Class XI Session 2024-25
Annual Examination
Subject - Chemistry

Time Allowed:3hour   **Maximum Marks:70**
General Instructions:

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. The use of log tables and calculators is not allowed

SectionA

1. **27°C in Kelvin is**   **[1]**
   a) 227K   b)246.15K
   c) 300.15K   d)127.15K

2. **Among the following pairs of orbitals which orbital will experience the larger effective nuclear charge? (i)2s and 3s, (ii) 4d and 4f, (iii) 3d and 3p:**   **[1]**
   a) 4f, 3d, and 3s respectively   b) 2s,4d and 3p respectively
   c) 2s,4d and 3d respectively   d) 4d,3p and 2s respectively

3. **In an alpha scattering experiment, few alpha particles rebounded because:**

   a) The mass of the atom is concentrated in the center

   b) Positive charge of the atoms very little space

   c) All the positive charge and mass of the atom is concentrated in small volume

   d) Most of the space in the atom is occupied

4. **The formula E=hV is used to calculate**   **[1]**
   a) wave number   b)energy of the ejected electrons
   c) radiation emitted by a black body   d)energy of quantum

5. **For an isolated system,ΔU=0,what will be ΔS?**   **[1]**

   a) ΔS>0   b) ΔS will increase for sometime and then reduce

   c)ΔS<0   d)ΔS= 0

6. **2×10^8 atoms of carbon are arranged side by side. Calculate the radius of carbon atom if the length of this arrangement is 2.4cm.**   **[1]**
   a)6.0×10^{-11}m   b)6.0×10^{-11}m
   c)3.0×10^{-11} m   d)5.7×10^{-11}m

7. **Which of the following processes takes place in oxidation?**   **[1]**
   a) Addition of hydrogen   b)Removal of oxygen
   c) Addition of oxygen   d)Removal of chlorine

8. Which method is used for the separation of a mixture of sodium sulphate and sodium dichromate?

[1]

   a) Fractional crystallisation   b)Sublimation

   c) Steamdistillation   d)Simpledistillation

9. The hydrocarbon which can react with sodium in liquid ammonia is_____.[1]
   a)$CH_3CH=CHCH_3$ b)$CH_3CH_2C\equiv CH$
   c)$CH_3CH_2CH_2C \equiv CCH_2CH_2CH_3$ d)$CH_3CH_2C\equiv CCH_2CH_3$

10.Where is nitrogen found in the periodic table?   **[1]**

   a)3^{nd}period,group15   b)2^{nd}period,group15

   c)2^{nd}period,group14   d)2^{nd}period,group18

11. The sign of ΔG for a spontaneous and non-spontaneous process respectively are   **[1]**
   a) positive and negative   b) negative and positive
   c) zero and positive   d) positive and zero

12.A liquid hydrocarbon is converted to a mixture of gaseous hydrocarbon by_____.[1]

   a) hydrolysis   b)oxidation
   c)cracking   d)distillation

13. Assertion(A): Cyclopentadienyl anion is much more stable than allyl anion.
    Reason(R): Cyclopentadienyl anion is aromatic in character.   **[1]**
   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false
   d) A is false but R is true.

14. Assertion: Alkyl benzene is not prepared by Friedel-Crafts alkylation of benzene.   **[1]**

   Reason: Alkyl halides are less reactive than acyl halides.

   a) If both Assertion & Reason are true and there as on is the correct explanation of the assertion.

   b) If both Assertion & Reason are true but there as on is not the correct explanation of the assertion.

   c) If Assertion is true statement but Reason is false.

   d) If both Assertion and Reason are false statements.

                                                          [1]

15. Assertion(A): Orbitals form the basis of the electronic structure of atoms.
   Reason(R): An atomic orbital is the wave function ψ for an electron in an atom.
   a) Both A and R are true and R is the correct explanation of A.
   b)Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

16.Assertion(A): One mole of SO_2 contains double the number of molecules present in one mole of O_2.
   Reason(R): Molecular weight of SO_2 is double to that of O_2. **[1]**
   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

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SectionB

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17.Glycine is an α-amino acid.It exists in the form of Zwitter ion as$NH_3^+CH_2COO^-$.   **[2]**
   Write the formula of its
     i. Conjugate acid
     ii. Conjugate base

18.Explain why cation are smaller and anions larger in radii than their parent atoms?   **[2]**

19.Round up the following up to three significant figures: **[2]**

   i.34.216   ii.10.4107   iii. 0.0459   iv.2808

20.Rotation around carbon-carbon single bond of ethane is not completely free.Justify the Statement.
[2]   OR

Despite their-I effect,halogens are o-and p-directing in haloarenes.Explain.

