehydes and ketones   d) Esters

OR

Alkaline solution of which of the following is used to detect O_3

    a) K_2MnO_4 b) KI   c) $KMnO_4$ d) $FeSO_4$

2   Read the passage given below and answer the assertion reasoning questions that follow: (1x4=4)
The three-dimensional structures of proteins are very diverse, ranging from completely fibrous to globular. Protein structures are determined at an atomic level by X-ray diffraction and neutron-diffraction studies of crystallized molecules and, more recently, by nuclear resonance spectroscopy (NMR) of proteins in solution. However, there are many structures that remain unresolved because these procedures require large quantities of very pure and homogeneous protein. Such quantities are often difficult to obtain, especially for hydrophobic membrane-bound proteins. Bioinformatics is used to predict the molecular structure from the protein sequence. As the structure of a protein ultimately determines its function, a precise determination of its structure is crucial for assessing function and for developing drugs that will interact in a site-selective manner.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement

(i) Assertion: Amino acids in a protein remain intact even when it is denatured.
   Reason: Denaturation of a protein can be brought about by change in pH only.

(i) Assertion: Amino acids have very high melting points.
   Reason: Amino acids are connected by peptide bonds in protein

OR

   Assertion: Keratin is a fibrous protein.
   Reason: Fibrous proteins are insoluble in water.

(ii) Assertion: Glycine is not required in the diet.
   Reason: Glycine is a non-essential amino acid.

(iii) Assertion: A dipeptide consists of two peptide linkages.
   Reason: Peptide linkages are formed by the condensation of amino group with carboxyl group of two different amino acids.

Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:

3   Identify the correct representation of the complex   1
     Pentaaquasulphatochromium (III) bromide.
     a) $[Cr(H_2O)_5Br]SO_4$ b) $[Cr(H_2O)_5(SO_4)Br]$
     c) $[Cr(H_2O)_5(SO_4)]Br$ d) $[Cr(H_2O)_5Br(SO_4)]Br$
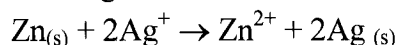
OR

     Identify the most stable complex among the following
     a) $[Fe(en)_3]^{3+}$ b) $[Fe(NH_3)_6]^{3+}$ c) $[Fe(CO)_5]$ d) $[Fe(H_2O)_6]^{3+}$

4   Reduction potentials of four metals A, B, C and D are -1.66 V, + 0.34 V, + 0.80   1
     V and -0.76 V. What is the order of their reactivity?
     a) A > D > B > C   b) D > A > B > C
     c) B > D > A > C   d) C > D > B > A

OR

     In a galvanic cell following reaction occurs. Which statement is the correct explanation of the cell functioning?
     $$Zn_{(s)} + 2Ag^+ \rightarrow Zn^{2+} + 2Ag_{(s)}$$
     a) Anode is zinc
     b) Electrons are carriers of current in the cell
     c) Silver is the anode
     d) Zinc is the cathode

5   Which explains the property of a noble gas?   1

     a) All noble gases have strong force interatomic forces
     b) All noble gases have completely filled p orbitals
     c) All noble gases have positive electron gain enthalpy
     d) All noble gases have high boiling points.

6   Cryoscopic constant of a liquid is   1
    a) Elevation of 1 molar solution
    b) Decrease in freezing point when 1g of solute is dissolved per kg of the solvent
    c) Factor used for the calculation of elevation in boiling point
   d) Decrease in freezing point when 1mol of solute is dissolved per kg of the solvent

7   Crystalline solids show   1
    a) Anisotropy and show short range order
    b) Isotropy and show short range order
    c) Anisotropy and show long range order
    d) Isotropy and show long range order

8   Toluene reacts with halogen in the presence of iron(III) chloride giving ortho para halogen   1
    compounds. the reaction is
    a) Nucleophilic substitution reaction
    b) Free radical addition reaction
    c) Nucleophilic substitution reaction
    d) Electrophilic substitution reaction

OR

A mixture containing two enantiomers in equal proportions

    a) Will have zero optical rotation
    b) Will be optically inactive
    c) Will be called a racemic mixture
    d) All of the above

                                                                                        1

9   The compound shown is
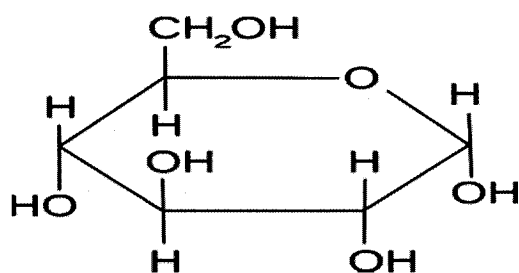
    a) α-D-(+) Glucopyranose   b) D (-) Glucose   c) β-- (+) Glucopyranose   d) L(-) Glucose

