

Question Paper 2007 Delhi Set-3

Class-12 Chemistry

General Instructions

1. All questions are compulsory.
2. Marks for each question are indicated against it.
3. Question numbers 1 to 5 are very short-answer questions, carrying 1 mark each. Answer these in one word or about one sentence each.
4. Question numbers 6 to 12 are short-answer questions, carrying 2 marks each. Answer these in about 30 words each.
5. Question numbers 13 to 24 are short-answer questions of 3 marks each. Answer these in about 40 words each.
6. Question numbers 25 to 27 are long-answer questions of 5 marks each. Answer these in about 70 words each.
7. Use Log Tables, if necessary Use of calculators is not permitted.

1. What is the coordination number in a rock salt type structure? **[1]**
2. State Raoult's law for a binary solution containing volatile components. **[1]**
3. What is meant by order of a reaction being zero? **[1]**
4. Write the IUPAC name of the following compound: **[1]**
$$(CH_3)_3CCH_2COOH$$
5. Mention one commercial use of N,N-Dimethylaniline (DMA). **[1]**
6. State as a mathematical formula the de Broglie relationship for moving particles. What experimental evidence is available for this concept? **[2]**

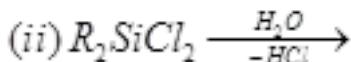
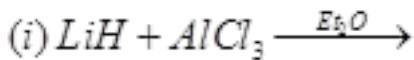
OR

Specify the ranges of values for quantum numbers m_l and m_s for an electron in an atom when the n quantum number value for it is 2. What is the significance of these values for the

orbitals? [2]

7. When can an endothermic process be spontaneous? Give an example of such a process. [2]

8. Write balanced chemical equations for the following reactions: [2]



9. Explain any one of the following statements: [2]

(i) The transition metals are well known for the formation of interstitial compounds.

(ii) The largest number of oxidation states are exhibited by manganese in the first series of transition elements.

10. Draw the three-dimensional representations of (R)- and (S)- butan-2-ol. [2]

11. Write chemical reaction equations to illustrate the following reactions: [2]

(i) Williamson synthesis of ethers

(ii) Reimer-Tiemann reaction

12. Distinguish between addition polymers and condensation polymers and give one example of each class. [2]

13. Answer the following in the light of MO theory: [3]

(a) Which has a higher bond order, C_2 or C_2^{2-} ?

(b) Which species is not likely to exist, Li_2 or Be_2 ?

OR

(a) Compare the structural shapes of the following species:

SF_6 and SF_4

(b) What type of intermolecular forces exist between Cl_2 and CBr_4 present in a mutual solution? [3]

14. (a) Name an element with which silicon can be doped to give an n-type semiconductor.

(b) Which type of crystals exhibits piezoelectricity? [3]

15. The vapour pressure of water is $12.3 \text{ kPa at } 300 \text{ K}$. Calculate the vapour pressure of a one molal solution of a non-volatile non-ionic solute in water. [3]

16. Using the values of $\Delta_f H^\circ$ and $\Delta_f S^\circ$, given herein, calculate the standard molar Gibbs energy of formation, $(\Delta_f G^\circ)$ for $CS_2(l)$. Given: $S_m^\circ(CS_2, l) = 151.34 \text{ J K}^{-1} \text{ mol}^{-1}$, $S_m^\circ(C, \text{graphite}) = 5.74 \text{ J K}^{-1} \text{ mol}^{-1}$, $S_m^\circ(S, \text{rhom bic}) = 31.8 \text{ J K}^{-1} \text{ mol}^{-1}$ and $\Delta_f H^\circ(CS_2, l) = 89.70 \text{ kJ mol}^{-1}$. [3]

17. The rates of most reactions double when their temperature is raised from 298 K to 308 K. Calculate activation energy of such a reaction. [3]

$(R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}, \log 2 = 0.3010)$

18. State what is observed when

(i) the electrodes connected to a battery are dipped into a sol.

(ii) an electrolyte solution is added to a sol.

