03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BME	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 meant by normal hydrogen electrode? Calculate the emf of the following cell at 25°C $Mg|Mg^{++}(0.1M)//Ag^{+}(1M)/Ag$. Given $E°Mg^{++}/Mg = -2.37V$, $E°Ag/Ag^{+} = -0.80V$. [2+3]
2. Explain the mechanism of basic buffer. Write the equation for acidic buffer. 0.005gm equivalent of KOH is added to 400ml of 0.1N acetic acid, calculate the pH of the mixture. (Ka for acetic acid = 1.8×10^{-5}). [1.5 + 0.5+3]
3. Define heterogeneous catalysis. Point out some characteristics of catalytic reactions and mention its industrial application. [1+4]
4. a) Define soil pollution. What are its sources? [1+3]
   b) Explain cause and effect of Ozone layer depletion. [4]
   c) Give averse effects of (i) pb (ii) phosphates in water. [2]
5. What are the general characteristics of inorganic polymer? What do you mean by cross linked? What are the engineering uses of chaleagenide polymer? [2+1+2]
6. Write short note on fibre reinforced resin. [5]
7. a) Explain variable oxidation states of transition metals, along with nature of oxides. [4]
   b) Explain the colour of $[Ti(H_2o)_6]^{+3}$ i on. [4]
   c) Transition metal complex ions with $d°$ or d^{10} configuration are colourless. Why? [2]
8. a) Explain the formation of $[Ni(CO)_4]°$ Complex on the basic of VBT. Also predict its geometry and magnetism with reason. [2+1]
   b) Write the formula of the following co-ordination compounds. [0.5×4]
      i) Dichloro-tetra-aqua chromium (III) cation
      ii) Dicyano argentate (I) ion
      iii) Sodium hexa nitrito cobaltate (III)
      iv) Hexa-cyanoferrate (III) ion
9. a) What are primary explosives and plastic explosives? Give the methods of preparation of TNT and uses. [1+1+3]
   b) Explain lubricating oils with types. [3]
   c) What are requisites of a good paint? [3]
10. a) Define: (i) Optical isomers (ii) Racemic mixture (iii) Chirality (iv) Optical activity. [4]
    b) Get differences in between enantiomers and di-stereomers. [3]
    c) How many meso-forms are possible for $CH_2OH\ (CHOH)_3\ CH_2OH$? Write their Fischer projection. [2]
11. a) Define lubricant and lubrication and explain the main purpose of lubricant. [1+1]
    b) What is paint? What are the requisites of a good paint? [1+2]
12. a) Describe the mechanism involved in the reaction between a tertiary alkylhalide and aqueaus caustic potash. [1.5+1.5]
    b) What type of solvent favours the unimolecular nucleophilic substitution reaction mechanism? What is meant by elimination reaction? [1+1]