10 Esters react with DIBAL-H to produce   1
    a) Alcohol   b) Aldehyde   c) Ketone   d) Carboxylic acid

11 Which among the following is a method of colloidal preparation?   1
    a) Electrical disintegration   b) Dialysis
    c) Electro dialysis   d) Ultrafiltration

OR

Delta formation and tanning of leather are examples of

    a) Coagulation   b) Peptization   c) Dialysis   d) Tyndall effect

In the following questions (Q. No. 12 - 16) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

12   Assertion: Solubility of a gas in liquid increases with increase in temperature   1

    Reason: Dissolution of a gas in water is exothermic in nature.

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

    Assertion: Osmosis does not occur between two isotonic solutions separated with a semi permeable membrane.

    Reason: Isotonic solutions have same osmotic pressures.

13   Assertion: Cresol is less acidic than phenol.   1

    Reason: pKa value of cresol is higher than that of phenol.

14   Assertion: HI is most reactive towards alcohols.   1

    Reason: HI has low bond dissociation energy.

15   Assertion: Acetophenone gives iodoform reaction.   1

    Reason: Iodoform reaction is answered by ketones only

16   Assertion: The magnetic moment of the complex $[Fe(CN)_6]^{-4}$ is zero.   1

    Reason: $[Fe(CN)_6]^{-4}$ contains four unpaired electrons.

<div align="center">

SECTION B

</div>

**The following questions, Q.No 17 – 25 are short answer type and carry 2 marks each.**

17   Explain the hybridisation and magnetic property of $[Co(en)_3]^{3+}$. [Given : At. no. of Co = 27]   2

18   Give reason   2

      a) Vinyl chloride is unreactive to nucleophilic substitution reaction.

      b) 2-Bromopentane when treated with alcoholic potash yields pent-2-ene as the major product.

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

      i) Give a chemical test to distinguish chloromethane and chlorobenzene.

      ii) What happens when benzenediazonium chloride is treated with potassium iodide?

19   Identify A,B,C and D   2

$$HCHO + CH_3MgBr \rightarrow A \xrightarrow{H_3O^+} B \xrightarrow{Cu,573K} C$$

$$\downarrow SOCl_2$$

$$D$$
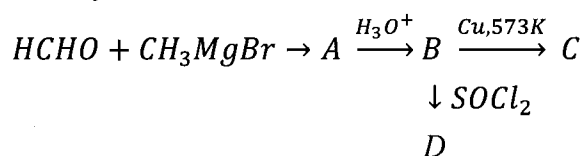
20   Give reason   2

       a) S_2 is paramagnetic

       b) ICl is more reactive than I_2

21   If 0.06 M glucose solution shows an osmotic pressure of 1.5 bar at 300K, what will be the osmotic   2
pressure of a 1 L solution containing 18g of glucose at the same temperature?
[Molar mass of glucose =180g/mol , R= 0.083 L bar/K/mol]

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

Calculate the amount of solute of molar mass 180 g/mol to be dissolved in a 200g solvent to form
a solution that has a vapour pressure of 31.84 mm Hg at 308 K..
(Vapour pressure of pure water at 308 K = 32 mm Hg)

                                                                           2

22   a) Identify the type of stoichiometric
defect shown in the figure.

       b) What happens to the density of solid
with such defect?
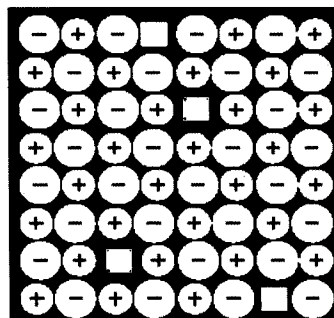
23   In SN_1 reaction why an optically active compound always produces a racemic mixture? Explain   2
with a suitable example.

24   At 400K, decomposition of to Cl_2 and O_2 has rate law r=k[Cl_2O_7]   2
Calculate the rate constant after 55 seconds if the pressure of Cl_2O_7 falls from 0.062 to 0.044 atm.
[Given log1.4090 =0.1489, log 62=1.7924, log 44=1.6435]

25   a) Determine the order of reaction :   2

           Step 1. $2NO + H_2 \rightarrow N_2 + H_2O_2$ [Slow]

           Step 2. $H_2O_2 + H_2 \rightarrow 2H_2O$ [Fast]

       b) A reaction is of first order in reactant A and of zero order in reactant B. How is the rate of
this reaction affected when the concentration of A is increased to three times?

       c) What do you understand by order of a reaction?

