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EXPECTED QUESTIONS FOR BOARD EXAM (2020-21)

CHEMISTRY THEORY (043), SET-I

CLASS- XII **MM : 70**

Time: 3 Hours

General Instructions. Read the following instructions carefully.

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

h) 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)
The following questions are multiple choice questions. Choose the most appropriate answer:

Aldehydes are generally more reactive than ketones in nucleophilic addition reactions due to steric and electronic reasons (or inductive effect). Relative reactivities of aldehydes and ketones in nucleophilic addition reactions is due to the positive charge on carbonyl carbon. Greater positive charge means greater reactivity. Electron releasing power of two alkyl groups in ketones is more than one in aldehyde. Therefore positive charge is reduced in ketones as compared to aldehydes. Aldehydes and ketones having at least one α-hydrogen undergo a self condensation in the presence of dilute alkali as catalyst to form α-hydroxy aldehydes (aldol) or α-hydroxy ketones (ketol), respectively.

(i) Oxidation of which one of the following results in to an Aldehyde

a) Primary alcohol
b) Secondary alcohol
c) Tertiary alcohol
d) Butan-2-ol

(ii) What is the correct order of reactivity of the carbonyl compounds for nucleophilic addition reaction?

a) Formaldehyde >Acetaldehyde>Acetone> Propanal
b) Acetone >Acetaldehyde> Propanal > Formaldehyde
c) Formaldehyde >Acetaldehyde> Propanal> Acetone
d) Formaldehyde >Acetone> Propanal >Acetaldehyde

OR

Which of the following is formed when Ehanal undergo aldol condensation followed by heating?

a) But-2-en-1-ol
b) But-1-en-2-ol
c) Prop-2-enal
d) But-2-en-1-al

(iii) Which of the following do not undergo aldol condensation?
a) Propanone
b) Propanal
c) Benzaldehyde
d) Ehanal

(iv) An organic compound 'X' with molecular formula C_3H_8O on heating with copper gives compound 'Y' which reduces Tollen's reagent. 'Y' on reduction with Zinc amalgum and HCl gives 'Z' . What is the product of reaction 'Z'

a) Propanal
b) Propane
c) Propanol
d) None of these

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

It is often recommended that the first aid kit to be kept in the houses must have a small lump of alum. In case, bleeding occurs while doing shave in the bathroom or from a knife cut in the kitchen, alum should be immediately rubbed on the affected portion. Bleeding stops and medical aid if required, can be obtained later on.

2. In these questions (Q. No 5-8 , 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.

(i) Assertion: Bleeding stops when alum is rubbed on the affected portion.
Reason: Alum can be used to remove colloidal impurities from water.

(ii) Assertion: Excess of electrolyte can bring about coagulation of colloidal solution.
Reason: The flocculating ion of the electrolyte removes the charge from the sol particles.

(iii) Assertion: Coagulation power of Al^{+3} is more than that of Na^{+}
Reason: Greater the valency of the flocculating ion added, greater is its power to cause coagulation (Hardy-Schulze rule)

(iv) Assertion: Addition of gelatin to a lyophobic sol may result in to its coagulation
Reason: Smaller the gold number of protective colloid, greater will be its protective power.

OR

Assertion: Persistent dialysis may also result in to coagulation of a lyophobic colloid.
Reason: Electrophoresis involves the migration of dispersion medium under the influence of electric field when the dispersed phase particles are prevented from moving.

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

3. The rate constant of a reaction has units L mol^{-1} s^{-1} . The order of the reaction is
   a) 3 b) 2
   c) 1 d) 0
4. Proteins are found to have two different types of secondary structures viz. α-helix and β-pleated sheet structure, α-helix structure of protein is stabilized by:

   a) Peptide bonds
   b) Van der Waal's forces
   c) Hydrogen bonds
   d) Dipole-dipole interactions.

OR

4. Curdling of milk is an example of:
a) breaking of peptide linkage
b) hydrolysis of lactose
c) breaking of protein into amino acids
d) denauration of proetin

5. A binary solution is prepared by mixing n-hexane and n-heptane. Which one of the following statements is correct regarding the behaviour of the solution?
a) The solution formed is nearly an ideal solution
b) The solution is non-ideal showing positive deviation from Raoult's law.
c) The solution is non-ideal showing negative deviation from Raoult's law.
d) n-heptane shows positive deviation while ethanol shows negative deviation from Raoult's law.

