Question Paper 2006
Compartment Outside Delhi Set-1

Class-12 Chemistry

Time Allowed: 3 Hours, Maximum Marks: 70

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.**

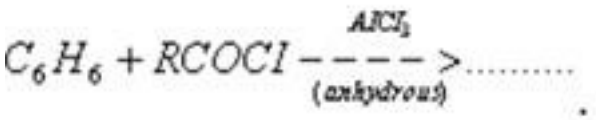
1. State Raoult's law for solutions of nonvolatile solutes. [1]

2. What makes the crystal of KCI appear sometimes violet? [1]

3. Define activation energy of a reaction. [1]

4. Give the IUPAC name of the following compound: [1]

5. Complete the reaction equation [1]



6. On what basis can you say that in an atom an s-orbital is spherical and the p-orbitals

are dumbbell shaped? [2]

7. Prove that in a process heat change at constant pressure is a measure of the change in enthalpy. [2]

8. What happens when

i. Tin dissolves in a hot alkali solution?

ii. XeO_3 reacts with an aqueous alkali solution?

Write the complete chemical equation in each case. [2]

Or

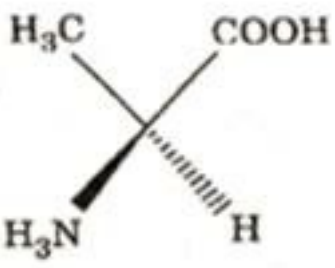
Write balanced chemical equations for the following processes

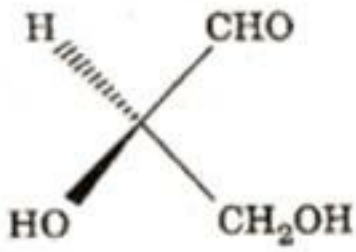
i. SiO_2 is treated with an excess of KOH .

ii. Bi_2O_3 is treated with $conc.\ HNO_3$.

9. How is the variability in oxidation states of the transition elements different from that of the non-transition elements? Illustrate with examples. [2]

10. Convert the following wedge-and-dash formula to Fischer projection formula. [2]





11. How are the following conversions carried out [2]

i. Propene to porpan-2-ol

ii. Phenol to salicylaldehyde

12. Differentiate between a homopolymer and a copolymer. Give one example of each.

[2]

13. Compare the relative stability of the following species and indicate their magnetic (diamagnetic or paramagnetic) characters O_2^+, O_2 and O_2^{2-} Is only bond order a quantitative measure of the bond strength in a species? [3]

Or

Draw the molecular orbital diagrams for the species N_2^+ and N_2^-. Comment on the magnetic property and bond strength of each.

14. What is a semiconductor? Describe two main types of semiconductors, giving examples and their distinctive features. [3]

15. A 0.2 per cent aqueous solution of a non-volatile solute exerts a vapour pressure of $1.004\ bar$ at $1000\ C$. What is the molar mass of the solute? (Given: Vapour pressure of pure water at $100°C$ is $1.013\ bar$ and molar mass of water is $18\ g\ mol^{-1}$) [3]

16. Calculate $\Delta_r G°$ and the equilibrium constant for the following reaction at 298 K and 1 atmosphere pressure:

$$CO(g)+3H_2(g) \leftrightarrow CH_4(g)+H_2O(l)$$

(Given that at $298\ K$ $\Delta_r H°$ for the reaction is $-250.3\ kJ\ mol^{-1}$ and $\Delta_f S°$ for the reaction is $-333.3\ JK^{-1}$ and $R = 8.314\ J\ K^{-1}\ mol^{-1}$ [3]

17. At $300°\ C$ the thermal dissociation of HI is 20%. What will be the equilibrium concentrations of H_2 and I_2 in the system $H_2 + I_2 \leftrightarrow 2HI$ at this temperature if the equilibrium concentration of HI is found to be $0.96\ mol\ L^{-1}$? [3]

18. State what you will observe when

i. an electrolyte is added to a colloidal solution,

ii. an electric current is passed through a colloidal solution,

iii. a beam of light is passed across pure water and then across a colloidal solution of

sulphur when you are not in the path of light. [3]

19. How would you account for the following observations: [3]

i. The enthalpies of atomisation of the transition metals are high.

ii. Of the lanthanoids only Cerium (Z = 58) is known to exhibit quite stable + 4 state in solutions.

iii. Sodium thiosulphate solution is used in the 'fixing' step of photography.

