

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.

- What is buffer solution? Derive Henderson's equation for basic buffer. Calculate pH of a mixture of 10 ml of 0.1M ammonium chloride solution and same volume of 0.2 M ammonia solution. (pK<sub>b</sub> for ammonia solution = 4.74). [1+1+3]
- How does a galvanic cell generate electricity? Construct a cell with the following cell reaction, write its notation and calculate standard emf of the cell. [1+1+1+2]  

$$2\text{Al} + 3\text{ZnSO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{Zn}$$

(1M)                      (1M)

Given, standard reduction potential of Al and Zn are -1.66V and 0.76 V respectively.
- What is catalysis? Explain intermediate compound formation theory and an industrial application of catalysis. [1+2.5+1.5]
- What are the parameters of water pollution? Explain its causes and adverse effects. [3+1+1]
- Write the functions of lubricant. Show your acquaintance with fluid film lubrication and its role in engineering. Give an example each of (a) semi solid lubricant and (b) emulsion. [1+2+1+1]
- Write short notes on: (any two) [2.5+2.5]
  - Global warming
  - Formation and depletion of ozone layer
  - Acid rain and its effects
- What is conducting polymer? Give an account of polyphosphazenes and chalcogenide glasses. Also write their applications in engineering field. [1+2+2]
- Explain the following: [2+3]
  - 3d- transition series show variable oxidation states
  - Completely filled 3-d transition series are unable to form coloured compounds
- What is a complex ion? Give example of a (i) complex cation and (ii) complex anion, with their IUPAC name. Also calculate EAN of central metal of these ions. [1+1+1+1+1]
- Show your acquaintance on the basis of hybridisation with inner orbital and outer orbital complexes with example. [2.5+2.5]
- Differentiate between high explosive and low explosives. Write the preparation and applications of TNT. [3+2]
- Write the method of preparation and uses of (a) polystyrene (b) Bakelite [2.5+2.5]
- Distinguish between enantiomers and diastereomers. Show all optical isomers of (a) 3-Bromo 2-butanol and (b) Tartaric acid. Also show optically inactive meso form of tartaric acid. Explain why 3-Bromo 2-butanol doesn't exist in meso form. [1+1.5+1+1+0.5]
- Explain E<sub>2</sub> and E<sub>1</sub> reactions with reference to dehydrohalogenation of haloalkane and point out the factors affecting these mechanism. [1.5+1.5+2]
- Why does haloalkane favour S<sub>N</sub> reaction? Explain why there is only inversion product in S<sub>N</sub>2 and both inversion and retention products in S<sub>N</sub>1 path. [1+2+2]
- What is plastic explosive? Write preparation.