

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Applied Chemistry

Semester : Spring

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the differences between a galvanic cell and electrolytic cell? 8
A galvanic cell consists of two electrode, zinc and lead, zinc electrode is immersed in 0.1 M zinc ion solution and lead electrode in 0.02 M lead ion solution. Calculate the emf of the cell at 298 K. Write the equations of electrode process and represent the cell schematically. Given that $E^\circ_{(Zn^{++}/Zn)} = -0.76$ volt and $E^\circ_{(Pb^{++}/Pb)} = -0.13$ volt

OR

Define electrochemical series. Write the applications of electrochemical series. From the following data, calculate the emf of cell at 25°C.

$$E^\circ_{Ni^{2+}/Ni} = -0.25V$$

$$E^\circ_{Cu^{2+}/Cu} = +0.34V$$

$$[Ni^{++}] = 0.1M,$$

$$[Cu^{2+}] = 0.2M$$

$$R = 8.314 J mol^{-1} K^{-1}$$

$$F = 96500C$$

- b) Explain primary and secondary Cells. Write the construction and working mechanism of lithium-ion battery. 7

2. a) What is air pollution? Write its cause effect and control measure? 7
b) What is hard water? How can you determine alkalinity of water experimentally? 8

OR

What is permanent hardness of water? How can you determine total hardness of water experimentally

3. a) Explain the properties of transition metals with regards to the magnetic properties and variable oxidation states. 7

- they have vacant d-orbitals
- b) Give reasons: 8
- i. Transition metals are good in forming complexes.
 - ii. TiO₂ is colourless. → not present of d-d electronic transition
 - iii. Zn is not considered as true transition element. → completely filled d-orbitals.
 - iv. Transition metals exhibit catalytic properties. → tendency to form complex compounds.
4. a) Define Nucleophilic Substitution reaction. Show the reaction mechanism between (R)-2-Bromobutane with water. 8
- b) Differentiate E₁ and E₂ reactions with mechanism and kinetics. complex compounds.
5. a) Write functions of various constituents of paints. 5
- b) Write Principle and applications of sensors. 5
- c) Write Preparation, properties and uses of TNT. 5
6. a) Write short notes on addition polymer and condensation polymer. 8
- b) How do biodegradable polymers differ from non-biodegradable polymer? Explain with suitable examples. 7
7. Write short notes on: (Any two) 2×5
- a) Chemistry of cement
 - b) Acidic and Basic Buffer
 - c) Stereochemistry

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- b) Differentiate between Zn-Cu and Ni-Cd batteries illustrating with suitable diagram and the involved cell reactions. 7
2. a) Define air pollution. Write cause, effect and preventive measure of air pollution. 8
- b) Define hardness of water. How can you determine free chlorine in the water sample in laboratory? How can you determine permanent hardness of water in lab. 7

OR

Define alkalinity and COD. How do you measure alkalinity and dissolved oxygen in laboratory, explain.

3. a) Write the electronic configuration of first series transition elements. 8
Explain why $ZnSO_4$ and TiO_2 are colorless.
- b) Describe the various characteristics of transition elements. 7
4. a) Differentiate between S_N1 and S_N2 reaction. Give the mechanism and stereochemistry of S_N1 reaction in favors of tertiary butyl bromide in presence of aqueous NaOH solution. 8
- b) Differentiate E_1 and E_2 reactions with mechanism and kinetics. 7
5. a) What are photovoltaic cells? Explain its basic principle and mention some of its major applications. 7
- b) Define cement with its types and chemistry. And describe the setting and hardening mechanism of cement. 8
6. a) What are polymers and polymerization? Differentiate addition polymer from the condensation polymer giving suitable example of each. 8
- b) How do biodegradable polymers differ from non-biodegradable polymer? Explain with suitable examples. 7
7. Write short notes on: (Any two) 2×5
 - a) Acid-Base titration
 - b) Buffer Solution and pH measurement
 - c) Saytzeff's Rule