## BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025
### 2018, 2019, 2020, 2021 ADMISSIONS SUPPLEMENTARY
### SEMESTER VI - CORE COURSE (CHEMISTRY )
### CH6B12B18 - Physical Chemistry – IV

**Time : 3 Hours**                                        **Maximum Marks : 60**

### Part A

**I. Answer any Ten questions. Each question carries 1 mark**                    **(10x1=10)**

1. Define ionic strength.

2. Define the term azeotrope.

3. Define upper consolute temperature.

4. Write cell reaction of following cell $Cd/Cd^{2+}// Cu^{2+}/Cu$.

5. Outline a reversible cell. Give example.

6. Identify a method to eliminate LJP.

7. Define fluorescence. Give example for a fluorescent material.

8. Identify the role of photosensitizer.

9. Delayed fluorescence is also called ----------------------.

10. List different proper axis of symmetry present in a square planar molecule.

11. Identify principle axis of symmetry in $SF_6$.

12. Define symmetry operation.

### Part B

**II. Answer any Six questions. Each question carries 5 marks**                    **(6x5=30)**

13. Define the term Cryoscopic constant. The latent heat of fusion of Benzene is 126.6J/g. 0.0401 g of a non-volatile solute when dissolved in 6.515g of Benzene depressed the freezing point of Benzene by 0.49K. Calculate the molar mass of the solute. Freezing point of pure Benzene is 278.4 K.

14. An aqueous solution of silver nitrate containing 1.25 g of the salt per 100 g of the solution was electrolysed between platinum electrodes. After passing a current for two hours, 20 g of the anodic solution contained 0.160 g of silver nitrate. The mass of copper deposited in the copper voltameter placed in series was found to be 0.0388 g. Calculate the transport numbers of silver and nitrate ions in silver nitrate. Equivalent masses of silver nitrate and copper are 170 and 31.77 respectively.

15. With the aid of suitable phase diagram explain binary partially miscible liquid systems with upper critical solution temperature.

16. Discuss fractional distillation of binary liquid solutions.

17. Discuss electrochemical series and its importance. Calculate the standard free energy change of the following cell reaction
    $$2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2, \text{ If } E^0 \text{ cell is 0.236 V at 298 K.}$$

18. Explain the term liquid junction potential. Calculate the EMF at 298K of the following cell: $Mg/Mg^{2+}(0.1M)// Ag^+(0.0001M)/Ag$, Given $E^0_{Mg^{2+}/Mg}$ = -2.37V and $E^0_{Ag^+/Ag}$ =0.80V.

19. Explain Chemiluminescence with suitable examples.

20. Discuss systematic procedure for the determination of point group of water molecule.

21. Discuss different symmetry elements with its operation.

## Part C

**III. Answer any Two questions. Each question carries 10 marks** (2x10=20)

22. Explain and thermodynamically deduce Raoult's law of relative lowering of vapour pressure.

23. a) Write a note on mean ionic activity and mean ionic activity coefficient of strong electrolytes and how they varies with concentration.

    b) Calculate the osmotic pressure of a solution obtained by mixing equal volumes of a 3.4% aqueous solution of urea (molar mass = 60 gmol$^{-1}$) and 1.6 % aqueous solution of sucrose (molar mass = 342 gmol$^{-1}$) at 298 K. R= 0.08205 L atm K$^{-1}$mol$^{-1}$.

24. a) Describe the use of Glass electrode in determining the pH of an unknown solution.

    (b) Calculate the free energy change of the following cell at 25$^0$C.

    Sn/Sn$^{2+}$ (0.6 M)//Pb$^{2+}$ (0.3 M)/Pb. Standard EMF of the cell is 0.014 V.

25. a) Derive Nernst equation for the potential of a metal- metal ion electrode. b) In the pH determination experiment, the EMF of a cell consisting of quinhydrone electrode and saturated calomel electrode was found to be 0.26 V at 298 K. Calculate the pH of the experimental solution.