

CBSE-2003 CLASS XII CHEMISTRY

General Instructions:

1. All questions are compulsory.
2. Marks for each question are indicated against it.
3. Question numbers **1 to 10** are very short-answer questions each of **1 mark**. Answer them in about one sentence each.
4. Question numbers **11 to 26** are short-answer questions of **2 marks** each. Answer them in not more than 30 words each.
5. Question numbers **27 to 32** are short-answer questions of **3 marks** each. Answer them in not more than 40 words each.
6. Question numbers **33 and 34** are long-answer questions of **5 marks** each. Answer them in not more than 70 words each.
7. Use Log Tables, If necessary.

Q. 1. What is the state of hybridization of carbon in CO_3^{2-} ion? **1**

Q. 2. How are the orbitals P_x , P_y and P_z oriented in space? **1**

Q. 3. Name one solid in which both Frenkel and Schottky defects occur **1**

Q. 4. How is it that the boiling points of the following solutions in water are different:

- (a) 0.1 M NaCl solution
- (b) 0.1 M sugar solution.

Q. 5. In the equation $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \leftrightarrow 2\text{NH}_3(\text{g})$, what would be the sign of work done? **1**

Q. 6. Why are the alkali metals not obtained by the chemical reduction methods? **1**

Q. 7. An aqueous solution of ferric chloride is acidic. Give reason. **1**

Q. 8. In what way is a sol different from a gel? **1**

Q. 9. Why is bithional added to the soiled soap? **1**

Q. 10. Give an example of a narcotic which is used as an analgesic. **1**

Q. 11. Calculate the number of photons having a wavelength of 500 nm which would provide 1.2 J of energy. **2**

$$\{h = 6.63 \times 10^{-34} \text{ Js}, c = 3.0 \times 10^8 \text{ ms}^{-1}\}$$

Q. 12. The density of chromium metal is 7.2 g cm^{-3} . If the unit cell has edge length of 289 pm, determine the type of unit cell.

Atomic mass of chromium is 52 amu; $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ 2

Q. 13. Calculate the osmotic pressure of a solution obtained by mixing 100 cm^3 of 0.25 M solution of urea and 100 cm^3 of 0.1 M solution of one-sugar at 293 K.

$R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$)

Q. 14. 1.0 g of a non-volatile solute was dissolved in 100 g of acetone (mol. mass = 58 g) at 298 K. The vapour pressure of solution was found to be 192.5 mm of Hg. Calculate the molar mass of solute. (The vapour pressure of pure acetone at 298 K is 195 mm Hg] 2

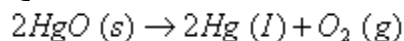
Q. 15. Define the term 'entropy'. Predict the sign of entropy change in each of the following: 2

(a) H_2 (at 298 K, 1 atm) \rightarrow H_2 (at 298 K, 10 atm)

(b) H_2O (at 298 K, 1 atm) \rightarrow H_2O (at 330 K, 1 atm)

(c) $2 \text{ NH}_4\text{NO}_3 (\text{s}) \rightarrow 2 \text{ N}_2 (\text{g}) + 4 \text{ H}_2\text{O} (\text{g}) + \text{O}_2 (\text{g})$

Q. 16. Calculate the standard free energy change ΔG^0 for the reaction



$\Delta H^0 = 91 \text{ KJ mol}^{-1}$ at 298 K, $S^0_{(\text{HgO})} = 72.0 \text{ JK}^{-1} \text{ mol}^{-1}$,

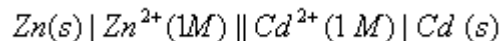
$S^0_{(\text{Hg})} = 77.4 \text{ JK}^{-1} \text{ mol}^{-1}$ and $S^0_{(\text{O}_2)} = 205 \text{ JK}^{-1} \text{ mol}^{-1}$ at 298 K.

Q. 17. Explain why electrolysis of aqueous solution of NaCl gives H_2 at cathode and Cl_2 at anode. Write overall reaction.

