Roll Number		

SET A

INDIAN SCHOOL MUSCAT
FIRST PRE-BOARD EXAMINATION
CHEMISTRY

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

09.03.2021 | Max. Marks: 70

General Instructions:

a) There are 33 questions. All questions are compulsory.

b) Section A: Q. No. 1 to 2 are case-based questions having four MCQs or Reason Assertion type based on given passage each carrying 1 mark.

c) Section A: Question 3 to 16 are MCQs and Reason Assertion type questions carrying 1 mark each

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

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

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

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

SECTION A (OBJECTIVE TYPE)

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

Alcohols are great hydrogen bonders, because the hydroxyl group is capable of both donating and accepting electrons to form such an interaction. This means that alcohol molecules stick to one another much better than analogous hydrocarbons. The presence of a hydrogen atom bonded to a heteroatom means that alcohols are also amphoteric, being capable of releasing the hydroxyl hydrogen as a proton, forming a species known as an alkoxide, or accepting a proton to form what we call an oxonium ion. Phenols are a family of organic compounds having a hydroxyl group attached directly to a benzene ring. Compounds that have a hydroxyl group attached to a polycyclic benzenoid ring are chemically similar to phenols, but they are called napthols and phenanthrols.

(i) 2-Methylbut-2-ene on hydroboration followed by oxidation gives
(a) 2-Methylbutan-2-ol
(b) 3-Methylbutan-2-ol
(c) 2-Methylbutanol
(d) tritert-pentyl borane

(ii) Which one of the following alcohols is expected to have the lowest pKa value?

(a) Ethanol
(b) 2-Fluoro ethanol
(c) 2,2,2-Trifluoroethanol
(d) 2-Chloroethanol

(iii) Propanone is subjected to catalytic reduction. The product formed would be

(a) Propanal
(b) Propan-1-ol
(c) Propan-2-ol
(d) Propane

(iv)The product of acid catalysed hydration of 2-phenylpropene is

(a) 3-Phenylpropan-2-ol
(b) 1-Phenylpropan-2-ol
(c) 2-Phenylpropan-2-ol
(d) 2-Phenylpropan-1-ol

OR

Which of the following cannot be cleaved by HI

(a) Phenetole
(b) Diphenylether
(c) Di-tert-butylether
(d) Dicyclohexyl ether

2. **In the following questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.** 1x4=4

A colloidal system consists of two phases - the dispersed phase and the dispersion medium. Colloidal systems are classified in three ways depending upon (i) physical states of the dispersed phase and dispersion medium (ii) nature of interaction between the dispersed phase and dispersion medium and (iii) nature of particles of dispersed phase. The colloidal systems show interesting optical, mechanical and electrical properties. The process of changing the colloidal particles in a sol into the insoluble precipitate by addition of some suitable electrolytes is known as coagulation. Colloidal particles always carry an electric charge. The nature of this charge is the same on all the particles in a given colloidal solution and may be either positive or negative. The combination of the two layers of opposite charges around the colloidal particle is called Helmholtz electrical double layer. According to modern views, the first layer of ions is firmly held and is termed fixed layer while the second layer is mobile which is termed diffused layer. This potential difference between the fixed layer and the diffused layer of opposite charges is called the electrokinetic potential or zeta potential.

(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: Lyophilic sol is more stable than lyophobic colloid.
Reason: Charge and solvation of the colloidal particles are responsibe for the stability of lyophobic colloid.

(ii) Assertion: Lyophilic colloids are used as protective colloids
Reason: Lyophilic colloids form a layer around lyophobic particles and protect them from electrolytes.

(iii) Assertion: In a stable colloidal sols, the colloidal particles do not settle down.
Reason: Brownian movement counters the force of gravity actively on colloidal particles.

(iv) Assertion: Coagulation power of Al^{3+} is greater than that of Na^{+}
Reason: Dispersed phase and dispersion medium are oppositely charged

OR

Assertion: If $FeCl_3$ is added to excess of hot water, a positively charged sol of ferric hydroxide is formed.
Reason: Preferential adsorption of Fe^{3+} ions on ferric hydroxide leads to positively charged sol.

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

3. The concentration of cation vacancies per mole when NaCl is doped with 10^{-5} mole % of $SrCl_2$ is 1
(a) 6.023×10^{20}
(b) 6.023×10^{23}
(c) 6.023×10^{21}
(d) 6.023×10^{18}

4. The vapour pressure of pure solvent is 0.8 mm of Hg at a particular temperature .On addition of a nonvolatile solute B, the vapor pressure of solution becomes 0.6 mm of Hg. The mole fraction of component B is: 1
(a) 0.25
(b) 0.45
(c) 0.75
(d) 0.15

5. Which of the statements about solutions of electrolytes is not correct? 1
(a) Conductivity of solution depends upon size of ions.
(b) Conductivity depends upon viscosity of solution.
(c) Conductivity does not depend upon solvation of ions present in solution.
(d) Conductivity of solution increases with temperature

