03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 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. Define Buffer. Write the mechanism of acidic buffer. Calculate the pH of the solution formed by adding 0.2 g of sodium acetate in 200 mL 0.1 M acetic acid. pKa for acetic acid = 4.74. [1+2+2]
2. What is standard hydrogen electrode? How is it used to measure the single electrode potential? Why is salt bridge used in construction of galvanic cell? Calculate the emf of the following cell at 25°C. [1+1+1+2]

   [$E^0_{Ni^{++}/Ni}$ = -0.24V and $E^0_{Pb^{++}/Pb}$ = -0.12V].

   $Ni\,(s)\,/Ni^{2+}(aq)\,(1M)//Pb^{2+}(aq)\,(1M)/Pb(s)$
3. Explain with an example the mechanism of adsorption theory of catalysis. Write the differences between homogenous and heterogenous catalysis. [4+1]
4. Define soil pollution. Write the major sources of soil pollution, their negative effects and control measures. [1+2+2]
5. Write the formation, effects and remedies of SOx and NOx. [2.5+2.5]
6. What are biodegradable polymers? Give the preparation and uses of Nylon 6,6 and polyurethane. [1+2+2]
7. Describe the preparation and uses of polymeric sulphur $(PS)_n$ and polyphosphazines. [2.5+2.5]
8. Give an account for the following: [1+1+3]
   a) Cu^{2+} ($3d^9$) is more stable than Cu^+ ($3d^{10}$). Justify the statement.
   b) Why Zinc is called non-typical transition element?
   c) Explain magnetic properties of transition elements.
9. Explain with reasons:
   a) Transition metals can form most of the complex compounds.
   b) Zinc (II) compounds are white and diamagnetic while copper (II) compounds are colored and paramagnetic. [2.5+2.5]
10. Explain the formation of $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ on the basis of Valence Bond Theory and also predict their magnetic property. [2+2+1]
11. Write the basic assumptions of Werner's theory of co-ordination compounds. $CoCl_3.4NH_3$ gives a precipitate with $AgNO_3$ solution. Explain it on the basis of Werner's theory. [3+2]
12. What are plastic explosives? Write the advantages of plastic explosives. Write the preparation of TNT, TNG and nitrocellulose. [1+1+3]

13. a) What are lubricants? Show your familiarity with application of different types of lubricants.
    b) Explain the method of application of paints in galvanized iron. [1+2+2]

14. a) Explain geometrical isomerism with examples. [1.5]
    b) Write all possible stereoisomers of 2,3-dibromopentane. Identify all possible enantiomers and diastereomers from the stereoisomers. [3.5]

15. What are the differences between E^1 and E^2 reactions? Explain the reaction mechanism for the reaction of primary alkyl halide with alcoholic NaOH. [2+3]

16. Why does SN^1 reaction give both retention and inversion isomers but SN^2 gives only inversion isomer? Write the mechanism for the reaction between bromoethane and aq.NaOH. [2+3]

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