03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

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

Subject: - Engineering Chemistry *(SH403)*

- ✓ 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. Define a galvanic cell. What are functions of salt bridge in a galvanic cell? Predict the feasibility of the following reactions,
   i) $Zn + Ag^{+} \rightarrow Zn^{++} + Ag$
   ii) $Zn^{++} + Ag \rightarrow Zn + Ag^{+}$

   Given, $E^{0}_{Zn^{++}/Zn} = -0.76V$, $E^{0}_{Ag^{+}/Ag} = 0.80V$ [1+1+3]

2. What is a buffer solution? Discuss the mechanism of buffer action with suitable examples. [1+4]

3. What is meant by catalysis? Point out its importance. Discuss intermediate compound formation theory of catalysis. [1+1+3]

4. a) Point out the sources of radioactive substances responsible for environmental pollution. Give their adverse effects and protective measures. [2.5]
   b) Briefly discuss any two sources of organic and inorganic substances responsible for water pollution. Point out their possible remedies. [2.5]

5. a) How do exhausts of internal combustion engine pollute air? Give the possible remedies. [3]
   b) What is the photochemistry behind ozone layer depletion? [2]

6. a) What are Chalcogenide glasses? Give their uses. [2.5]
   b) Give the preparation and applications of silicone rubbers. [2.5]

7. a) Give the preparation and applications of polystyrene and polyurethanes. [4]
   b) What are the advantages of conducting polymers? [1]

8. Why do transition elements form complexes? List the industrial application of 3d transition elements in engineering. [3+2]

9. Explain the following features of transition elements with reference to 3d transition series; [2.5+2.5]
   a) Variable oxidation state
   b) Formation of colored compounds

10. Differentiate between complex salts and double salts. How does Werner's theory explain the bonding in complex salts? [1+4]

11. a) Write the IUPAC name of following; [2]

i) $K_2[HgI_4]$

ii) $K_4[Fe(CN)_6]$

iii) $[Co(NH_3)_5Cl]^{2-}$

iv) $Li[AlH_4]$

b) How does valence bond theory explain the formation of $[Ni(NH_3)_6]^{2+}$? Predict its magnetic behaviour. [3]

12. What are primary explosives, low explosives and plastic explosives? Give the preparation and applications 2,4,6-Trinitrotoluene (TNT). [3+2]

13. a) Show your familiarity with liquid, semi solid and solid lubricants giving examples. [3]

b) Discuss any two types of paints showing their applications in engineering works. [2]

14. a) What are geometrical isomers? Give an example. [2]

b) Show your familiarity with diastereomerism. [2]

c) Draw the structure of 2-Chlorobutane specifying *R* and *S* configuration. [1]

15. Discuss the unimolecular nucleophilic substitution reaction mechanism in alkyl halide showing the stereochemistry. [5]

16. What is meant by elimination reaction? Discuss E1 and E2 reaction mechanism. [1+4]

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