03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
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 <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. What is buffer solution? Calculate the pH of 500 cc of 0.2 M CH_3COOH solution when 2 g of sodium acetate is added. [K_a for CH_3COOH is 1.8×10^{-4}] [1+4]
2. What is Daniell cell? Answer the following question using equation (a) and (b) [1+4]
   (a) Fe^{++} (0.2M) = F^{+++} + e (0.1M), E^0 = -0.77V, (b) Cu (0.3M) - 2e = Cu^{++}, E^0 = -0.34V
   (i) net cell reaction (ii) spontaneity of redox reaction (iii) cell notation (iv) emf of cell
3. What are catalytic promoter and catalytic poison? Explain their activity on the basis of adsorption theory of catalysis. [2+3]
4. a) What are chlorofluorocarbons? Explain their photolytic reactions in the upper atmosphere [3]
   b) Discuss about the air pollution caused by oxide of nonmetals? [2]
5. What are the major water pollutants? Point out their adverse effect and the possible measures to control water pollution. [1+2+2]
6. Write the preparation and uses of Teflon and epoxy resin. What are conducting polymers? Point out their applications in engineering field. [3+1+1]
7. a) Give preparation and uses of the nonmetallic super conductor. [3+2]
   b) Write down the main characteristic of inorganic polymers.
8. Give an account for the followings:
   i) Transition metals are well known to form complexs. [2]
   ii) Copper (I) compounds are white and diamegnetic where as copper (II) compounds are colored and paramagnetic. [2]
   iii) Zinc is nontypical transtion metal. [1]
9. a) Explain the variable oxidation states of transition elements. Which divalent metal has maximum paramagnetic character among the first transition metals? [2.5+1+1.5]
   b) A transition metal forms alloys with other transition metals easily. Why? Explain.
10. Explain how the two complexes of Ni, $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]^{\circ}$ have different structures but do not differ in their magnetic behavior (Ni = 28). [5]
11. a) Write the IUPAC name of the following compounds/ions [2+1+2]
    I) $[Co(NH_3)_5NO_2]Cl_2$
    II) $[Fe(C_2O_4)_3]^{3-}$
    III) $[Cr(en)_2Cl_2]^{+}$
    IV) $NH_4[Cr(H_2O)_2(NCS)_4]$
    b) What is complex compound? What do you understand by principal and auxiliary valency of the central ion in complex compound? Illustrate them in $[Co(NH_3)_6]Cl_3$.

12. a) What are lubricating oils? Indicate its application in engineering work. [1+2]

b) Show your familiarity with the types of paint. [2]

13. a) Write the difference between enantiomers and diasterioisomers giving appropriate examples. [3+2]

b) Write Cis, Trans and Z, E notations for the possible isomes of but-2-endioic acid.

14. a) Explain the mechanism involved in the reaction between bromomethane and aqueous NaOH. [3]

b) How do nucleophile and solvent affect this type of reaction? [2]

15. a) Differentiate between E^1 and E^2 reaction. [2+3]

b) Explain the reaction mechanism for the dehydrohalogination of 3°alkyl halide.

16. What are low explosives? Write the preparation and uses of GTN and TNT. [1+4]

***