II-TERM EXAMINATION : 2022-23

CLASS - XII (CBSE) E/M

CHEMISTRY [THEORY]

Time: 3 hrs. M.M.: 70

General Instructions : Read the following instructions carefully.

i) **There are 33 questions in this questions paper. All questions are compulsory.**

ii) **Section A : Question no. 1 to 2 are case based questions having four MCQ or Reason Assertion type based on given passage each carrying 1 mark.**

iii) **Section A : Question no. 3 to 16 are MCQs and reason assertion type questions carrying 1 mark each.**

iv) **Section B : Questions no. 17 to 25 are short answer questions and carry 2 marks each.**

v) **Section C : Question no. 26 to 30 are short answer questions and carry 3 marks each.**

vi) **Section D : Questions no. 31 to 33 are long answer questions carrying 5 marks each.**

vii) **There is no overall choice. However and internal choices have been provided.**

viii) **Use of calculators log tables is not permitted.**

SECTION -A
(OBJECTIVE TYPE)

1. Read the passage given below and answer the following questions : [1×4=4]

The reaction of phenol with aqueous sodium hydroxide indicates that phenols are stronger . Acids than alcohols and water. Due to the higher electronegativity of sp^2 hybridized C of phenol to which -OH is attached, electron density decreases on oxygen. This increase the polarity of the O–H bond and results in an increase in ionization of phenol than that of alcohols. In alkoxide ion the negative charge is localized on oxygen while in phenoxide ion, the charge is delocalized. The delocalization of negative charge makes phenoxide ions more stable and favours the ionization of phenol.

i) Phenol is less acidic than :
   a) Ethanol b) o-nitrophenol
   c) o-methyl phenol d) o-methoxy phenol

ii) Cyclohexanol is a :
   a) Primary alcohol b) Secondary alcohol
   c) Tertiary alcohol d) Phenol

iii) Phenol can be destinguished from ethanol by the reaction with :
   a) Br_2 water d) Na c) glycerol d) All of above

iv) Phenol are more acidic than alcohol due to :
   a) Higher molecular mass of phenol
   b) Stronger hydrogen bonds in phenol
   c) Alkoxide ion is a strong conjugate base
   d) Phenoxide ion is resonance stablised

2. Read the passage given below and answer the following questions : [1×4=4]

Double salts are addition compounds which lose their identity in aqueous solution whereas complexes which are also addition compounds do not lose their identity in aqueous solution. The coordination compounds show isomerism and find application in photography qualitative analysis, metallurgy, water purification and in the treatment of various diseases.

i) Which of the following statement in incorrect ?
   a) Alum is a double salt
   b) EDTA salt of calcium is used in the treatment of lead poisoning
   c) Effective atomic number of the metal in complexes $Ni(CO)_4$ and $[Fe(CN)_6]^{4-}$ is same.
   d) In $[Fe(CN)_6]^{4-}$ oxidation state of Fe is +3

ii) Choose correct option for $[Pt\,Cl_2\,(en)_2]^{2+}$:
   a) Platinum is in +2 oxidation state.
   b) Its trans form is optically active.
   c) It has two five membrered chelating rings
   d) Both (b) and (c)

iii) What type of hybridisation is involved in $[Fe(CN)_6]^{3-}$:
   a) d^2sp^3 b) dsp^2 c) sp^3d^2 d) sp^3

iv) The dark blue colour of the solution formed when excess of ammonia is added to a solution of copper (II) sulphate is due to the presence of the ion

a) $[Cu(OH)_4(H_2O)_2]^{2-}$ b) $[Cu(NH_3)_4]^{2+}$

c) $[Cu(NH_3)_4(H_2O)_2]^{2+}$ d) $[Cu(NH_3)(H_2O)_4]^{2+}$

Question 3 to 16 are MCQs acid assertion reason type questions carrying 1 mark each.

3. During electrolysis the mass deposited at an electrode in directly proportional to : [1]

a) atomic weight b) equivalent weight

c) molecular weight d) atomic number

4. A 500 g tooth paste sample has 0.2 g fluoride concentration. What is the concentration of fluoride ion in term of ppm level : [1]

