TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME, BCH	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 Daniel cell? Calculate the emf of the following combination. [1+4]

   $Fe^{++}(0.2M) \rightarrow Fe^{+++}(0.1M) + e^-$, $E° = -0.77V$

   $Cu^{++}(0.3M) + 2e^- \rightarrow Cu$, $E° = 0.34V$

2. Derive Henderson equation. To 1 liter of buffer solution containing 0.1M NH_4OH and 0.2M NH_4Cl, if 0.2 g of NaOH is added, what will be the pH of the resulting solution? [pK_b=4.74]. [2+3]

3. a) Define the terms: [2×1]

   (i) Auto Catalyst
   (ii) Catalytic poisons

   b) Describe the absorption theory of catalysis with an example. [3]

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4. What is Particulate Matter (PM)? What are the types and sources of particulate matter causing air pollution? Also mention their adverse effect. [1+2+2]
5. Write the consequence of acid rain. How do oxides of Nitrogen and sulphur make water acidic? [2+3]
6. What do you mean by biodegradable polymers? Give the preparation and uses of epoxy resin and polystyrene. [1+4]
7. What is inorganic polymer? Write the preparation and uses of Polyphosphazine and Polymeric sulphur. [1+4]
8. Why are d-block elements called transition elements? Write the electronic configuration of elements of 3d series. [1.5+3.5]
9. Mention the main reasons of exhibiting variable oxidation states of transition elements. Manganese exhibits the highest oxidation state among the 3d elements, why? Cu^{+2} compounds are coloured and paramagnetic while Zn^{+2} compounds are white and diamagnetic, explain. [2+1+2]
10. Compare the magnetic behaviour of the complex $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ using valence bond theory. [2.5+2.5]
11. a) What do you understand by a chelating ligand? Describe Sidwick theory of co-ordination compounds with an example. [1+2]

    b) Name the following complexes by IUPAC system. [4×0.5]

    (i) $[Co(NH_3)_5SO_4]Br$
    (ii) $[Co(en)_3]Br_3$
    (iii) $K_3[Cr(NO_3)_6]$
    (iv) $[Ni(CN)_4]^{2-}$

12. What is explosive? Write the preparations and uses of trinitrotoluene(TNT) and trinitrocellulose. [1+4]

13. a) Mention the functions of lubricant and discuss about solid lubricant. [2.5]

    b) Write requisites of good paints and mention the important constitutes of paints. [2.5]

14. a) Give the necessary conditions for the molecule to exhibit geometrical isomerism and write an example with Z and E notation. [2.5]

    b) Write the possible optical isomer of 2, 3-dichloropentane and distinguish enantiomers and diastereomers. [2.5]

15. a) Explain the mechanism of the reaction of bromomethane in aqueous potassium hydroxide. [3]

    b) What types of nucleophile and solvent favours SN_2 and SN_1 reaction mechanism? [2]

16. Discuss the mechanism for the reaction of tertiary alkyl halide with alcoholic sodium hydroxide. Write the differences between E_1 and E_2 reactions. [3+2]

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