M.Sc. Examination, 2024
Semester-I
Environmental Science
Course: MEC-11 (Fundamentals in Environmental Science)

Time: 3 Hours **Full Marks: 40**

Questions are of value as indicated in the margin

Answer Question **No. 1** and **any four** from the rest.

1. Write short notes on **any four** of the following: $4 \times 2 = 8$

   a) WSSD

   b) Agenda 21

   c) t-test

   d) Qurom sensing

   e) ORP

   f) Hypsometry of earth

2. a) Why do you think life support system is essential for human being? Illustrate your answer.

   b) How does human activities in technosphere affects atmospheric component?

   c) What are the scopes of Environmental Science? $3 + 3 + 2 = 8$

3. a) Is Environmental Studies a multidisciplinary subject? Justify your answer.

   b) Discuss the developments that happened globally after the publication of book, Silent Spring. $3 + 5 = 8$

4. a) How positive and negative control mechanisms regulate the lac operon? Explain with diagram.

   b) What is tryptophan operon? $6 + 2 = 8$

5. a) Briefly describe the roles of different enzymes and proteins involved in the synthesis of the leading and lagging strands.

   b) Write short notes on Rho-dependent termination. $5 + 3 = 8$

6. a) What is chemical speciation? Explain with a suitable example

   b) Rainwater is slightly acidic or alkaline. Illustrate its chemistry

   c) What is redox reaction? Explain with a suitable example $3 + 2 + 3 = 8$

7. Write notes on any two of the following $4 + 4 = 8$

   a) Geological Time Scale

   b) Structure and composition of earth's atmosphere

   c) Mass Extinction

M.Sc. Examination 2024
Sem-I
Environmental Science
Paper- MEC-12
(Climatology and Climate Change)

Time: Three hours **Full Marks: 40**

Questions are of value as indicated in the margin.
Answer **question No.1** and **any four** from the rest.

1. Write short notes on **any four** of the following. $2 \times 4 = 8$
   a) Buoyant Jet
   b) Heat island effects
   c) Solar Constant
   d) Family- D (Vertical) Clouds
   e) Pressure Gradient Force (PGF)
   f) Milankovitch cycles

2. a) Define plume.
   b) Discuss various types of plumes formed in the atmosphere under different meteorological conditions and the role they play in air quality. $1+(4+3) = 8$

3. a) What is global warming?
   b) What are the consequences of global warming on agriculture and health?
   c) What is CDM? Briefly discuss its components.
   $1 + (2 + 2) + (1+2) = 8$

4. a) What is lapse rate?
   b) Discuss different types of stability classes in the atmosphere and the role they play in air pollution meteorology.
   c) What are the roles of wind rose in town planning?
   $1 + (3+2) + 2 = 8$

5 a) Discuss the factors (with examples) that influence the temperature of a particular place on the earth's surface.
   b) Explain the diurnal variation of 'temperature'? $6 +2 = 8$

6. Describe the wind driven and thermohaline circulation patterns in the oceans.
   $4 + 4 = 8$

7. a) Write a note on jet streams.
   b) Write the conditions required for Tropical cyclogenesis.
   $4 + 4 = 8$

M.Sc. Examination, 2024
Semester - I
Environmental Science
Course: MEC-13 (Principles of Soil Science)

Time: 3 Hours **Full Marks: 40**

Questions are of value, as indicated in the margin.

Answer **Question No.1** and **any four** from the rest

1. Write the short notes on **any four** of the following (2×4 = 8)
   a) ZPC
   b) Bulk Density
   c) OC and OM
   d) Soil fabric and soil plasma
   e) Illuviation and elluviation
   f) Rill and sheet erosion

2. a) What is permanent and variable charge in soil? Explain
   b) Discuss the isomorphic substitution with a suitable example
   c) Why clay soil solution is colloidal in nature? 3+ 3+2 = 8

3. Discuss the characteristics of Alfisol, Spodosols, Ultisols and Oxidols. 2+2+2+2= 8

4. a) What is soil organic carbon? Discuss the sources and processes of formation in soil.
   b) How is soil air different from ambient air? Discuss its role in soil nitrogen fixation.

