TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / I	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? Why is salt bridge used in the construction of galvanic cell?
   Calculate the emf of the following cell at 20°C, Cr/Cr^{+++} (0.5M) // $Fe \mid Fe^{++}$ (0.2M). Given $E°_{Cr/Cr^{+++}} = 0.75V$ and $E°_{Fe^{++}/Fe} = -0.44V$. [1+1+3]
2. Differentiate between acidic and basic buffers. 100 ml of 0.5 M NH_4OH is mixed with 400 ml of 0.1 M NH_4Cl. what will be the pH of this solution. When 20 ml of 0.5 M HCL is added to it? K_b for $NH_3 = 1.8 \times 10^{-5}$ [2+3]
3. Define catalytic promoter and catalytic poison. Explain the adsorption theory of catalysis with a suitable example. [2+3]
4. Write down the major water pollutants and their harmful effects on mankind. Mention their possible remedies. [5]
5. Mention the major gases for causing green house effect and how are these gases released in the atmosphere? Mention the possible measures to control the global warming. [3+2]
6. Write down the preparation of polymeric sulphur nitride. Mention the engineering applications of polymeric sulphur nitride and chalcogenide glass. [2+3]
7. What are biodegradable and non biodegradable polymers? Mention the applications of Bakelite and epoxy resin. [2+3]
8. What are transition elements? Explain the colour of transition elements on the basis of d to d transition. [1+4]
9. What are d block elements? Why does the number of unpaired electron make the compound paramagnetic? Calculate the magnetic moment if the metal ion contains five unpaired electrons. [1+3+1]
10. a) What is primary valency? Describe simple test to distinguish between the following pairs of complexes on the basis of Werner's theory, (i) $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$.
    b) Name the following complexes by IUPAC system
    (i) $[Cr(H_2O)_4(NH_3)_2]Cl_3$ (ii) $[Pt(NH_3)_2Cl_2]$ (iii) $Na_3[Al(C_2O_4)_3]$
    (iv) $[Co(NO_3)_6]^{3-}$ [2.5+2.5]
11. Explain the formation of (i) $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ ions with the help of VBT approach. Explain which one is inner orbital complex and outer orbital complex. [2.5+2.5]
12. What are high and low explosives? Write the important uses of TNT and TNG. [2+3]
13. a) What are lubricants? Mention the function of lubricant.
    b) What is paint? What are the major constituents of paint? Mention the requisites of paints. [2.5+2.5]
14. What is optical isomerism? Show all the possible stereoisomers of tartaric acid indicating enantiomers and meso-forms. [1+4]
15. Explain why SN^1 reaction gives the products with both retention and inversion of configuration but SN^2 gives only inversion of configuration. Write the mechanism of reaction between tertiary alkyl halide and aqueous sodium hydroxide. [2+3]
16. Explain the mechanism of E^1 reaction with a suitable example. Write the differences between E^1 and E^2 reactions mechanism. [3+2]

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