6. Which of the following is a diamagnetic ion: 1
(Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively)
(a) V^{2+}
(b) Sc^{3+}
(c) Cu^{2+}
(d) Mn^{3+}

7. Which of the following is the most likely structure of $CrCl_3.6H_2O$ if $1/3^{rd}$ of total chlorine of the compound is precipitated by adding $AgNO_3$ to its aqueous solution? 1
(a) $[Cr(H_2O)_6]Cl_3$
(b) $[Cr(H_2O)_3Cl_3](H_2O)_3$
(c) $[Cr\ (H_2O)_5Cl\ ]Cl_2\ H_2O$
(d) $[Cr(H_2O)_4Cl_2]\ Cl.2H_2O$

8. Two complexes $[Cr(H_2O)_6]Cl_3$ (A) and $[Cr(NH_3)_6]Cl_3$ (B) are violet and yellow coloured, respectively. The incorrect statement regarding them is 1
(a) Δo value for (A) is less than that of (B)
(b) Both absorb and emit energies corresponding to their complementary colours
(c) Δo values of (A) and (B) are calculated from the energies of violet and yellow light, respectively
(d) Both are paramagnetic with three unpaired electrons

OR

Crystal field stabilization energy for high spin d^4 octahedral complex is
(a) $-1.6\Delta o$
(b) $-1.8\Delta o$
(c) $-1.2\Delta o$
(d) $-0.6\Delta o$

9. The reaction of toluene with Cl_2 in the presence of $FeCl_3$ gives 'X' and the reaction with Cl_2 in presence of light gives 'Y'. Thus 'X' and 'Y' are: 1
(a) 'X' = benzyl chloride and 'Y' = m-chlorotoluene
(b) 'X' = benzyl chloride and 'Y' = o-chlorotoluene
(c) 'X' = m-chlorotoluene and 'Y' = p-cholorotoluene
(d) 'X' = p-chlorotoluene and 'Y' = benzyl chloride

10. Which of the following is the strongest base? 1
(a) Aniline (b) N - methyl aniline (c) o-methyl aniline (d) Benzyl amine

OR

Which of the following on reduction with $LiAlH_4$ will not give amine

(a) Methyl cyanide

(b) Acetamide

(c) Nitromethane

(d) Phthalic acid

11. If the amino group of glycine and carboyxylic acid group of alanine undergo condensation, the name of the compound thus formed is 1

(a) Alanylglycide (dipeptide)

(b) Glycylalanide (di peptide)

(c) Glycylalanine (dipeptide)

(d) Alanylglycine (dipeptide)

OR

The secondary structure of a protein refers to

(a) α - helical structure

(b) Hydrophobic interactions

(c) Sequence of α -amino acids

(d) Different conformations of polypeptide chains

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: Aquatic species are more comfortable in cold waters rather than in warm waters. 1
Reason: Different gases have different K_H values at the same temperature.

OR

Assertion: A mixture of CS_2 and Acetone form maximum boiling azeotrope.
Reason: In mixture of CS_2 and Acetone the new intermolecular forces are weaker than the intermolecular forces which exist in pure components.

13. Assertion: Both rhombic and monoclinic sulphur exist as S_8 but oxygen exist as O_2. 1
Reason: Oxygen forms ΠΠ–ΠΠ multiple bond due to small size and small bond length but ΠΠ–ΠΠ bonding is not possible in Sulphur.

14. Assertion: The alpha-hydrogen atom in carbonyl compounds is acidic. 1
Reason: Carbonyl compounds with alpha hydrogen undergo aldol condensation

15. Assertion: D (+) Glucose is dextrorotatory in nature. 1
Reason: 'D' represents its dextrorotatory nature

16. Assertion: Anisole undergoes electrophilic substitution at ortho and para positions 1
Reason: Methoxy group in anisole increases the rate of electrophilic substitution

SECTION B

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

17. (a) Define packing efficiency 2
(b) Why does LiCl acquire pink colour when heated in Li vapour?

18. 15.0 g of an unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at – 0.34 ^{0} C. What is the molar mass of the material? 2
K_f for water = 1.86 K kg mol^{-1}

19. For a reaction, $\frac{dX}{dt} = k[H^+]^n$. If pH of reaction medium changes from two to one, the rate becomes 100 times of the value at pH = 2. Calculate the order of reaction? 2

20. Show that in case of first order reaction, the time required for 99.9% of the reaction to take place is about ten times than that required for half the reaction. 2

21. a) Explain the chemistry behind brown ring test for detection of nitrate ions. 2
b) Write the reaction of thermal decomposition of sodium azide

22. Using valence bond theory, explain the geometry and magnetic behaviour of $[Co(NH_3)_6]^{3+}$. 2
(At. no. of Co = 27)

OR

a) Write the IUPAC name of the coordination complex: $[CoCl_2(en)_2]Cl$

b) Write the formula for the following complex: Pentaamminenitrito-O-cobalt (III)

23. a) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification. 2
b) Write the structure of the following compound : 2-(2-chlorophenyl)-1-iodooctane

24. What happens when : 2

a) 1-bromopropane reacts with metallic sodium.
b) Bromoethane is treated with aqueous KOH

OR

a) Which will have a higher boiling point 1-chloropentane or 2-chloro-2-methyl butane. Give reason.
b) Why dextro and laevo rotatory isomers of butan-2-ol are difficult to separate by fractional distillation.