6. Because of lanthanoid contraction:

a) separation of the lanthanoid elements become difficult.
b) there is a very small difference in the atomic size of the transition metals of 5^{th} and 6^{th} period in the same group.
c) there is a gradual decrease in the basic strength of the hydroxides of lanthanoids
d) all are correct

OR

Which of the following is a diamagnetic ion:
(Atomic numbers of Cr, Mn, Ni and Cu are 24, 25, 28 and 29 respectively)
a) Cr^{2+}
b) Cu^{+}
c) Ni^{2+}
d) Mn^{2+}

7. Method by which aniline cannot be prepared is

a) degradation of benzamide with bromine in alkaline solution

b) reduction of nitrobenzene with Sn and HCl
c) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous sodium hydroxide solution
d) hydrolysis of phenylisocyanide with acidic solution

OR

IUPAC name of product formed by reaction of methyl amine with two moles of ethyl chloride
a) N,N-Dimethylethanamine
b) N,N-Diethylmethanamine
c) N-Methyl ethanamine
d) N-Ethyl - N-methylethanamine

8. What is the correct electronic configuration of the central atom in $[Cr(NH_3)_6]Cl_3$ based on crystal field theory?

a) $e^4t_2^2$
b) $t_{2g}^4e_g^2$
c) $t_{2g}^6e_g^0$
d) $e^2t_{2g}^4$

OR

Which is true for the complex $[Ni(en)_2]^{2+}$?

a) paramagnetic, square planar
b) diamagnetic, square planar
c) diamagnetic, tetrahedral
d) paramagnetic, square planar

9. The hybridization involved in formation of $[Cr(NH_3)_5Cl]Cl_2$ is

a) sp^3
b) d^2sp^3
c) dsp^2
d) sp^3d^2

10. Identify A, and B:

$CH_3CH_2I \xrightarrow{KCN} A \xrightarrow{LiAlH4} B$

a) A = C_2H_5CN, B= $C_2H_5NH_2$,
b) A= C_2H_5CN, B= C_2H_4,
c) A = C_2H_4, B= $C_2H_5NH_2$,
d) A= C_2H_5CN, B= $C_3H_7NH_2$,

11. Which of the following has Frankel defect
a) Sodium chloride
b) Graphite
c) Silver bromide
d) Iron oxide

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: Deoxyribose, $C_5H_{10}O_4$ is not a carbohydrate.

Reason: Carbohydrates are optically active polyhydroxy aldehyde or ketone or the compound which produce such units on hydrolysis.

13. Assertion: Sulphur exhibits paramagnetic behaviour in the vapour state.
Reason: In vapour state, sulphur partly exists as S_2 molecules which have two unpaired electrons in antibonding π* orbital.

14. Assertion: Osmotic pressure is a colligative property.
Reason: Osmotic pressure is directly proportional to molarity.

OR

Assertion: Acetone-aniline mixtures shows negative deviation from Raoult's law
Reason: H-bonding between acetone and aniline is stronger than that between acetone-acetone and aniline-aniline.

15. Assertion: The Ka of acetic acid is greater than that of phenol.
Reason: Phenoxide ion is more resonance stabilized than acetate ion.

16. Assertion: tert-Butyl methyl ether on treatment with HI at 373 K gives a mixture of methyl alcohol and tert-butyl iodide.
Reason: The reaction occurs by SN^2 mechanism.

SECTION B

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

17. Explain the mechanism of acid catalysed hydration of Ethene at 443 K.

OR

Carry out the conversion 2-bromopropane to 1- bromopropane in not more than 2 steps

18. 40 grams of NaOH is dissolved to make a 2 litre solution . Find the Molarity. Does it change with change in temperature

19. (i) Using the valence bond approach, write the hybridization of iron ion in the following complex ion. Also predict its magnetic behaviour :$[Fe(H_2O)_6]Cl_3$
(ii) Write the IUPAC name of the coordination complex: $[CoCl_2(en)_2]NO_3$

OR

(i) What is meant by chelate effect? Give an example.
(ii) Predict the geometry and magnetic moment of $[NiCl_4]^{2-}$ ion.

20. A first order reaction takes 40 minutes for 30% decomposition. Calculate $t_{1/2}$

OR

The following results have been obtained during the kinetic studies of the reaction:

$P + 2Q \Rightarrow R + 2S$

Exp.	**Initial P(mol/L)**	**Initial Q (mol/L)**	**Init. Rate of Formation of R (M min^{-1})**
1	0.10	0.10	3.0×10^{-4}
2	0.30	0.30	9.0×10^{-4}
3	0.10	0.30	3.0×10^{-4}
4	0.20	0.40	6.0×10^{-4}

Determine the rate law expression for the reaction.

21. (i) Why is alum added to water for purification ?
(ii) Explain why deltas are formed where river & sea water meet.

22. Mention the reagent used to distinguish between the following set of compounds given
a) Propanoic acid and propanol b) Ethanamine and N- methyl ehthanamine

23. Draw the structure of the following compounds:
(a) Dibasic oxoacid of phosphorus
(b) Noble gas species which is isostructural with BrO_3^-

24. (a) Write chemical equations for Reimer Tiemann reaction?
(b) Which compound out of the following pairs will react faster in SN^1 reaction and why ? CH_2=CHBr or CH_2=CHCH Br.

25. A compound is consist of three element P, Q and R . Atoms of element P form ccp lattice and those of the element Q occupy 1/3rd of tetrahedral voids and those of the element R occupy 2/3rd of octahedral voids. What is the formula of the compound formed by the elements P, Q and R?

