03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2070 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. Derive Henderson equation for buffer solution. What is the pH of resulting mixture obtained by mixing of 100 cc of 0.2 N HCL and 50 cc of 0.5M ammonia solution, K_b for ammonia is 1.8×10^{-4}. [1+4]
2. How can you measure the standard reduction potential of Zn electrode? Hydrogen electrode at 1 atm is connected with Zn electrode in which the emf of the cell is found to be 0.61 V at 25°C. If $[Zn^{++}] = 1.0$ M, calculate H^+ in hydrogen electrode. [2+3]
3. What is heterogeneous catalysis? Giving a suitable example, explain the mechanism of heterogeneous catalysis. Write any two criteria for choosing a catalyst for industrial purpose. [1+3+1]
4. a) What do you mean by CFC? Mention their photolytic reactions in high altitude at stratosphere.

   b) How do the oxides of sulphur and nitrogen make water acidic? [1+2+2]
5. Write major sources of water pollution. How does CO_2 act as pollutant of the atmosphere? Explain. [2+3]
6. Give an account on chalcogenide glasses and polysulphur nitride. [2.5+2.5]
7. Explain about the biodegradable and non-biodegradable polymers with suitable examples. [2.5×2]
8. Explain giving reasons.

   a) Transition metals and their compounds show paramagnetic behavior. [2.5]

   b) Zinc (I I) Compounds are white and diamagnetic while copper (I I) Compounds are colored and paramagnetic. [2.5]
9. Transition elements formed colored compounds. Explain this on the basis of d to d transition. [5]
10. Compare the magnetic behavior of the complex entities $[F_e(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ using valence bond theory. [2.5+2.5]
11. a) Write the IUPAC name of the following co-ordination compounds. [2]

    i) $[C_r(NH_3)_6]^{3+}$

    ii) $[Pt(NH_3)_2Cl_2]$

    iii) $Na_3[C_r(C_2O_4)_3]$

    iv) $[CO(NH_3)_4Cl_2]Cl$

    b) What is EAN? How would you explain the stability and magnetic behavior of a complex compound by EAN rule. [3]

12. a) Write the characteristics of a good paint and explain the method of application of paint in galvanized iron.

b) Mention the types and functions of lubricants with examples. [2+1+2]

13. a) What isomerism is shown by lactic acid? Write its possible isomers. [2]

b) What do you mean by racemic mixture? Explain chemical resolution of a racemic mixture. [1+2]

14. a) Describe SN^1 reaction mechanism in haloalkane shown stereochemistry.

b) Why does nucleophile attack the substrate molecule from backside in SN^2 reaction mechanism? [4+1]

15. Discuss E^1 reaction with reference to the dehydrohalogenation of alkyl halide. How does E^1 differs from E^2 reaction. [3+2]

16. What are plastic explosives? Write down the characteristics of explosives. Give the preparation and uses of explosive obtained from toluene. [1+2+2]

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