TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

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

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 normal hydrogen electrode? Calculate the emf of given combination at 20°C; [2+3]
   (i) $Fe^{++}(1M) = Fe^{+++}(0.2M) + e$, $E^0 = -0.77V$
   (ii) $Sn^{++}(0.3M) + 2e = Sn$, $E^0 = -0.14V$
2. Could you prepare the acidific buffer of pH =1? Why and how? Calculate the pH of mixture obtained by mixing 50cc of 0.5N NH_4OH and 100cc of 0.2M NH_4Cl solutions. ($Kb = 1.8\times10^{-5}$) [2+3]
3. What are the characteristics of Catalysts? Explain their activity on the basis of adsorption theory of catalysis. [2+3]
4. a) Why are the oxides of sulphur called air Pollutants? [2]
   b) Mention the sources and consequences of greenhouse effect. [3]
5. What are the effect of soil pollution in agriculture and living beings? How is soil pollution controlled? [3+2]
6. How do you prepare polythiazyl? Mention the applications of polyphosphazines and chalcogenide glasses in engineering field. [2+3]
7. Discuss about the conducting polymers. Write the preparation and uses of Teflon and epoxy resin. [1+4]
8. Why are d-block elements called transition elements? Explain the origin of colour in transition metals on the basis of d-d transition. [1+4]
9. Explain the followings: [2×2.5]
   a) Presence of the unpaired electrons makes substance paramagnetic.
   b) Variable oxidation states are the main characteristic of transition elements.
10. a) Differentiate between double salt and complex salt with examples. [3]
    b) Write the IUPAC names of the followings: [2]
    (i) $Na_4[Fe(CN)_6]$ (ii) $[Zn(OH)_4]^{2-}$ (iii)$[Co(NH_3)_4Cl_2]Cl$ (iv)$[Co(en)_2Cl_2]^+$
11. Using VBT approach, explain the formulation of $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ and differentiate between these two. [4+1]
12. a) What is geometrical isomerism? Why is trans-isomer more stable than cis-isomer? [2]
    b) How do enantiomers differ from diastereomers? Illustrate with an example. [3]
13. a) Explain the mechanism for reaction between tertiary butyl bromide with aqueous KOH. [3]
    b) How does SN_2 reaction differ from SN_1 reaction? [2]
14. What is Saytzeff's rule? Explain it with an example. Explain the reaction mechanism for the dehydrohalogenation of tertiary alkyl halide. [2+3]
15. Give an account of low and high explosives. Write the preparation and uses of TNT. [3+2]
16. a) Show your acquaintance with liquid, semisolid and solid lubricant with examples. [3]
    b) Discuss two types of paints showing their applications in engineering works. [2]

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