

CBSE Class 12 Chemistry 2004 - Set 56/1 (Foreign)



Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains 27 questions. All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Questions 1 to 5 are very short-answer questions carrying 1 mark each. Answer in one word or about one sentence each.
- (iv) Questions 6 to 12 are short-answer questions carrying 2 marks each. Answer in about 30 words each.
- (v) Questions 13 to 24 are short-answer questions carrying 3 marks each. Answer in about 40 words each.
- (vi) Questions 25 to 27 are long-answer questions carrying 5 marks each. Answer in about 70 words each.
- (vii) Use log tables, if necessary. Use of calculators is not permitted.

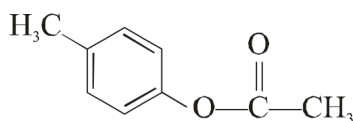
Questions

1. What is coordination number of a metal atom in ccp structure?

2. State Raoult's law for a solution of volatile liquids.

3. Write the Arrhenius equation which relates the rate constant with temperature.

4. Write the IUPAC name of the following:



5. Arrange the following in the order of their increasing basic character in solution:

NH_3 , EtNH_2 , Et_2NH , Et_3N .

6. Describe mathematically the formation of molecular orbitals in homonuclear diatomic hydrogen molecule by LCAO method.

OR

6. Compare the relative stability of the following species and indicate their magnetic (diamagnetic or paramagnetic) behaviour:

B_2 and O_2^{2-}

7. Describe a Leclanche cell with special reference to (i) the electrodes used and (ii) the reactions occurring at the electrodes in the cell.

8. Write the chemical equation for the reactions which occur when:

(i) R_2SiCl_2 is subjected to hydrolysis.

(ii) Sodium iodate, NaIO_3 is reduced with sodium hydrogen sulphite.

OR

8. Write the chemical equation for the reactions which occur when:

(i) XeF_4 is subjected to hydrolysis.

(ii) SO_2 reacts with hydrogen sulphide (H_2S).

9. The outer electronic configurations of two transition metals are (i) $3d^5 4s^2$ and (ii) $3d^6 4s^2$ respectively. Based on this information predict the relative stability of +2 and +3 oxidation states of these metals. Which one of the two exhibits larger number of oxidation states?

10. Explain the terms (i) asymmetric molecule and (ii) R and S notations.

11. Describe the mechanism by which the hydroxyl group attached to an aromatic ring is more acidic than the hydroxyl group attached to an alkyl group. How does the presence of a nitro group in phenol affect its acidic character?

12. Distinguish between homopolymers and copolymers and give one example for each.

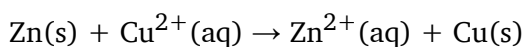
13. What do you understand by (i) Radial probability density, R^2 and (ii) Radial probability function, $4\pi r^2 R^2$? Draw the curves obtained by plotting radial probability function versus r of the electron from the nucleus for 1s and 2s orbitals for hydrogen atom.

14. Calculate the density of silver which is known to crystallise in face-centred cubic form. The distance between the nearest metal atoms is 287 pm.

(Molar mass of Ag = $107.87 \text{ g mol}^{-1}$, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

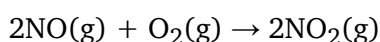
15. Two elements A and B form compounds having molecular formulae AB_2 and AB_4 . When dissolved in 20 g of benzene, 1 g of AB_2 lowers the freezing point by 2.3 K, whereas 1.0 g of AB_4 lowers it by 1.3 K. The molar depression constant for benzene is $5.1 \text{ K kg mol}^{-1}$. Calculate the atomic masses of A and B.

16. Calculate the equilibrium constant for the reaction:



Given: $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.763 \text{ V}$ and $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$.

17. Define order of a reaction. The following reaction occurs in one step:



How will the rate of the above reaction change if the volume of the reaction vessel is diminished to one-third of its original volume? Calculate the extent to which the change will occur.

18. Explain the following terms:

- (i) Peptisation
- (ii) Electrophoresis
- (iii) Hardy-Schulze rule

OR

18. Explain the following terms:

- (i) Tyndall effect
- (ii) Shape-selective catalysis
- (iii) Coagulation

19. (a) Write the complete chemical equations for the reactions when (i) alkaline KMnO_4 reacts with KI and when (ii) mercury (II) chloride reacts with aqueous ammonia.

(b) Which property of the transition metals makes them good catalysts?

20. (a) Draw a figure to show the splitting of degenerate d orbitals in octahedral field.

(b) Write the IUPAC name and draw the structure of coordination entities of $[\text{PtCl}(\text{NH}_3)_5]\text{Cl}_3$.

21. Complete the following nuclear reactions:

(i) $^{133}_{56}\text{Ba}$ undergoes K-capture

(ii) $^{238}_{92}\text{U}$ undergoes α -decay

(iii) $^{234}_{91}\text{Pa}$ undergoes β -decay

(Note: Use symbol 'X' where name of the element is not known in the nuclear reaction)

22. Write one chemical equation each to exemplify the following reactions:

- (i) Aldol condensation
- (ii) Cannizzaro's reaction
- (iii) Hell-Volhard-Zelinsky reaction

23. Write the chemical equation and the condition for preparing each of the following:

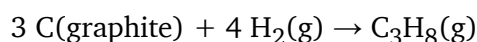
- (i) Ethyl amine from ethyl bromide
- (ii) Sulphanilic acid from aniline
- (iii) Phenol from aniline

24. Describe the following with examples:

- (i) Antifertility drugs
- (ii) Antioxidants
- (iii) Biliquid propellant

25. (a) Taking a suitable example show that ΔS_{total} is a criterion for spontaneity of a change.

(b) Calculate the standard Gibbs energy change for the formation of propane at 298 K.



$\Delta_f H^\circ$ for propane is $-103.85 \text{ kJ mol}^{-1}$ and S°_m $\text{C}_3\text{H}_8(\text{g}) = 270.2 \text{ J K}^{-1} \text{ mol}^{-1}$, $S^\circ_m \text{ C(graphite)} = 5.70 \text{ J K}^{-1} \text{ mol}^{-1}$ and $S^\circ_m \text{ H}_2(\text{g}) = 130.68 \text{ J K}^{-1} \text{ mol}^{-1}$.

26. (a) Assign reasons for each of the following:

- (i) Sulphur in vapour state exhibits some paramagnetic behaviour.
- (ii) Anhydrous aluminium chloride acts as a catalyst in many organic reactions.
- (iii) The bond energy of F–F bond is less than that of Cl–Cl bond.

(b) Draw the structures of the following species:

- (i) $\text{PCl}_5 (\text{s})$
- (ii) XeF_4

27. (a) What is mutarotation? Explain occurrence of mutarotation in D-glucose.

(b) How are lipids classified? Give one example of each class.

OR

27. How does DNA replicate? Describe the mechanism of replication. How is the process responsible for preservation of heredity?

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