03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 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. What is an electrochemical series? How does an electrolytic cell differ from a galvanic cell? Calculate the emf of the following cell at 25°C [1+2+2]

   $Zn/Zn^{++}(0.1M)//Cu^{++}(0.05M)/Cu$

   Given, $E^0Zn^{++}/Zn = -0.76V. E^0Cu^{++}/Cu = 0.34V$

2. a) How does an acidic buffer solution containing acetic acid and sodium acetate resist the change in p^H in in spite of the addition of the small amount of acid or base? Explain it. [2]

   b) Calculate the pH of resulting solution when 0.01 mole of NaOH is added to 500ml of 0.1M acetic acetic acid (p^{ka} for acetic is 4.74) [3]

3. What is homogeneous catalyst? How does a catalyst alter the rate of reaction? Explain with example. [1+4]

4. What is water pollution? Write down the major sources of water pollution and mention the possible measure to control. How does the oxides nitrogen make the water acidic? [1+3+1]

5. Write short notes on: [2.5+2.5]

   i) Ozone layer depletion
   ii) Global warming due to air pollution

6. What is conducting polymer? Describe the preparation and uses of polyurethane and Epoxy resin. [1+2+2]

7. a) Write down the structure of cyclic and cross linked silicones and also give the engineering applications of silicones. [1+1]

   b) What are the general characteristic of inorganic polymer? Write the preparation and uses of polymeric sulphur. [1+2]

8. Give reasons: [5]

   a) Transition elements are mostly paramagnetic
   b) Transition elements and their compounds show catalytic behavior
   c) $Fe_2(SO_4)_3$ is more stable then $FeSO_4$
   d) Compound of Ti^{+3} are coloured but those if Ti^{+4} are colourless
   e) Zn in 3d series is called typical transition element

9. Write the expected and actual electronic configuration of Cr in box notation. Why the actual electronic configuration of Cr is different from expected electronic configuration? In the 3-d transition series the size of atom decreases from Sc to Cr but the size remains almost similar from Cr to Zn. Explain. [1+1+1+2]

10. How does valence bond theory explain the geometry and magnetic behavior of a complex? Explain with suitable example. [5]

11. a) Explain the formation of $[FeF_6]^{3-}$ on the basis of VBT and predict its geometry as well as magnetism. [3]

    b) Write IUPAC names of the given examples. [2]

    i) $[Ni(CO)_4]$

    ii) $K_4[Fe(CN)_6]$

    iii) $Na[Ag(CN)_2]$

    iv) $K_2[HgI_4]$

12. What primary explosives, low explosives and high explosives? Write the preparation and uses of nitroglycerine. [3+2]

13. a) What is lubricant? In what situation grease and solid lubricant are used? [1+2]

    b) What are the characteristics of good paints? [2]

14. Explain enantiomers, racemic mixture and meso compounds with examples. Draw the structures and specify Z and E configuration of 4-methyl hept 3-ene and 2-chlori pent 2-ene. [3+2]

15. Describe the bimolecular nuclephilic substitution reaction in haloalkane with suitable example. What type of solvent is favour for this reaction? Write down the differences between S_{N_1} and S_{N_2} reactions? [2+1+2]

16. Explain the reaction mechanism of dehydrohalogenation of tertiary buty1 bromide by alcoholic caustic soda. Mention the factors governing the mechanism of E1 reaction. [3+2]

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