25. Write short note on (Give equations) 2
a) Etards reaction
b) Decarboxylation

SECTION C

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

26. Copper crystallises with fcc unit cell. If the radius of copper atom is 127.8 pm, calculate the density of copper metal. (atomic mass of Cu = 63.5 u). 3

27. Account for the following: 3

a) Zinc salts are white while Cu^{2+} salts are coloured.
b) Mn_2O_7 is acidic whereas MnO is basic.
c) Both O_2 and F_2 stabilise high oxidation state but the ability of oxygen to do so exceeds that of fluorine

OR

a) Name an element of lanthanoid series which is well known to show +4 oxidation state. Is it a strong oxidizing agent or reducing agent?
b) What is lanthanoid contraction? Write its one consequence

28. Draw the structure of : 3

a) BrF_3
b) Hypochlorous acid
c) XeF_2

29. a) How will you convert an amide into following? (Give equations) 3
i) An amine with one carbon atom less than that of the amide.
ii) An amine containing same number of carbon atom as that in the amide
b) Arrange the following in the increasing order of their boiling point :
$C_2H_5NH_2$, C_2H_5OH, $(CH_3)_3N$

OR

a) Give a simple chemical test to distinguish between the following pair of compounds : $(CH_3)_2NH$ and $(CH_3)_3N$.

b) Write the IUPAC name of $CH_3CH{=}CH(NH_2)CH_3$
c) Write equation for sulphonation of aniline

30. Define the following 3

a) Anomers
b) Native protein
c) Nucleoside

SECTION D

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

31. (a) Account for the following : 5

(i) Carboxylic acids do not give reactions of carbonyl group
(ii) Benzoic acid does not undergo Friedel-Craft reaction.
(iii) Oxidation of toluene to C_6H_5CHO with CrO_3 is carried out in presence of acetic anhydride.

(b) Convert the following

(i) Ethanal to but-2-enal (ii) Propanal to Butan-2-one

OR

(a) Complete the following reactions and write main products :

(i) $CH_3COOH + NH_3$ (heat) $\rightarrow$

(ii) $CH_3COR + NaOI \rightarrow$

(iii) $R—CH_2—COOH \xrightarrow{Br_2/Red\ P}$

(b) Arrange the following in the increasing order of reactivity towards nucleophilic addition reactions

$C_6H_5COCH_3$, CH_3CHO , CH_3COCH_3

(c) An aromatic organic compound 'A' with molecular formula C_8H_8O gives positive DNP and iodoform tests. It neither reduces Tollens' reagent nor does it decolourise bromine water. Write the structure of 'A'.

32. (a) Define the term cell constant 5

(b) Why is alternating current used for measuring resistance of an electrolytic solution?

(c) Equilibrium constant (K_c) for the given cell reaction is 10. Calculate E°cell.

(d) A zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95% dissociated at this dilution at 298 K. Calculate the electrode potential. [$E°_{Zn2+/Zn} = -0.76$ V]

OR

(a) State Kohlrausch law

(b) Predict the products of electrolysis of NaCl (aq)

(c) The resistance of 0.01 M NaCl solution at 25° C is 200 Ω. The cell constant of the conductivity cell used is unity. Calculate the molar conductivity of the solution .At 291K, the molar conductivities at infinite dilution of NH_4Cl, NH_4OH and NaCl are 129.8, 217.4 and 108.9 S cm^2 mol^{-1} respectively. If the molar conductivity of a 0.1 molar solution of NH_4OH is 9.33 Scm^2mol^{-1}, what is the degree of dissociation? 5

33. (a) Explain why
    (i) H_2S is more acidic than H_2O.
    (ii) Hydrolysis of XeF_6 is not regarded as a redox reaction.
    (b) Write the chemical equations of the following reactions :
    (i) Sucrose is heated with conc. H_2SO_4.
    (ii) Reaction of copper metal with cold and dilute HNO_3.
    (iii) Preparation of bleaching powder from Chlorine.

OR

(a) Complete the following
    (i) Cl_2 + NaOH (hot,con) →
    (ii) $XeF_4 + H_2O$ →
(b) Give a test for the detection of SO_2 gas.
(c) Why does ozone act as a powerful oxidising agent?
(d) Bleaching action of chlorine is permanent. Justify

End of the Question Paper