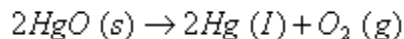


- Q. 1.** What is the state of hybridization of carbon in  $CO_3^{2-}$  ion? **1**
- Q. 2.** How are the orbitals  $P_x$ ,  $P_y$  and  $P_z$  oriented in space? **1**
- Q. 3.** Name one solid in which both Frenkel and 'Schottky' defects occur **1**
- Q. 4.** How is it that the boiling points of the following solutions in water are different:  
 (a) 0.1 M NaCl solution  
 (b) 0.1 M sugar solution.
- Q. 5.** In the equation  $N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$ , 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 toiled 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  $7.2 \text{ g cm}^{-3}$ . 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  $100 \text{ cm}^3$  of 0.25 M solution of urea and  $100 \text{ cm}^3$  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)  $2 NH_4NO_3(s) \rightarrow 2 N_2(g) + 4 H_2O(g) + O_2(g)$

**Q. 16.** Calculate the standard free energy change  $\Delta G^0$  for the reaction



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

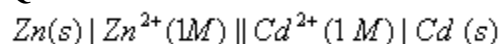
$$S^0(Hg) = 77.4 \text{ JK}^{-1} \text{ mol}^{-1} \text{ and } S^0_{(O_2)} = 205 \text{ JK}^{-1} \text{ mol}^{-1} \text{ at } 298 \text{ K}.$$

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

$$\text{Given } E^0_{Mg^{2+}/Mg} = -2.71 \text{ V}, E^0_{Cl_2/Cl^-} = 1.36 \text{ V}$$

$$\text{and } \frac{1}{2}O_2(g) + 2H^+(aq) + 2e^- \rightarrow H_2O(l); E^0 = 1.23 \text{ V}].$$

**Q. 18.** Calculate the cell emf and  $\Delta G$  for the cell reaction at  $25^0C$  for the cell **2**



$E^0$  values at  $25^0 C$  :

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

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

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

**Q. 20.** The reaction  $SO_2Cl_2 \rightarrow SO_2 + Cl_2$  is a first order reaction with  $k = 2.2 \times 10^{-5} \text{ s}^{-1}$  at 575 K. What percentage of  $SO_2$  will get decomposed in 80 minutes, when the reaction is carried out at 575 K? **2**

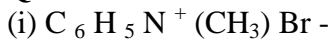
**Q. 21.** Give chemical tests to distinguish between the following pairs of compounds: **2**

- (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  $\text{LiAlH}_4$ .
- (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  $\text{Cr}(\text{H}_2\text{O})_5(\text{NCS})]^{2+}$ .

**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)  $\text{PH}_3$  is a weaker base than  $\text{NH}_3$ .
- (c)  $\text{SF}_6$  exists but  $\text{SH}_6$  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.