

Q. 1. What is the utility of piezoelectric crystals? **1**

Q. 2. Two liquids X and Y boil at 110°C and 130°C respectively. Which one of them has higher vapour pressure at 50°C ? **1**

Q. 3. Define activation energy of a reaction. **1**

Q. 4. How is ethanoic acid industrially obtained from ethanal? **1**

Q. 5. How is methyl nitrile obtained from ethanoyl chloride? **1**

Q. 6. On the basis of Heisenberg's uncertainty principle, show that electron can not exist within the atomic nucleus.

(Nuclear radius = 10^{-15} m , $h = 6.626 \times 10^{-34}\text{ Js}$.) **2**

Q. 7. The concept of coupling reactions is useful in making the occurrence of a non-spontaneous reaction possible. Explain giving one suitable example. **2**

Q. 8. How would you explain the sharp, increase in the molar conductivity of a weak electrolyte on dilution? How is the molar conductivity related to the degree of dissociation of a sparingly soluble salt? **2**

Q. 9. (a) What prompted Bartlett to the discovery of noble gas compounds? **2**

(b) State two important uses of noble gases.

Q. 10. Does the presence of two chiral carbon atoms always make the molecule optically active? Explain giving an example. **2**

Q. 11. Explain the following giving suitable examples: **2**

(a) Kolbe's reaction

(b) Williamson synthesis

Q. 12. How are the following prepared?

(a) Dacron (b) Bakelite

Q. 13. (a) Explain why the uncertainty principle is significant only for the motion of subatomic particles and is negligible for the macroscopic objects.

(b) In what way does the bonding molecular orbital in a molecule of hydrogen differ from its antibonding molecular orbital? **3**

Q. 14. (a) Iron (II) oxide has a cubic structure and each unit cell has side $5 \times 10^{-8}\text{ m}$. If the density of the oxide is 4 gm cm^{-3} , calculate the number of Fe^{2+} and O^{2-} ions present in each unit cell. (Molar mass of $\text{FeO} = 72\text{ g mol}^{-1}$, $N_A = 6.02 \times 10^{23}\text{ mol}^{-1}$)

(b) In a crystal of zinc sulphide, zinc occupies tetrahedral voids. & What is the coordination number of zinc? **3**

Q. 15. 45 g of ethylene glycol $C_2H_6O_2$ is mixed with 600 g of water. Calculate:

- (a) freezing point depression
- (b) freezing point of the solution **3**

Q. 16. How does the Gibb's energy change when a spontaneous reaction occurs? Show with the help of a diagram how Gibb's energy changes during the course of a reaction. **3**

Q. 17. Silver is electro deposited on a metallic vessel of surface area 800 cm^2 by passing current of 0.2 amp for 3 hours Calculate the thickness of silver deposited (Density of silver = 10.47 g cm^{-3} , Atomic mass of silver = 107.92 amu) **3**

Q. 18. (a) A first order reaction is 15% completed in 20 minutes. How long will it take to complete 60%?

(b) What is the significance of rate constant in a rate law? **3**

Q. 19. (a) What are the two types of emulsions and how do they differ from one another? Give one example of each.

(b) Which one of the following electrolytes is most effective for the coagulation of $Fe(OH)_3$ sol and why?

Or

(a) Which will be absorbed more readily on the surface of charcoal and why?

NH_3 or CO_2 .

(b) In what way are multimolecular colloids different from macromolecular colloids?

Give one example for each.

(c) State the principle of electro dialysis. **3**

Q. 20. (a) A co-ordination compound has the formula $CoCl_3 \cdot 4NH_3$. It does not liberate NH_3 but forms a precipitate of $AgCl$ on treatment with $AgNO_3$ solution Write the structure and IUPAC name of the complex.

(b) Name two properties of the central metal ion which enable it to form stable complex entities.

(c) The formation of complex compounds finds application in the extraction of some metals. Furnish one example to support the above statement. **3**

Q. 21. (a) How can the course of a reaction be known by using radioisotopes?

(b) Describe the principle of Breeder reactor.

(c) Complete the following nuclear reactions:

- (i) ${}_{42}^{96}\text{Mo}(\dots, n) {}_{43}^{97}\text{Tc}$
 (ii) $\dots(a, 2n) {}_{85}^{211}\text{At}$ **3**

Q. 22. (a) Give chemical tests to distinguish between the following pairs of compound:

- (i) Phenol and Benzoic acid
 (ii) Benzaldehyde and Acetophenone
 (iii) Give IUPAC name of $\text{CH}_3\text{CONH.C}_6\text{H}_5$. **3**

Q. 23. Give reasons for the following observations: **3**

- (a) It is difficult to prepare pure amines by ammonolysis of alkyl halides.
 (b) Nitrobenzene does not undergo Friedel Craft's alkylation.
 (c) Electrophilic substitution in case of aromatic amines takes place more readily than in benzene.

Q. 24. Define the following and give one example of each: **3**

- (i) Antihistamines
 (ii) Disinfectants
 (iii) Antacids

Q. 25. Give reasons for the following facts:

- (a) Anhydrous AlCl_3 acts as a catalyst.
 (c) PbCl_4 is less stable than SnCl_4
 (d) Bond dissociation energy of F_2 is less than that of Cl_2 .
 (e) H_3PO_4 is a diprotic acid. **5**

Or

- (a) Name the chief ore of aluminium and describe the principle of extraction of aluminium metal from its ore.
 (b) How is it that aluminium though an electropositive metal, finds extensive use as a structural material? **4, 1**

Q. 26. Give reasons:

- (a) Cr^{2+} is a strong reducing agent whereas Mn^{2+} is not. (Cr = 24, Mn = 25)
 (b) The transition metal ions such as Cu^+ , Ag^+ and Sc^{3+} are colourless.
 (c) The enthalpies of atomizations of transition metals of 3d series do not follow a regular trend throughout the series.
 (d) The radius of Fe^{2+} ($Z = 26$) is less than that of Mn^{2+} ($Z = 25$).
 (e) Chemistry of the actinoids is much more complicated than that of the lanthanoids. **5**

Q. 27. (a) Write down the structures and names of the products formed when D- glucose is treated with

(i) Acetic anhydride

(ii) HI

(iii) Conc. HNO_3

(b) What is photosynthesis? Write its importance in the biological world. **3, 2**