Roll Number		

SET C

INDIAN SCHOOL MUSCAT
FINAL EXAMINATION
CHEMISTRY

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

27.01.2021 | Max. Marks: 70

General Instructions:

a) There are 33 questions in this question paper. All questions are compulsory.

b) 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.

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

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

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

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

g) Use of calculator is not permitted.

SECTION A (OBJECTIVE TYPE)

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

Silica gel is non-toxic, non-flammable and non-reactive, stable product. It can react with various reagents such as with hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, and strong bases. The dried form of silica gel called as silica xerogel which is tough and hard. It is naturally occurring mineral purified and processed into granular or beaded form. Silica gel possesses a high specific surface area allows it to absorb water readily. Silica gel removes moisture by adsorbing into numerous pores and not absorbing it into the bulk of gel. Due to this mechanism silica gel is useful as a desiccant (drying agent).

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: Silica gel is used as a drying agent.

Reason: Silica gel is porous and can adsorb moisture.

ii) Assertion: Smaller the size of particles greater the rate of adsorption.

Reason: Adsorption decreases as surface area increases.

OR

Assertion: Adsorption is spontaneous process.

Reason: Entropy decreases during adsorption.

iii) Assertion: Gases are physisorbed on any given surface.

Reason: Physisorption of gases depends on critical temperature.

iv) Assertion: For chemical adsorption of molecules on the surface, activation energy is needed.

Reason: Chemisorption is favorable at low temperatures.

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

Dehydration of alcohols under acidic conditions is obviously a widely used method to prepare alkenes. The efficiency of this process is correlated to the stability of the carbocationic intermediate. The reaction is pulled to completion by distilling the alkene from the reaction mixture, which is an application of Le Chatelier's principle. Because a given alkene has a much lower boiling point than the alcohol from which it was formed, distillation is an efficient method for isolating the product.

Choose the correct answer out of the following choices.

i) Which of the following is most suitable in converting alcohol to alkene?

a) Conc.HNO_3
b) Conc HCl and $ZnCl_2$
c) Conc H_2SO_4
d) Alkaline $KMnO_4$

ii) The order of dehydration of alcohols

a) Tertiary > Secondary > Primary
b) Secondary > Primary >Tertiary
c) Primary> Secondary >Tertiary
d) Primary> Tertiary >Secondary

OR

Alcohols can be obtained by the reduction of

a) Aldehyde using $LiAlH_4$
b) Aldehyde using alkaline $KMnO_4$
c) Alkene using H_2,Ni
d) Alkene using B_2H_6

iii) Reaction of 3-methylbutan-2-ol with HBr would give

a) 2-Bromo-3-methylbutane
b) 2-Bromo-2-methylbutane
c) 2-Methylbut-1-ene
d) 2-Methylbut-2-ene

iv) 2-Methylpropan-2-ol when treated with copper at 573 K forms

a) 2-Methylpropan-2-one
b) 2-Methylpropan-2-al
c) 2-Methylpropene
d) Propanoic acid

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

3 Elevation of boiling point is a colligative property because 1

a) it depends upon the number and nature of particles of the solute
b) it does not depends upon the number of particles of solute and depends on nature of solute.
c) it depends upon the number of particles of solute and not on nature of solute.
d) it does not depend on nature of the solute.

4 Using the plot of molar conductivity versus $c^{1/2}$, the Λ^0 of which of the following cannot be calculated? 1

a) KCl
b) NH_4OH
c) HCl
d) NaOH

5 Which among the following not a diamagnetic ion? (Atomic numbers of Sc, Ti , V and Mn are 21,22, 23 and 25 respectively) 1

a) Mn^{2+}
b) Ti^{2+}
c) V^{4+}
d) Sc^{3+}

OR

Transition metals and their compounds are known to be good catalyst due to their

a) larger size and absence of d orbitals
b) Larger surface area and variable oxidation sate
c) Smaller surface area and availability of vacant d orbitals
d) Ability to form complexes and magnetic property

6 The oxidation sate of central metal in $[Pt(NH_3)Cl(NO_2)(CN)]^-$ is 1

a) +2
b) +4
c) +3
d) -2

OR

Given are the stepwise formation constants for the formation of a complex $[ML_2]$,
$M + L \rightleftharpoons ML$; $K_1=3$
$ML + L \rightleftharpoons ML_2$; $K_2=2$
the overall complex dissociation constant will be

a) 3x2
b) $\frac{1}{3x2}$
c) Log3 x log2
d) Log 3 + log 2

7 The formula of a compound in which the element Y forms ccp lattice and atoms of X occupy $2/3^{rd}$ of tetrahedral voids will be 1

a) XY_4
b) XY_3
c) X_4Y_2
d) X_4Y_3

8 Ethanol when treated with thionyl chloride gives a compound X, which when treated with sodium iodide in presence of dry acetone gives a major product Y and by product Z. In this X ,Y and Z respectively are 1

a) Chloromethane, sodium chloride ,iodomethane
b) Chloroethane, sodium chloride, iodomethane
c) Chloroethane, iodoethane, sodium chloride
d) Sodium chloride, chloroethane, iodomethane