(iii) an emulsion is subjected to high speed centrifugation. [3]

19. Answer the following questions: [3]

(i) Which element in the first series of transition elements does not exhibit variable oxidation states and why?

(ii) What happens when a solution of copper (II) sulphate is saturated with ammonia?

(iii) Why do actinoids, in general, exhibit a greater range of oxidation states than the lanthanoids?

20. (a) Illustrate the following with an example each:

- (i) Linkage isomerism
- (ii) Coordination isomerism

(b) Why is $[NiCl_4]^{2-}$ paramagnetic? ($Ni = 28$) [3]

21. Write the nuclear reactions for the following radioactive changes: [3]

- (i) $^{210}_{84}Po$ undergoes α -decay
- (ii) $^{234}_{93}Pa$ undergoes β -decay
- (iii) $^{133}_{56}Ba$ undergoes K -decay

(You can put 'X' for the symbol which is not correctly known)

22. Explain the mechanism of nucleophilic addition to a carbonyl group and give one example of such addition reactions. [3]

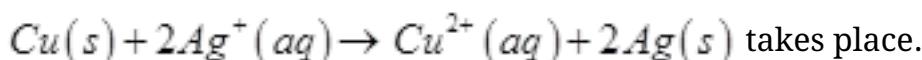
23. Write the chemical equations for the following chemical reactions: [3]

- (a) 1-Nitropropene is prepared from acetaldehyde
- (b) Benzonitrile is converted to acetophenone
- (c) A primary amine is prepared from a primary alkyl halide

24. Mention one important use of each of the following: [3]

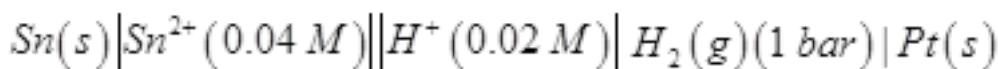
- (i) Equanil
- (ii) Sucralose
- (iii) Carbon fibres

25. (a) Write the formulation for the galvanic cell in which the reaction,



Identify the cathode and the anode reactions in it.

(b) Write Nernst equation and calculate the emf of the following cell:

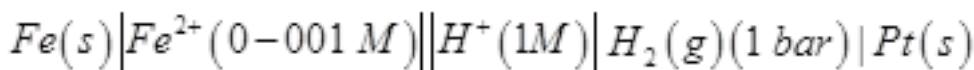


(Given $E^\circ_{Sn^{2+}/Sn} = -0.14\text{ V}$) [2, 3]

OR

(a) Explain with one example each the terms weak and strong electrolytes.

(b) Write the Nernst equation and calculate the emf of the following cell:



(Given $E^\circ_{Fe^{2+}/Fe} = -0.44\text{ V}$) [2, 3]

26. (a) How would you account for any two of the following:

(i) PbO_2 is a stronger oxidising agent than SnO_2 .

(ii) H_3PO_2 acts as a monobasic acid.

(iii) The pK_a value for $HOCl$ is higher than that of $HOClO$.

(b) Draw the structures of the following species:

(i) Peroxodisulphuric acid, $H_2S_2O_8$.

(ii) Xenon tetrafluoride, XeF_4 . [2, 3]

OR

(a) Assign reasons for any two of the following observations:

(i) The lower oxidation state becomes more stable with increasing atomic number in Group 13.

(ii) Hydrogen iodide is a stronger acid than hydrogen fluoride in aqueous solution.

(iii) The basic character among the hydrides of Group 15 elements decreases with increasing atomic numbers.

(b) Draw the structural formula for $XeOF_4$. [2, 3]

27. (a) Name the three major classes of carbohydrates and give the distinctive characteristic of each class.

(b) What are nucleotides? Name two classes of nitrogen containing bases found amongst nucleotides. [3, 2]

OR

(a) Describe the classification of lipids based on their chemical compositions. Mention the chief chemical characteristic of each class.

(b) Explain the term 'mutarotation'. [3, 2]