20. Draw the structures of the following: [3]

i. Cis-dichlorotetracyanochromate (III)

ii. Pentaamminenitrito-N-cobalt (III)

iii. Hexamethyldialuminium

21. Write the product nucleides for the following radiaction decays: [3]

i. $^{238}_{92}U$ undergoes α - decay

ii. $^{239}_{93}Np$ undergoes $\beta^- -$ decay

iii. $^{133}_{56}Np$ undergoes $\beta^+ -$ emission

(Note: You can put 'X' for the symbol if it is not known to you).

22. How would you bring about the following conversions: [3]

i. Propanal to butanone

ii. Benzaldehyde to benzophenone

iii. Benzoyl chloride to benzonitrile

Give the complete chemical equation and reaction conditions in each case.

23. a. Explain the following observations:

i. Primary amines are higher boiling than comparable tertiary amines.

ii. Aromatic amines are less basic than aliphatic amines.

b. Mention two important uses of N, N-Dimethyl aniline(DMA). [3]

24. Describe the following with examples: [3]

i. Tranquilizers

ii. Preservatives

iii. Biliquid propellants

25. a. State the products of electrolysis obtained on the cathode and the anode in the following cases.

i. A dilute solution of H_2SO_4 with platinum electrodes

ii. An aqueous solution of $AgNO_3$ with silver electrodes

b. Write the cell formulation and calculate the standard cell potential of the galvanic cell in which the following reaction takes place:

$$Fe^{2+}(aq) + Ag^{+}(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$$

Calculate $\Delta_f G^\circ$ for the above reaction.

[Given: $E^\circ_{Ag^+/Ag} = +0.80\ V$ and $E^\circ_{Fe^{3+}/Fe^{2+}} = +0.77V; F = 96500 C mol^{-1}$] [2, 3]

Or

a. What are fuel cells? Write the electrode reactions of a fuel cell which uses the reaction of hydrogen with oxygen.

b. Write the cell formulation and calculate the standard cell potential of the galvanic cell which uses the following reaction in its operation:

$$2Cr(s) + 3Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd(s)$$

Calculate $\Delta_r G^\circ$ for the above reaction.

[Given: $E^\circ_{Cr^{3+}/Cr} = -0.74\ V$ and $E^\circ_{Cd^{2+}/Cd} = -0.40V;\ F = 96500\ C\ mol^{-1}$]

26. a. How would you account for the following:

i. Tin (II) is a stronger reducing agent than lead (II).

ii. Enthalpy of dissociation for F_2 is much less than that for Cl_2.

iii. Sulphur in vapour state exhibits paramagnetism.

b. Draw the structures of the following molecules:

i. H_3PO_2

ii. $XeOF_4$ [3, 2]

Or

a. Explain the following observations:

i. Anhydrous aluminium chloride has a lower melting point than aluminium fluoride

ii. Bismuth oxide is not acidic in any of its reactions

iii. HF is weaker acid than HI in aqueous solutions

b. Draw the structures of the following molecules

i. XeF_4

ii. SF_4

27. a. Enumerate the structural differences between DNA and RNA. Write down the structure of a nucleoside which is present only in RNA.

b. What are reducing sugars? Give an example each of a reducing sugar and a non-reducing sugar. [3, 2]

Or

a. Name the three classes of lipids and give one example of each class.

b. Explain the term mutarotation giving an example.