9 The complex which is heteroleptic, has a coordination number 6 and is bound to ambidendate ligand is 1

a) $[Co(Cl)(en)_2H_2O]^{2+}$
b) $[Cr(NH_3)_3(NO_2)_3]$
c) $[Co(en)_3]^{3+}$
d) $[Ni(CN)_4]^{2-}$

10 $$RCN \xrightarrow{LiAlH_4} X \xrightarrow[H_2O]{HNO_2} Y$$ 1

X and Y in the above reaction are

a) $X = RCH_2NH_2$, $Y = RCH_2OH$
b) $X = RNH_2$, $Y = ROH$
c) $X = RNH_2$, $Y = RCH_2OH$
d) $X = RCH_2NH_2$, $Y = ROH$

OR

Which among the following depicts the increasing order of basic character of amines in aqueous soution?

a) $CH_3NH_2 < (CH_3)_2NH < (CH_3)_3N < C_6H_5NH_2 < C_6H_5CH_2NH_2$
b) $C_6H_5NH_2 < C_6H_5CH_2NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$
c) $C_6H_5NH_2 < C_6H_5CH_2NH_2\ (CH_3)_3N < (CH_3)_2NH < CH_3NH_2$
d) $(CH_3)_3N < C_6H_5NH_2 < C_6H_5CH_2NH_2 < CH_3NH_2 < (CH_3)_2NH$

11 Base present only in RNA 1

a) Adenine
b) Thymine
c) Guanine
d) Uracil

OR

Glucose is a/an

a) Ketose ,Monosaccharide and a Non-Reducing sugar
b) Aldose ,Monosaccharide and a Reducing sugar
c) Aldose ,Monosaccharide and a Non- Reducing sugar
d) Ketose, Monosaccharide and a Reducing sugar

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: Scuba divers carry air tanks diluted with helium. 1
Reason: Nitrogen from air when gets released as bubbles in blood, blocks capillaries causing bends

OR

Assertion: Benzene and toluene forms ideal solution.
Reason: They do not obey Raoult's law.

13 Assertion: Xenon does not form XeF_5 1
Reason: Xenon is a noble gas.

14 Assertion: Phenoxide ion is more stable than alkoxide ion. 1
Reason: In alkoxide ion the negative charge is delocalised compared to in phenoxide.

15 Assertion: Dry HCl is used in the reaction of aldehyde with alcohol to form acetal. 1
Reason: HCl protonates the carbonyl oxygen increasing the electrophilicity of the carbonyl carbon.

16 Assertion: Glucose gives positive test with Schiff's reagent. 1
Reason: The aldehyde group in glucose forms the hemiacetal with hydroxyl group

SECTION B

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

17 Show that the half-life of a first order reaction is independent of the initial concentration of the reactants. 2

18 Draw the structures of following: XeO_3, $HClO_2$ 2

19 a) Write the IUPAC name of $[Fe(en)_2Cl_2]Cl$ 2
b) Using crystal field theory, write the electronic configuration of metal in the complex $[Mn(en)_3]^{2+}$ ion.[Atomic number of Mn=25]

OR

Explain the shape and hybridisation of the complex $[Ni(Cl)_4]^{2-}$
[Atomic number of Ni = 28]

20 A first order reaction takes 30 minutes for 50% completion. Calculate the time required for 90% completion of this reaction. (log 2 = 0.3010). 2

OR

The decomposition of phosphine PH_3 follows the following rate equation:
Rate = $k[PH_3]$
What fraction of the original sample of phosphine remains behind after 1 minute, if its half-life is 37.9 seconds at 120^0?

21 Write chemical equations when 2
a) Chlorobenzene is treated with CH_3COCl in the presence of anhydrous $AlCl_3$
b) Benzyl alcohol is treated with thionyl chloride

OR

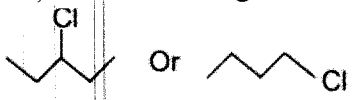
Account for the following
i) Ethyl iodide undergoes faster SN_2 than ethyl bromide
ii) p-dichlorobenzene has higher melting point than those of ortho or meta isomers

22 a) AgCl shows Frenkel defect whereas NaCl shows Schottky defect. Why? 2
b) What type of non-stoichiometric point defect is responsible for the pink colour of LiCl?