SECTION C

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

26. Give reasons for the following:
i. Transition elements exhibit variable oxidation states .
ii. Zirconium and hafnium have almost similar atomic radii.
iii. Cu^+ ion is not known in aqueous solution.

OR

Explain the following observations:
i. The general trend towards less negative E^o values across the first transition series
ii. The positive reduction potential of Copper
iii. More negative E^o values of Mn and Zn

27. Arrange the following in increasing order of property specified:
i. triethylamine, ethanamine, diethylethanamine (solubility in water)
ii. $C_4H_9NH_2$, $C_2H_5N(CH_3)_2$, $(C_2H_5)_2NH$ (boiling point)

iii. Ethanamine, N-Ethyl ethanamine, N,N-Diethyl ehanamine
(Basic strength in aqeous solution)

OR

i. Give a chemical test to distinguish between Benzoic acid and Phenol.
ii. Write chemical equations for Hoffmann bromamide degradation reaction.
iii. Methyl amine is soluble in water but not aniline. Explain.

28. An element 'X' (atomic mass = 40 g mol-1) having fcc structure, has unit cell edge length of 400 pm. Calculate the density of 'X' and the number of unit cells in 4 g of 'X'.

29. (i) What is the effect of denaturation on the structure of proteins?
(ii) What is the difference between a nucleoside and nucleotide?
(iii) Represent Alanine (aminoacid) in the zwitter ionic form.

30. i. Explain why N does not form pentahalides while phosphorus does.
ii. Arrange the following in decreasing order of bond dissociation enthalpy

F_2 , Cl_2 , Br_2 , I_2

iii. Electron gain enthalpy of fluorine is less negative than chlorine. Justify

SECTION D

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

31. Answer the following questions: **(1+2+2)**
(i) Write the balanced chemical reaction for reaction of Cl_2 with hot and concentrated NaOH.
(ii) Complete the following chemical equations:
(a) $PbS + O_3$ ❼
(b) $H_2SO_4 + Cu$ ❼
(iii) Give reason
(a) Amongst all noble gases only xenon is known to form compounds with oxygen and fluorine.
(b) I-Cl is more reactive than I_2 .

OR

Answer the following questions: **(1+3+1)**
(i) Arrange the following in the increasing order of basic strength: (Give reason)
NH_3, PH_3, AsH_3, SbH_3, BiH_3
(ii) Account for the following observation
(a) Acidity of oxo –acids of chlorine is HOCl < HOClO < $HOClO_2$ < $HOClO_3$.
(b) Nitrogen can't form compounds like $R_3N{=}O$, while phosphorus can form $R_3P{=}O$.
(c) Fluorine never acts as the central atom in polyatomic interhalogen compounds.
(iii) Complete the following reaction:
$XeF_6 + 3H_2O$ ❼

32. I. How do you convert the following: **(3+2)**

(i) Prop-1-ene to 1-fluoropropane

(ii) Chlorobenzene to p-chlorotoluene

(iii) Ethanol to propane nitrile

II. Give reasons:

(i) C—Cl bond length in chlorobenzene is shorter than C—Cl bond length in CH_3—Cl.

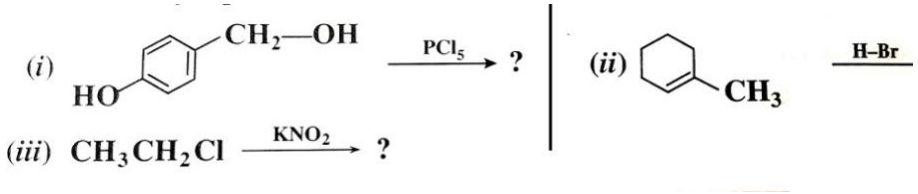
(ii) SN1 reactions are accompanied by racemization in optically active alkyl halides

OR

(2+3)

I. Amongst the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields i) a single monochloride. ii) Three isomeric monohalides

II. Write the major products in the following reactions:



33. (i) How molar conductivity is affected with dilution? **(1+3+1)**

(ii) Calculate the emf of the following cell at 298 K:

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

(Given $E^o_{(Mg2+/\ Mg)}$ = -2.37 V, $E^o_{(Cu2+\ /Cu)}$ = 0.34V)

(iii) Is it a working electrochemical cell?.

OR

(1+3+1)

(i) Why on dilution the molar conductivity of CH_3COOH increases drastically, while that of CH_3COONa increases gradually?

(ii) Write the cell reactions and find emf of the cell at 298K

$Sn(s)/Sn^{2+}$(0.004M) // H^+ (0.02M) /H_2(g)(1bar) / Pt(s). Given that $E^0_{(Sn2+/Sn)}$ = -0.14 V

(iii)) The conductivity of 0.20 M solution of KCl at 298 K is 0.025 S cm^{-1}.
Calculate its molar conductivity.

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