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

For a chemical reaction R→P, the variation in the concentration vs. time(t) plot is given as
shown

<p align="center">Page **6** of **8**</p>

(i) What is the order of the reaction?
(ii) What is the slope of the line?
(iii) What is the unit of rate constant 'k'?
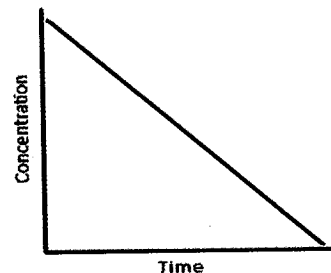
SECTION C

Q. No 26 -30 are Short Answer Type II carrying 3 mark each.

26   a) State Hardy Schulze rule.   3
    b) Which of the following is suitable for the coagulation of a metal sulphide sol?
        $NaCl$, Na_2SO_4 or $CaCl_2$.
    c) Why are lyophilic sols added to lyophobic sols?

27   Explain Ostwald's process to manufacture nitric acid with balanced chemical equations.   3

28   The density of an element is 11.35 g/cm^3 and the metal crystallizes with fcc unit cell.   3
    Estimate the radius of lead atom. (Atomic mass of element = 207 g/mol, $N_A = 6.02 \times 10^{23}$)

OR

Analysis shows that a metal oxide has the empirical formula $M_{0.98}O_{1.00}$. Calculate the percentage of M^{2+} and M^{3+} ions in the crystal.

29   Explain the mechanism of acidic dehydration of ethanol to ethene.   3

OR

Convert phenol to
    a) Benzoquinone
    b) p-nitrophenol
    c) Picric acid

30   a) Arrange the following in order of their increasing reactivity towards HCN :   3
        CH_3CHO, CH_3COCH_3, $HCHO$, $C_2H_5COCH_3$
    b) Which acid of each pair shown here would you expect to be stronger? Why?
        CH_3COOH or CH_2FCOOH.

SECTION D

Q. No 31 to 33 are long answer type carrying 5 marks each.

31   For the cell represented as   5

$Fe^{2+}_{(aq)} \mid Fe^{3+}_{(aq)} \parallel Ag^{+}_{(aq)} \mid Ag_{(s)}$
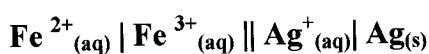
Given $E^0_{cell} = 0.03$ V, R=8.314 J/K/mol, F= 96500 C
    a) Identify anode and cathode as current is drawn from the cell.

b) Write the reactions taking place at the electrodes.

c) Calculate Gibbs energy and equilibrium constant for the above cell.

OR

a) Why conductivity of a solution decreases with decrease in concentration of the electrolyte?

b) Calculate the limiting molar conductivity of ammonium hydroxide. Given limiting molar conductivities of $Ba(OH)_2$, $BaCl_2$ and NH_4Cl as 457.6, 240.6 and 129.8 Scm^2/mol respectively.

c) The conductivity of 0.1 mol L^{-1} solution of NaCl is 1.06×10^{-2} S cm^{-1}. Calculate the degree of dissociation. Given $\lambda°(Na^+) = 50.1$ S $cm^2 mol^{-1}$ and $\lambda°(Cl^-) = 76.5$ S $cm^2 mol^{-1}$.

32 a) Why aniline dissolves in HCl?   5

b) Draw the structure of N,N,3-Trimethylcyclohexanamine

c) A compound 'A' having molecular formula C_3H_7ON reacts with Br_2 in presence of NaOH to give compound 'B'. This compound 'B' reacts with HNO_2 to form alcohol 'C' and N_2 gas. Identify compounds 'A' and 'C' and write the reaction involved for conversion of A to B.

OR

Complete the following:

a) $CH_3NO_2 \xrightarrow{H_3/Pd} A \xrightarrow{CH_3Cl} B$

b) $CH_3CH_2I \xrightarrow{NaCN} C \xrightarrow{LiAlH_4} D$

c) $C_6H_5SO_2Cl + C_2H_5NH_2 \rightarrow E$

33 Explain why   5

a) Transition metals form complexes.

b) Zn^{+2} salts are colourless.

c) Cd and Hg have low melting points.

d) The highest oxidation state of a metal is exhibited in its oxide

e) Zirconium and Hafnium exhibit similar properties.

OR

a) Name a member of the lanthanoid series which exhibits +4 oxidation state and give reason for your choice.

b) From the 3d- series of transition elements identify the one
   (i) That exhibit only one oxidation state.
   (ii) That has very high third ionization enthalpy.
   (iii) That has positive standard electrode potential value [give reason]

End of the Question Paper