03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 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. What is SHE? Calculate the emf of electrode couple of $E^{\circ}_{Sn/Sn^{+2}} = -1.4V$ and $E^{\circ}_{Fe^{+2}/Fe^{+3}} = -0.77V$. Where the concentration of Sn^{+2}, Fe^{+2} and Fe^{+3} are 0.2M 0.1M and 1 M respectively. [2+3]
2. Explain the mechanism of buffer action with a suitable example. Calculate the weight in gram of NH_4Cl required to prepare buffer solution having pH = 9.35 in 200 cc of 0.2N ammonia solution. (pkb = 4.74) [3+2]
3. What is heterogeneous catalysis? How does a catalyst alter the rate of reaction? Give a brief account on the intermediate compound formation theory of catalysis. [1+1+3]
4. a) What is ozone depletion? Write the chemical reactions involved in the stratospheric ozone depletion by nitric oxide? [1+2+2]
   b) How does carbon dioxide cause atmospheric pollution?
5. What are the major water pollutants and their harmful effect? Mention the possible measures to control water pollution. [2+3]
6. a) Write the engineering applications of Silicone and give the structure of cyclic and cross linked silicons. [3+2]
   b) Write the preparation of polyphosphazine and its uses.
7. What are biodegradable polymers? Write down the preparation and uses of Nylon 6.6 and Teflon. [1+4]
8. a) Why do transition metals form complex compound? [3+2]
   b) Explain why the 3d transition series having completely filled d-orbital cannot form coloured compounds.
9. What are transition elements? Why does the presence of unpaired electrons make a substance paramagnetic in nature? Explain it with magnetic moment measurement. [1+4]
10. Name the following complexes by IUPAC system: [2+3]
    i) $[Cr(H_2O)_4(NH_3)_2]Br_3$
    ii) $[CuCl_2(CH_3NH_2)_2]$
    iii) $Ni[PtCl_6]$
    iv) $[Cr(NH_3)_6]^{3+}$

    State and explain EAN rule as applied to metal complexes.
11. Differentiate between inner and outer orbital complexes. Magnetic measurement on $K_3[Fe(CN)_6]$ indicates the presence of one unpaired electron, predict on the basis of VBT whether the given complex is inner or outer complex. [2+3]

12. Define explosives. Why are the primary explosives called "detonators"? Write the reaction of toluene forming an explosive. Mention the important uses of GTN and plastic explosives.[1+1+1+2]

13. a) What are solid lubricants? Mention the types and function of lubricants with examples.[1+2+2]

    b) Explain the method of application of paint in galvanized iron.

14. a) What isomerism is shown by tartaric acid and why? [2+3]

    b) Define enantiomers with examples. Differentiate between racemic mixture and mesocompound.

15. Explain the reaction mechanism for the hydrolysis of tertiary alkyl halide by aqueous NaOH. What solvent favours the reaction mechanism? [4+1]

16. What is Saytzeff's rule? Describe the mechanism for the reaction of 3°alkyl halide in alcoholic alkali. [2+3]

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