a) 250 b) 200 c) 400 d) 1000

5. An electrochemical cell behaves like an electrolytic cell when : [1]

a) $E_{Cell} = E_{external}$ b) $E_{Cell} = 0$

c) $E_{external} > E_{Cell}$ d) $E_{external} < E_{Cell}$

6. The coordination number and oxidation number of cobalt in the complex . $[Co(en)_2Br_2]C\ell_2$ is : [1]

a) 6, 3 b) 6, 4 c) 3, 6 d) 4, 6

7. Which one of the following transition elements does not exhibit variable oxidation state: [1]

a) Ni b) Cu c) Sc d) V

8. Phenol reacts with bromine in Cs_2 at low temperature to gene : [1]

a) m-bromophenol b) o and p -bromophenol

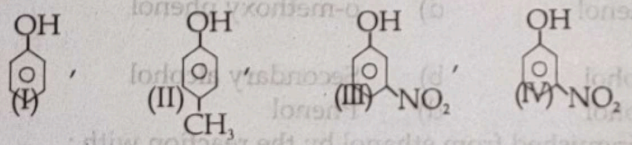
c) p-bromophenol d) 2, 4, 6 -tribromophenol

9. Which of the following solution shows positive deviation from Raoult's Law : [1]

a) Acetone + Aniline b) Acetone + Ethanol

c) $H_2O + HNO_3$ d) Chloroform + Benzene

10. In the following compounds : [1]



(I) (II) (III) (IV)

The order of activity is

a) III > IV > I > II b) I > IV > III > II

c) II > I > III > IV d) IV > III > I > II

Question no. 11 to 16. A statement of assertion (A) followed by a statement of Reason (R) is given choose the correct option out of choices given below for each question :

a) If both A and R are correct and R is the correct explanation of A

b) If both A and R are correct and R is not the correct explanation of A.

c) If A is correct but R is incorrect

d) If A is incorrect but R is correct

11. **Assertion (A):** Solution having positive deviation from Raoult's Law shows ΔH_{mixing} = +ive [1]

Reason (R) : Energy required to break solute-solute or solvent-solvent attractive forces are greater than the energy released in the interaction of solute and solvent molecules.

12. **Assertion A :** Ce^{4+} is used as an oxidising agent in volumetric analysis [1]

Reason (R) : Ce^{4+} has the tendency of attaining more stable +3 oxidation state.

13. **Assertion (A):** Copper sulphate can not be stored in zinc vessel. [1]

Reason (R) : $E^0_{Zn^{++}/Zn}$ is higher than $E^0_{Cu^{++}/Cu}$

14. **Assertion (A):** Conductivity of all electrolytes decreases on dilution. [1]

Reason (R) : On dilution number of ions per unit volume decreases

15. **Assertion (A):** Tertiary alcohol react very fast with Leucas reagent [1]

Reason (R) : In tertiary alcohol C–OH bond become more polar due to +I effect of Alkyl group.

16. **Assertion (A):** $[Zn(NH_3)_4]SO_4$ is coloured substance. [1]

Reason (R) : Complexes shows colour due to d-d transition.

SECTION–B

Q. No- 17 to 25 are very short answer type and carrying 2 marks each.

17. Account for the following : [2]
    i) Mn (III) undergoes disproportionation reaction easily.
    ii) Zn has lowest enthalpy of atomization in 3d series.

    OR

    i) Why atomic size of zirconium and Haffnium are same.
    ii) What is misch metal. Give its main composition.

18. Complete the following equation :[2]

$$MnO_4^- + Fe^{++} + H^+ \longrightarrow \qquad Cr_2O_7^{--} + SO_2 + H^+ \longrightarrow$$

19. Define the following term: [2]
    a) Raoult's law b) Colligative properties

    OR

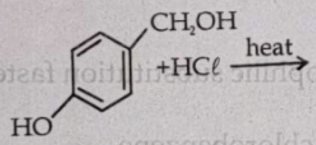
    30 g/lt solution of urea is isotonic with NaCℓ solution calculate concentration of NaCℓ solution in g/lt.

20. When 1.5 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point of benzene raised from 353.23 k to 353.93 k. Cal. molar mass of the solute. Molal elevation constant for benzene is 2.52 k molal^{-}. [2]

21. If molality of an aqueous solution of cane sugar is 0.445 m. What is the mole fraction of cane sugar. [2]

22. $[Fe(H_2O)_6]^{3+}$ is strongly paramagnatic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic. Explain . [2]

23. Complete the following reaction : [2]

i) 

ii) $CH_3-CHO + CH_3MgBr \xrightarrow{H_2O/H^+}$

24. An aromatic compound A on treatment with $CHCl_3$/KOH given two compounds B and C. Both B and C give same product D when distilled with Zn dust. Identify A, B, C, D . [2]

    OR

    Answer the following with proper reason :
    i) Out of CH_3NH_2 and CH_3OH which has higher boiling point.
    ii) Out of  and  which will react faster in SN^1 reaction with OH^-.