Given $E^0_{\text{Na}^+/\text{Na}} = -2.71 \text{ V}$; $E^0_{\text{Cl}_2/\text{Cl}^-} = 1.36 \text{ V}$

and $\frac{1}{2} \text{O}_2 (\text{g}) + 2\text{H}^+ (\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2\text{O} (\text{l})$; $E^0 = 1.23 \text{ V}$].

Q. 18. Calculate the cell emf and ΔG for the cell reaction at 25°C for the cell 2



E^0 values at 25°C :

$E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$ and $E^0_{\text{Cd}^{2+}/\text{Cd}} = -0.403 \text{ V}$;

$F = 96,500 \text{ C}$, $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$.

Q. 19. Explain the term photosensitization giving an example. 2

Q. 20. The reaction $\text{SO}_2\text{Cl}_2 \rightarrow \text{SO}_2 + \text{Cl}_2$ is a first order reaction with $k = 2.2 \times 10^{-5} \text{ s}^{-1}$ at 575 K. What percentage of SO_2Cl_2 will get decomposed in 80 minutes, when the reaction is carried out at 575 K? 2

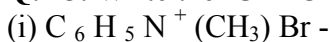
Q. 21. Give chemical tests to distinguish between the following pairs of compounds: **2**

- (a) Chloroform and Carbon tetrachloride
- (b) Phenol and Benzoic acid

Q. 22. Account for the following:

- (a) Ethers possess a dipole moment even if the alkyl groups in the molecule are identical.
- (b) Sodium bisulphate is used for the purification of aldehydes and ketones.

Q. 23. Write the IUPAC names of the following compounds:



Q. 24. In terms of their mode of formation how is chain growth polymerization different from step growth polymerization? Give one example of each. **2**

Q. 25. Write two differences between lyophilic sols and lyophobic sols. Give one example of each.

Q. 26. What are antibodies? How do they fight a bacterium? **3**

Q. 27. Explain the following with suitable examples:

- (a) Kharasch effect
- (b) Sandmeyer's reaction
- (c) Kolbe-Schmidt reaction

Q. 28. How are the following obtained: **3**

- (a) 2-phenyl-2-butanol from acetophenone
- (b) Lactic acid from acetylene
- (c) Diethyl ether from ethene

Write reactions and conditions involved.

Q. 29. What happens when: (Write reactions only) **3**

- (a) Nitroethane is treated with $LiAlH_4$.
- (b) Diazonium chloride reacts with phenol in basic medium.
- (c) Methyl cyanide is treated with methyl magnesium bromide followed by hydrolysis.

Q. 30. Describe briefly the following: **3**

- (a) Preparation of ferrocene (chemical equation only)
- (b) Structure of Zeise's salt
- (c) Isomerism shown by $Cr(H_2O)_5(NCS)]^{2+}$.

Q. 31. (a) Why do thermonuclear reactions require very high temperature?

(b) One of the hazards of nuclear explosion is the generation of Sr-90 and its subsequent incorporation in bones. This nuclide has a half-life period of 28.1 years. Suppose one

microgram was absorbed by a newborn baby, how much Sr-90 will remain in his bones after 20 years? **3**

Q. 32. Write four characteristic features of enzymes Name a disease which is caused by the deficiency of a particular enzyme. **3**

Q. 33. Account for the following: **5**

- (a) Sn (II) is a reducing agent but Pb (II) is not.
- (b) PH_3 is a weaker base than NH_3 .
- (c) SF_6 exists but SH_6 does not
- (d) Sulphur exhibits tendency for catenation but oxygen does not
- (e) The electron affinity of fluorine is less than that of chlorine.

Q. 34. (a) Explain the cause and consequences of lanthanide contraction.

(b) Give balanced chemical equations for the following reactions:

- (i) Between acidified potassium dichromate and potassium iodide.
- (ii) Between potassium permanganate and oxalic acid In the presence of dilute sulphuric acid
- (iii) Chromite ore is fused with NaOH in air.