Subject: - Engineering Chemistry (SH 403)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.
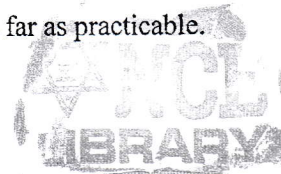
1. What is single electrode potential? Write down the cell notation for standard hydrogen electrode. How will you predict the spontaneity of any redox system using emf? The value of E^o for the $Zn(s) + Cu^{2+} (aq) \rightarrow Cu (s) + Zn^{2+} (aq)$ is 1.10 V. What is the value of E_{cell} when the concentration of Cu^{2+} is 1.0 M and the concentration of Zn^{2+} is 0.025 M? [1+1+1+2]

2. What happens when a small amount of acid or base is added on a buffer solution of acetic acid and sodium acetate? Determine the amount of sodium acetate required in 100 ml 0.2M acetic acid solution to prepare a buffer solution of pH 5.8 pK_a for acetic acid = 4.74 [2+3]

3. Differentiate between negative catalysis and catalytic poisoning. How a catalyst work and what is the role of promoter? [2+2+1]

4. What are the primary and secondary air pollutants? Describe with examples. What is acid rain and how does it occur? [2+1+2]

5. What is water pollution? What are the major pollutants that should be monitored in order to explain the drinking water quality? [1+4]

6. a) How do you differentiate a double salt from a complex? Explain with examples. [2]

   b) Write the IUPAC name and calculate the effective atomic number of following complexes. [3]

   (i) $[Co(NH_3)_3Cl_3]$ (ii) $K_3[Fe(C_2O_4)_3]$ (iii) $[Al(OH)(H_2O)_5]^{2+}$

7. What are low and high spin complexes? How does valance bond theory explain the geometry and magnetic behavior of a complex? Explain with reference to $[Fe(CN)_6]^{3-}$ [1+2+2]

8. Give the reasons for:

   a) Cu^+ compounds are diamagnetic where as Cu^{++} compounds are paramagnetic.

   b) Ti^{+++} compounds are colored where as Ti^{++++} compounds are colorless. [2.5+2.5]

9. What are transition elements? Why are they called so? Why do transition elements form complex. [1+1+3]

10. Define the following terms: [1×5]

    a) Primary explosives   b) Secondary explosives   c) Tertiary explosives
    d) Low explosives   e) High explosives

11. Explain the chemical separation of racemic mixture. Write the structure cis and trans isomers of cyclo-octene. [2+3]

12. Write all the possible stereoisomers of tartaric acid. 'The meso form of tartaric acid cannot rotate plan polarized light.' Explain. [3+2]

13. Define the following terms: [1×5]

   a) Solid lubricant   b) Enamel   c) Varnish   d) Semi solid lubricants
   e) Emulsion paints

14. What are biodegradable polymers? Describe the preparation and uses of polystyrene. [1+2+2]

15. Describe the preparation and uses of polyphosphazine. 'The SN^1 reaction gives both retention and inversion product but SN^2 reaction fevers inversion product.' Explain. [2+3]

16. What do you mean by elimination reaction? Explain the reaction mechanism of E1 reaction. [2+3]

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