   4 + 4 = 8

5. What is secondary minerals ?. Give a note on the different types of silicate clay minerals and explain the reason for its maximum expansion. (2) (4+2) = 8

6. Comment on soil type of India. Discuss any three types of soils found in West Bengal. 2+ (2+2+2) = 8

7. What is NPK? Discuss its role in plant growth and soil health. 2+(3+3) = 8)

M.Sc. Examination, 2024
Semester-I
Environmental Science
Course: MEC-14
(Techniques in Environmental Science)

Time: 3 Hours **Full Marks: 40**

Questions are of value as indicated in the margin
Answer Question No. 1 and any four from the rest

1. Write down short notes on any four of the following: **4 × 2 = 8**

a) Concentration Units
b) Critical Fluid Extraction
c) Pro-column
d) GF-AAS
e) S/N Ratio
f) Accuracy and precision

2. What are relative and absolute chemical analyses? Discuss the limitations of the titration method. (3 + 3) + 2 = 8

3. a) Why does analysis using AAS fail in sample with high concentration of metals?
b) Explain the principle and procedure of Southern blotting. 3 + (2 + 3) = 8

4. Define chemical speciation. Briefly discuss its importance. Briefly discuss about the protocol of Tessier and BCR. 2 + 2 +(2 + 2) = 8

5. a) What is 2D gel electrophoresis?
b) What are the roles of SDS and beta-mercaptoethanol in gel electrophoresis?
c) How does gas chromatography separate components of a mixture?
d) What is cation exchange chromatography? 2 + 2 + 2 + 2 = 8

6. a) What is chromatography.
b) Discuss the process involved in separating different components using HPLC.
c) What are the advantages of HPLC over GC? 2 + 4 + 2 = 8

7. a) What do you mean by monitoring?
b) Discuss the types of monitoring and the purpose for which they are undertaken.
c) What are the objectives of water quality monitoring? 2 + 4 + 2 = 8

M.Sc. Examination, 2024
Semester - I
Environmental Science
Course: MEC-15 (Water Pollution)

Time: 3 Hours **Full Marks: 40**

Questions are of value, as indicated in the margin.
Answer **Question No.1** and **any four** from the rest

1. Write the short notes on **any four** of the following 2×4 = 8
   a. Residual chlorine
   b. Turbidity
   c. Temporary hardness
   d. Water acidity
   e. Coliforms
   f. Fluorosis

2. a) Discuss the dissolved oxygen profile in sewage-mixed river water.
   b) A 30 ml sewage water mixed in a 300 ml BOD bottle with an initial 8 mg/ L dissolved oxygen (DO). On five-day incubation, the remaining DO is 2.5 mg/L. Calculate the BOD of the sample.
   c) What are deoxygenating substances? Discuss various types and sources of deoxygenating substances in river water.
   3 +2+(1+2) =8

3. a) Explain the terms bioconcentration, biomagnification, and bioconcentration factor (BCF).
   b) What is organochlorine pesticide? Discuss any three important properties of organochlorine pesticide and draw the structure of DDT and DDE.
   (1+2+1) + (1+2+1) = 8

4. What are POPs? Discuss the physico-chemical parameters which influence the fate of POPs in the environment. 2 + 6 = 8

5. Discuss the physico-chemical factors which influence the fate of oil in aquatic environments. Explain the types of containment for oil spills in a marine environment.
   5+3=8

6. Explain a) Arsenic mobilization in the Bengal basin, b) Arsenic removal technologies c) The toxic effects of Arsenic. 2+4+2=8
7. What are heavy metals? Explain the source and effect of Pb and Hg on human health.
   2 + (3+3) = 8
