2009

CHEMISTRY

PAPER—CH-2104

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

Environmental Science (For Inorganic Spl. Student)

Answer any *four* questions

1. (*a*) Explain Oxygen sag curve.

   (*b*) Write the function of flotation used in the waste water treatment process.

   (*c*) Write the environmental problems associated with large oil spill from a toxer in a sea.

(*d*) Draw a conventional flow diagram of sewage treatment plant.

(*e*) Compare the trickling filter with the activated sludge process used in waste water treatment. 2 + 2 + 2 + 2 + 2

2. (*a*) Describe the types of material present in municipal sewage water.

(*b*) What types of solid waste are suitable in incineration ?

(*c*) Describe the sanitary land fill process in detail and mention its merits and demerits. 2 + 2 + 6

3. (*a*) Write the difference between pollutant and contaminant. What are the different components of atmosphere ? How particulates help in radiation balance of earth ?

(*b*) "Oxygen plays a key role in the troposphere, while ozone, in the stratosphere." Explain.

(*c*) Define following nomenclatures :

(*i*) Speciation

(*ii*) Threshold Limit Value (TLV).

(1 + 2 + 3) + 2 + 2

4. (*a*) Write an account on monitoring of NO_x and SO_x.

(*b*) Comment on the origin of soot particles.

(*c*) What is Van Allen belts? 6 + 3 + 1

5. (*a*) Write short note on Nitrogen in aquatic environment.

(*b*) Give some examples of microbially-mediated redox reactions in natural water.

(*c*) Write the name of the different inorganic and organic components present in soil. 4 + 4 + 2

6. (*a*) What is CFC? How does it effect the ozone layer? Comment on the possible substitutes of CFC.

(*b*) What is PAN? (2 + 4 + 2) + 2

7. (*a*) Explain biological methylation and illustrate propagation of mercury in food chain.

(*b*) Enumerate the biochemical effects of Lead with particular reference to their sources, species and pathways in the environment and impact on human. (3 + 3) + 4

8. (*a*) Explain the mechanism of action of insectisides.

(*b*) 'MIC— is poisonous to human beings.' Give your comment. 6 + 4

Polymer Science (For Organic and Physical Spl. Student)

Answer any *five* questions

1. Differentiate between chain growth and step growth polymerization process with respect to following points (any *four*) : 2×4

(*i*) Choice of monomers

(*ii*) Reaction mechanism

(*iii*) Molecular weight and molecular weight distribution

(*iv*) Reaction rate

(*v*) Termination.

2. Derive overall rate expression for free-radical polymerization process assuming no chain transfer reaction. 8

3. (*a*) Why molecular weight needs averaging in polymers?

(*b*) What 'viscosity average molecular weight' data signifies for a polymer.

(*c*) Explain in steps, how Mark Howink equation could be arrived starting from a dilute polymer solution for calculating viscosity average molecular weight. 1 + 1 + 6

4. (*a*) What is significant about molecular weight of a polymer? Explain and write the expression for the terms Mn, Mw, Mz.

(*b*) Name one method each for determination of Mn and Mw. Write the principle behind the method and only the final expression should be applied. 4 + 4

5. Write short notes on the following (any *four*) : 2×4

(*i*) Autoacceleration

(*ii*) Chain-transfer reaction

(*iii*) Ionic polymerization

(*iv*) Glass transition temperature

(*v*) Step-growth polymerization

(*vi*) Reactivity ratio.

6. (*a*) Write the general mechanism of free-radical polymerization explaining all the terms.

(*b*) Write the final expression for a free-radical copolymer equation relating mole fraction of a monomer in the copolymer to that in the feed.

(*c*) What are the different types of radical copolymerization possible? Under what condition can one obtain a perfectly alternate copolymer? 2 + 2 + 4

7. Write briefly about the four different techniques used for carrying out free-radical polymerization. Mention one advantage and one disadvantage for each technique. 2×4

8. (*a*) Discuss briefly on the properties of rubbers, plastics, fibers.

(*b*) How does polarity of a polymer molecule affect the physical properties of the polymer, explain with one example. (3 x 2) + 2

9. (*a*) Write and explain Carothers equation relating the degree of polymerization (Xn) to the extent of reaction (p) in case of step-growth polymerization using equivalent amount of monomers.

(*b*) What will the predicted degree of polymerization (Xn) of a polyester synthesized by reaction 0·25 moles of a diol with 0·27 moles of a diacid assuming complete conversion of the diol. 4 + 4