21.Calculate the energy of each of the photons which   **[2]**

   i. correspond to light of frequency3×10^{15}Hz

   ii. have wavelength of $0.50 Å^0$

Section C

22.Arrange the following in order of increasing: **[3]**

   i. dipole moment H_2O,H_2S,BF_3

   ii. covalent character LiCI,LiBr,LiI

   iii. covalent character NaCl,$MgCl_2$,$AICl_3$

23.Answer: [3]

   (i) Give the mathematical expression of heat capacity.   **[1]**

   (ii)Water can be lifted into the water tank at the top of the house with the help of a pump.Then   why
is it not considered to be spontaneous?**[1]**

   (iii) Define surroundings.   **[1]**

24. At 60 ^{O}C , di nitrogen tetroxide is fifty percent dissociated. Calculate the standard free energy
change at this temperature and at one atmosphere.   **[3]**

25.Calculate the oxidation state of   **[3]**

   i.Mn in $KMnO_4$ and   ii. N in NO_3^-

26. Correct the following electronic configuration of the elements in the ground state. **[3]**

   i. $1s^2,2s^1,2p_z^2,2p_y^2,2p_z^2,3s^2,2p_x^1$

   ii. $1s^2,2s^1,2p_z^1,2p_y^1,2p_z^2,3s^2,2p_x^1$

   iii $1s^2,2s^1,2p^6,3s^2,3p^6,3d^5$

   iv. $1s^2,2s^2, 2p^6,3s^2, 3p^6,3d^4,4s^2$

27. Write the general outer electronic configuration of s,p,d and f-block elements?   **[3]**

28. A sugar syrup of weight 214.2 g contains 34.2 g of sugar ($C_{12}H_{22}O_{11}$).Calculate **[3]**

   i. molal concentration,and

   ii. mole fraction of sugar in the syrup

Section-D

29.Read the text carefully and answer the questions: **[4]**

Once an organic compound is extracted from a natural source or synthesised in the laboratory,it
is essential to purify it.Various methods used for the purification of organic compounds are
based on the nature of the compound and the impurity present in it. Finally,the purity of a
compound is ascertained by determining its melting or boiling point. This is one of the most
commonly used techniques for the purification of solid organic compounds.In crystallisation
Impurities,which impart colour to the solution are removed by adsorbing over activated
charcoal.In distillation Liquid shaving different boiling points vaporise at different
temperatures.The vapours are cooled and the liquids so formed are collected separately. Steam
Distillation is applied to separate substances which are steam volatile and are immiscible with
water. Distillation under reduced pressure: This method is used to purify liquids having very
high boiling points.

   (i)   Which method can be used to separate two compounds with different solubilities in a solvent?

OR

       Why chloro form and aniline are easily separated by the technique of distillation?

   (ii)   Distillation method is used to separate which type of substance?

   (iii)   Which technique is used to separate aniline from aniline water mixture?

30.Read the text carefully and answer the questions:

When anions and cations approach each other,the valence shell of anions are pulled towards the cation nucleus and thus,the shape of the anion is deformed.The phenomenon of deformation of anion by a cation is known as polarization and the ability of the cation to polarize

The anion is called as polarizing power of cation. Due to polarization, sharing of electrons occurs between two ions to some extent and the bond shows some covalent character. The magnitude of polarization depends upon a number of factors.

(i) Out of $AlCl_3$ and AlI_3 which halides show maximum polarization?

(ii) Out of $AlCl_3$ and $CaCl_2$ which one is more covalent in nature?

(iii) The non-aqueous solvent like ether is added to the mixture of LiCl ,NaCl and KCl.Which will be extracted into the ether?   **OR**

Out of CaF_2 and CaI_2 which one has a minimum melting point?

SectionE

31. Attempt any five of the following: **[5]**

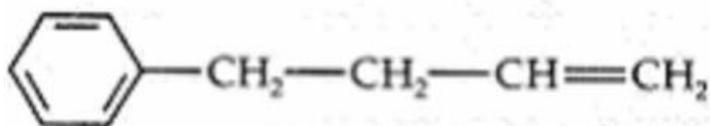(i) Write the IUPAC name given below:
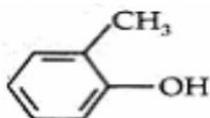
[1]

(ii)Why does the iodination of benzene is carried out in the presence of nitric acid or iodic acid? **[1]**

(iii) Although benzene is highly unsaturated it does not undergo addition reactions.**[1]**

(iv)Why is benzene extraordinarily stable though it contains three double bonds?   **[1]**
(v)Write an IUPAC name:

(vi)Why do alkynes not show geometrical isomerism?**[1]**
(vii) How will you distinguish between acetylene and ethylene? **[1]**

32. What is the pH of 0.001 M aniline solution? The ionisation constant of aniline is 4.27×10^{-10}. Calculate the degree of ionisation of aniline in the solution .Also calculate the ionisation constant of the conjugate acid of aniline.   **[5]**

OR

The ionization constant of benzoic acid is $6.46\times10^{-5}$and $K_{sp}$for silver benzoate is 2.5×10^{-13}. How many times is silver benzoate more soluble in a buffer of pH 3.19 compared to its solubility in pure water?

33.Answer: [5]

(i) Which of the two : $O_2NCH_2CH_2O^-$or $CH_3CH_2O^-$ is expected to be more stable and why? **[2.5]**

(ii) Show the polarization of carbon-magnesium bond in the following structure :

   CH_3—CH_2—CH_2—CH_2—Mg—X.   **[2.5]**

OR

(i) Write the structural formula of **[2.5]**
   (a) o-ethylanisole,
   (b) p-nitroaniline,

(c)2,3-dibromo-1-phenylpentane,

(d) 4-ethyl-1-fluoro-2-nitrobenzene

(ii) Give condensed and bond line structural formulas and identify the functional groups present ,if any, for: **[2.5]**

a. 2,2,4-Trimethylpentane

b. 2-Hydroxy-1,2,3-propanetricarboxylicacid

c. Hexanedial?