Term End External Examination 4th Semester (Session- July 2024)

Subject: Environmental Science

Course No and Title: EVSC1422M/Environmental Chemistry

Time: 2.15 hours Max Marks:100 Min. Marks:40

Section A: Objective Type Questions

Q1. Choose the appropriate Answer: (8x1.5=12)

i. Which of the following equations represents Gibbs free energy?

A $\Delta G=\Delta H-T\Delta S$ **B** $\Delta G=\Delta E-P\Delta V$

C $\Delta G=\Delta U-TS$ **D** $\Delta G=P\Delta V-T\Delta S$

ii. Which of the following expressions represents Beer-Lambert's Law?

A $A=\epsilon cl$ **B** $A=k\epsilon c$

C $A=c/\epsilon l$ **D** $A=\epsilon l/c$

iii. Biochemical Oxygen Demand (BOD) is a measure of:

A The total oxygen content in water **B** The oxygen required by microorganisms to decompose organic matter in water

C The chemical oxygen demand of water **D** The amount of dissolved oxygen in water

iv. Which factor primarily affects the solubility of gases in water?

A pH of water **B** Temperature of water

C Salinity of water **D** Turbidity of water

v. The process by which soil is formed from parent material through mechanical and chemical weathering is known as:

A Lithification **B** Metamorphism

C Pedogenesis **D** Diagenesis

vi. Which of the following is a major inorganic component of soil?

A Humus **B** Clay minerals

C Microorganisms **D** Organic acids

vii. Which of the following is a common radical found in the atmosphere that plays a crucial role in the breakdown of pollutants?

A O_2 **B** CO_2

C OH **D** N_2

viii. The primary driver of photochemical smog formation is:

A Sulfur dioxide (SO_2) **B** Ozone (O_3)

C Hydroxyl radicals (OH) **D** Nitrogen dioxide (NO_2)

Section-B: Descriptive Type Questions (Short Type)

Q2: Answer all the Questions (8 x 4 =32)

i. Write short notes on Gibbs free energy

ii. Discuss in brief the types of titrimetry.

iii. Describe the importance of dissolved oxygen (DO) in aquatic systems.

iv. Define the concept of the solubility product. How is it used to predict the precipitation of salts in water?

v. Outline the processes involved in soil formation.

vi. What is the role of organic matter and microorganisms in soil fertility and structure?

vii. How do different types of aerosols affect climate and air quality?

viii. Discuss various reactions in the atmosphere with suitable examples.

Section – C: Descriptive Type Questions (Medium Type)

Answer all the questions: (4 x 7=28)

Q 3. Describe the principles of Spectrophotometry. Discuss its working with a suitable diagram.

OR

How many grams og glucose (C6H12O6) are produced when 24.0 mol of carbon dioxide reacts with excess of water.

Q 4. Discuss the physical and chemical properties of water that make it a unique solvent in environmental systems.

OR

Write a note on carbonate system in aquatic ecosystems. Support your answer with suitable graphs and reactions.

Q 5. Write a note on soil-water interaction.

OR

Outline the environmental fate of fertilizers and pesticides in soil.

Q6. Describe the mechanisms and environmental impacts of photochemical smog formation.

OR

Explain the role of nitrogen oxides (NOx) in thermochemic reactions in the atmosphere.

Section – D: Descriptive Type Questions (Long Type)

Answer any two of the following: (2 x 14=28)

Q 7. Write a detailed note on stoichiometric conversion with suitable examples.

Q8. Discuss the composition of sea water. Elaborate with examples.

Q 9. Explain the processes of rock weathering and their role in soil formation. Provide examples of environmental factors influencing weathering rates.

Q 10. Write a detailed note of environmental fate of air pollution. Support your answers with suitable reactions.