25. How the following conversions can be carried out : [2]
    i) Anilene to phenol ii) Ethanol to propan -2-ol

SECTION–C

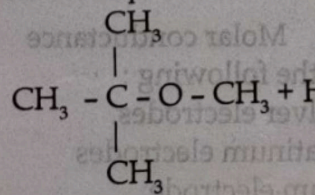
Answer the following questions 26 to 30 . They are short answer type and carry 3 marks each.

26. Explain the following by giving reaction : [3]
    i) Willamson's ether synthesis ii) Finkelstein reaction
    iii) Iodofarm reaction

    OR

    Arrange the following as directed :
    i) Pentan-1-ol, butan-1-ol, butan-2-ol, 2-methyl-2-propanol (increasing order of boiling point)
    ii) Phenol, o-nitrophenol, o-cresol (increasing order of acidic character)
    iii) Butan-1-ol, butan-2-ol, 2-methyl-2-propanol (increasing ease of dehydration)

27. Write the main product in each of the following reaction : [3]

i) 

ii) $CH_3-CH=CH_2 \xrightarrow[(ii)\ H_2O_2/OH^-]{(i)\ B_2H_6}$ iii) $C_6H_5OH \xrightarrow[(ii)\ CO_2, H^+]{(i)\ aq\ NaOH}$

[3]

28. Write short notes on following:
i) Cell constant ii) Reverse osmosis iii) Secondary batteries [3]

29. Calculate cell potential of following cell at 298 K. Also write cell reaction
$Ni \mid Ni^{++}(0.1M) \parallel Ag^{+}(0.2M) \mid Ag$
$E^{0}_{Ni^{2+}/Ni} = -0.25V$, $E^{0}_{Ag^{+}/Ag} = +0.80V$ [3]

30. Write formula of following coordination compound or ion :
i) Tetrachlorido platinate (II) ion
ii) Triammine trichlorido chromium (III)
iii) Pentammine bromido cobalt (III) chloride

OR

Using valence bond theory find in $[CO(NH_3)_6]^{3+}$
i) Type of hybridisation ii) Magnetic behaviour iii) Shape

SECTION-D

Answer the following question 31 to 33. They are long answer questions carrying 5 marks each.

31. a) Explain the following : [5]
i) Benzyl halide show high reactivity for SN^1 reaction.
ii) Chloroform is stored in closed dark brown bottles.
iii) Phenol is more easily nitrated than benzene.
b) Write the mechanism of hydration of ethene to yield ethanol.

OR

a) How the following conversions can be carried out :
i) Benzene to 4-bromonitrobenzene ii) Anilene to bromobenzene
iii) Phenol to anisole
b) Explain the following :
i) p-nitrochlorobenzene undergoes nucleophilic substitution faster than chlorobenzene.
ii) Willamson's synthesis is not carried on chlorobenzene

32. A meal ion M^{n+} having d^4 valence electronic configuration combines with three bidentate legands to form a complex compound $\Delta_0 > p$: [5]
i) Write electronic configuration according to crystal field theory.
ii) What type of hybridisation will M^{n+} ion have.
iii) Calculate number of unpaired electron.
iv) Calculate magnetic moment of complex
v) Name the type of isomerism shown by complex.

OR

a) $COSO_4C\ell.5NH_3$ exists in two isomeric form A and B. A reacts with $AgNO_3$ to give white PPt but does not react with $BaC\ell_2$. B gives white PPt with $BaC\ell_2$ but does not react with $AgNO_3$. Answer the following questions.
i) Write structural formula and IUPAC name of A andB
ii) Name the type of isomerism involved.
b) Draw geometrical isomers of $[CO(en)_2C\ell_2]^{+}$ ion and write IUPAC name also.

33. a) A current of 1.7A is passed through 300 ml of 0.16 M solution of $ZnSO_4$ for 230 sec. with a current efficiency of 90%. Find out the molarity of Zn^{++} after deposition of Zn. Assume volume of solution remains constant. [5]
b) The conductivity of 0.1 M solution of $NaC\ell$ is $1.06\times10^{-2}\,scm^{-1}$ calculate its molar conductivity and degree of dissociation.
$\lambda^{0}_{Na^{+}} = 50.1\,S\,cm^2\,mol^{-1}$ and $\lambda^{0}_{C\ell^{-}} = 76.5\,S\,cm^2\,mol^{-1}$

OR

a) Define the terms:
i) Kohlrausch's Law ii) Molar conductance
b) Predict the products of electrolysis in each of the following :
i) An aqueous solution of $AgNO_3$ with silver electrodes.
ii) An aqueous solution of $CuC\ell_2$ with platinum electrodes
iii) A dilute solution of H_2SO_4 with platinum electrode.

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