23 What would be the molar mass of a compound, if 6.21 g of it dissolved in 24.0 g of chloroform forms a solution that has a boiling point of 68.04 °C? The boiling point of pure chloroform is 61.7°C and the boiling point elevation constant, for chloroform is 3.63 K kg/mol. 2

24 a) Write the IUPAC name of $(CH_3)_2C=CHCOOH$ 2
b) Draw the structure of 1, 3-Diphenylprop-2-en-1-one.

25 a) Which among the following undergoes SN_1 faster and why? 2



b) What happens when chloropropane is treated with potasium cyanide? Write equation

SECTION C

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

26 Give the structures of the products when D-glucose is treated with 3

a) HI b) NH_2OH c) Br_2 water

27 Calculate the radius of the atom and the molar mass of an element which forms bcc structure, has a cell edge length of 250 pm and a density of 8 g/cm^3. 3

28 A colorless substance A $[C_6H_7N]$ is sparingly soluble in water and gives water soluble compound on treating with mineral acid. On reacting with chloroform and alcoholic potash A produces obnoxious smell due to the formation of compound B. Reaction of A with nitrous acid at low temperature gives a compound C. Identify A,B and C. Also write the reaction of A converting to B. 3

OR

a) Illustrate Hoffmann bromamide degradation reaction
b) Give a chemical test to distinguish between methyl amine and dimethyl amine.
c) Convert methanamine to methanol.

29 Give reason for the following 3

a) Transition elements exhibit higher enthalpies of atomization
b) Cu^+ ion is not stable in aqueous solutions
c) Transition metals generally form colored compounds.

OR

What is lanthanoid contraction? What is its cause? Write any one consequence of lanthanoid contraction?

30 a) Complete the following 3

i) $XeF_4 + O_2F_2 \rightarrow$

ii) NaOH (hot conc.) + $Cl_2 \rightarrow$

b) Arrange the following in the increasing order of thermal stability
H_2O, H_2S, H_2Se, H_2Te

SECTION D

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

31 Complete the following 5

a) $CH_3COCH_3 + NH_2OH \rightarrow$

b) $CH_3CH_2CHO \xrightarrow{NH_4OH, AgNO_3}$

c) $C_6H_5CHO \xrightarrow{conc\ KOH}$

d) $CH_3CH_2CH_2COOH + Cl_2 \xrightarrow[H_3O^+]{red\ P_4,}$

e) $C_6H_5CONH_2 \xrightarrow{H_3O^+}$

OR

a) How will you distinguish between benzoic acid and phenol?

b) Illustrate the following with chemical equations

i) Clemmensen's reduction

ii) Gattermann-Koch reaction

iii) Aldol condensation

c) Arrange the following in the increasing order of acid strength

Benzoic acid, 4-Nitrobenzoic acid, 2,4-Dinitro benzoic acid, 4-Methoxy benzoic acid

32 a) Mention the temperature and pressure to maximise the yield of ammonia. 5

b) Nitrogen does not show catenation property. Why?

c) Name the allotrope of sulphur that is stable at room temperature.

d) What happens when sulphur dioxide gas is passed through an aqueous solution of Fe(III) salt?

e) Complete and balance: $Zn + dil\ HNO_3 \rightarrow$

OR

a) How is chlorine manufactured?

b) When a greenish yellow gas A, is treated with excess F_2, forms a T-shaped compound B, which is used in the enrichment of ^{235}U. Identify A and B .Also, write reaction to show the hydrolysis of compound B.

c) Name the hydride of group 15 element which is the strongest reducing agent.

f) Complete and balance: $Cu + dil\ HNO_3 \rightarrow$

33 a) State Kohlrausch's law of independent migration of ions. Give two applications of this law. 5

b) Calculate the emf of the following cell at 298 K

$Mg_{(s)}/Mg^{2+}(0.1M)//Cu^{2+}(0.001M)/Cu_{(s)}$

Given: E^{o}_{cell}=+2.71V, 1F=96500C/mol

OR

a) Predict the product of electrolysis of an aqueous solution of silver nitrate with inert electrodes.

b) Define limiting molar conductivity

c) A conductivity cell when filled with 0.01M KCl has a resistance of 747.5 ohm at 25°C. When the same cell was filled with an aqueous solution of 0.05M $CaCl_2$ solution the resistance was 876 ohm. Calculate

(i) Conductivity of the $CaCl_2$ solution

(ii) Molar conductivity of the $CaCl_2$ solution

(given conductivity of 0.01 M KCl = 0.14114 Sm^{-1})

End of the Question Paper