

2011

M.Sc.

Part-II Examination

ENVIRONMENTAL SCIENCE

PAPER—IXA

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Answer Q. No. 1 and any five questions from the rest.

1. Answer any ten questions of the following : 2×10

- (i) What is the abbreviated form of pH?
- (ii) Define chemical speciation with an example.
- (iii) Give the full form and structure of PAN.
- (iv) What are heavy metals?
- (v) What is El Niño?
- (vi) State the difference between B.O.D. and C.O.D.

(Turn Over)

- (vii) What is solar flux ?
- (viii) Why soil chemistry study is necessary ?
- (ix) How does redox potential arise in water ?
- (x) What are the utilities of X-ray diffraction analysis ?
- (xi) State the condition of spontaneity of a chemical reaction in terms of Gibb's free energy.
- (xii) What is the biochemical effect of MIC ?
- (xiii) Mention the environmental factors on which the solubility of gases in water depend.
- (xiv) What are the differences between Pollutants and Contaminants ?
- (xv) Give full form of GLC and HPLC.
- (xvi) Define Coagulation and Coagulant.

2. How do organic components originate in soil? Mention the roles of soil organic matter? Write down the nitrogen pathways in the environment. What are the major soil inorganic components? Add a note on significance of soil profile study. 3+3+5+3+2

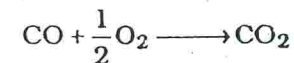
3. Enlist the factors determining the DO content in water depend. How does pH of natural water remain neutral or near neutral? What are the implications of BOD and COD analysis? What types of relationship are there

between the following pairs :

(i) DO and BOD ; (ii) DO and COD ; (iii) BOD and COD.

3+4+3+6

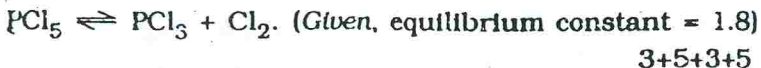
4. Enlist different particulate pollutants highlighting their sources and formation. Briefly discuss the environmental impacts and controlling strategies of particulate matters. (4+4) + (4+4)
5. State the principle of Flame Photometry. Name the metals which are determined by this instrument. Why other metals are not determined by Flame Photometer? What are the water quality parameters which are determined by titrimetry and gravimetry? Write basic principle of Colourimetry. What are the differences between colourimetry and spectrophotometry? 3+2+4+2+3+2
6. Briefly discuss the possible sources and bio-chemical effects of (i) Arsenic, (ii) Cadmium, (iii) Lead and (iv) Mercury. (2+2)×4
7. Define chemical potential. Calculate the free energy change for the process at 25°C



Given that heat of formation is - 67360 cal. and change in entropy is - 20.7 cal/deg.

What are the units of Chemical Potential, Gibbs Free Energy and Equilibrium Constant ?

Calculate the pressure in atmosphere to obtain 50% dissociation of PCl_5 at 25°C



8. How is Ozone formed in stratosphere? What are the mechanisms of Ozone removal? What is Green house effect? Name the green house gases with their relative proportion and sources. 3+5+3+(2+3)

9. What is solubility product? Why is it important in anhydrous chemistry?

Find out the solubility of AgCl in 0.1M and 0.01M HCl solution.

Given Solubility Product of $\text{AgCl} = 1 \times 10^{-10} \text{M}^2\text{L}^{-2}$.

Write down the steps of chemical reactions in DO estimation. 3+3+5+5

10. Write down the flow chart of domestic waste water treatment. What is the role of activated sludge in the treatment process?

What are the chemical reactions for the formation of acid rain in atmosphere? Add a note on meteorological parameters in the formation of acid rain. 5+3+4+4