TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE, BCH	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Chemistry (*SH 403*)

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- ✓ 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. Explain the principle involved in the construction of galvanic cell. Draw the cell diagram and calculate the emf of following cell at 25°C. (Given: $E°Al^{3+}/Al$ = -1.66 V and $E°Cu^{2+}/Cu$ = 0.34V)
   Al (s) / Al^{3+} (0.75 M) || Cu^{2+} (0.50 M) / Cu (s) [2+3]
2. Give an example of a buffer solution with a pH less than 7 and show how it resists the PH change on addition of small amount of acid or base?
   100 ml of 0.2 M acetic acid solution is mixed with 300 ml of 0.3 M sodium acetate solution. Calculate the pH of resulting mixture. (pKa = 4.74) [2.5+2.5]
3. What is meant by homogenous catalysis? Explain the adsorption theory of catalysis with suitable example. [1+4]
4. What does a primary pollutant mean? What are the harmful effects of CO on human being? What is the difference between good ozone and bad ozone? [1+2+2]
5. a) Define the terms BOD and COD.
   b) Define soil pollution. What are the causes of soil pollution? [2+1+2]
6. What are the general characteristics of inorganic polymer? Write the preparation and uses of chalcogenide glasses. Also mention two uses of silicones. [2+2+1]
7. Define the term biodegradable polymer with suitable example. Write down the preparation and application of Teflon and polyurethane. [1+2+2]
8. Why does d-block element is called transitional element? Describe the 3d series elements on the basis of color formation and variable oxidation state. [1+2+2]
9. Explain the variation of ionization potential across the 3d series of elements. Why are copper (II) complexes paramagnetic but copper (I) complexes diamagnetic? [2+3]
10. Write the postulates of Werner's coordination theory. Show the Werner's representation of $Co(NH_3)_4$. CI_2 and Co $(NH_3)_5$. Cl. Write the IUPAC name of following complexes:
    (i) Na_4 [Fe $(CN)_6$] (ii) [$Ag(CN)_2]^-$ [2+2+1]
11. Explain on the basis of valence bond theory-$[Co\ (NH_3)_6]^{3+}$ is diamagnetic but $[Cu\ (NH_3)_6]^{2+}$ is paramagnetic. [2.5+2.5]
12. What are plastic explosives? Write the preparation and uses of trinitrotoluene (TNT) and Gun cotton. [1+2+2]
13. a) What are the requisites of a good paint? Write the uses of emulsion.
    b) What is the purpose of lubrication? Mention the conditions at which the solid lubricants are used. [2.5+2.5]
14. a) Explain the condition required for optional activity of a molecule. Explain the stereoisomeric forms of 3-bromo-2-butanol.
    b) Write the cis and trans isomers of butene dioic acid. [1+2+2]
15. Explain the reaction mechanism for the hydrolysis of tertiary alkyl halide by aqueous NaOH. How the nature of solvent governs S_N1 and S_N2 reaction? [3+2]
16. What is elimination reaction? Discuss the mechanism of E2 reaction. Write your acquaintance with Sayrzeff's rule. [1+2+2]

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