

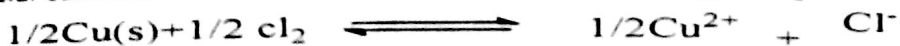
**CHEMISTRY**

F.M:70

Duration: 3 hours

Answer any **SIX** questions including Q.No.1 which is compulsory  
Figures in the right-hand margin indicate marks

1.a. Calculate the standard emf and standard free energy change for the reaction.



$$E^\circ_{\text{Cl}_2/\text{Cl}} = 1.36\text{V}; E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}, F = 96500\text{C}$$

- b. What are oxidation and reduction potentials? What is their use in predicting the feasibility of the reaction?
- c. Zn gives H<sub>2</sub> gas when it reacts with H<sub>2</sub>SO<sub>4</sub> but Ag does not. Explain
- d. If the half life of a first order reaction in A is 15min. How long it will take for [A] to reach 10% of initial Con.
- e. Determine the number of phases, components and degrees of freedom in the system i.e, water and vapour in equilibrium.
- f. What is normalization of steel. How is it done and what is its significance.
- g. Calculate the wavelength of a body of m = 10gr.  $\mu = 10^5$  cm/sec.  $h = 6.626 \times 10^{-27}$
- h. Why ultraviolet spectrum in benzene vapour contains many sharp bands, whereas the same spectrum of benzene solution in alcohol contains broad peak.
- i. In microwave spectroscopy, rotation about the bond axis of a linear molecule cannot be responsible for any absorption peaks. Explain.
- j. A steel screw in a brass marine hardware corrodes. Give reason.

2.a. Write down the Schrodinger wave equation for the wave mechanical model of an atom. Name the three (5M)  
quantum numbers of an electron, which are yielded by this equation.

b. What is de Broglie concept. Derive the equation for wave length of an electron. (5M)

3.a. What is microwave spectroscopy. What is the difference between infrared and microwave spectroscopy. (2M)

b. How many fundamental modes of vibration would you predict for (i) benzene (ii) methane (iii) CO<sub>2</sub> (3M)

c. How uv visible spectroscopy used in quantitative analysis of metals. Explain with suitable examples. (5M)

4.a. What is Galvanic corrosion. Explain with a suitable example. (5M)

b. What is electrode potential. How is it measured. (5M)

5.a. With the help of a neat phase diagram explain, how phase rule is applicable to lead silver system. (6M)

b. Differentiate between true equilibrium and metastable equilibrium. (2M)

c. State the significance of eutectic point. (2M)

6.a. Glass electrode is preferred to quinhydrone electrode in measuring p<sup>H</sup> of a solution. Give reason. (2M)

b. What are fuel cells. What are the advantages of fuel cells. (3M)

c. Explain the emf method for the determination of P<sup>H</sup> of a solution. (5M)

7.a. Give an account on steady state approximation. (4M)

b. How is standard free energy change related to the equilibrium constant. (3M)

c. Give the statement of 2<sup>nd</sup> law of thermodynamics in terms of entropy. (3M)

8.a. What are organometallic compounds. Give their applications in organic transformations. (5M)

b. What are nano materials? Give the applications of nano materials in the field of medicine. (5M)