M.Sc. 4th Semester Examination, 2015

CHEMISTRY

PAPER – CEM- 404

Full Marks : 40

Time : 2 hours

The figures in the right hand margin indicate marks

(Inorganic Special)

(Environmental Chemistry)

Answer any five questions

1. (a) How Arsenic is analyzed by Atomic Absorption Spectrophotometry (AAS)?
   (b) Explain the function of Glass electrode.
   (c) Discuss the principle of High performance liquid chromatography (HPLC).
2. (a) What are the pre-concentration techniques involved before analysis of the sampled water? Discuss.

(b) Describe the method for the estimation of the following parameters in water sample. \( \frac{2}{2} \times 2 \)

(i) Dissolved oxygen

(ii) Nitrite.

3. (a) Explain the working principle of Hollow cathode lamp.

(b) Describe the principle of the Non-Dispersive Infrared Spectrometry (NDIS)

(c) Why ICPES is superior to other atomizing devices?

(d) What type samples are analyzed by Flame Ionization Detector?

4. (a) Explain an account on monitoring of \( SO_2 \) in air spectrophotometrically.
(b) Give an account of air quality standards of primary air pollutants.

(c) What are the advantages of Graphite furnace over AAS?

5. (a) Discuss oxygen sag curve in detail.

(b) Describe the different processes by which industrial waste water can be treated.

6. (a) Give the collection mechanism for fabric filter.

(b) Discuss the operating principle of électrostatic precipitator.

7. (a) Describe working principle of cyclone with help of a neat sketch.

(b) Discuss the dust discharge system in cyclone.

(c) Discuss the charge of efficiency if the following changes are made in a cyclone:
   (i) increase cyclone size
(ii) lengthen the cylinder
(iii) increase inlet area maintaining velocity
(iv) increase dust concentration
(v) increase particle size
(vi) increase particle density
(vii) decrease velocity
(viii) increase temperature maintaining velocity.

8. Write a notes on (any four):

(i) Reverse osmosis

(ii) Electro coagulation principle

(iii) Oxygen sag curve

(iv) Function of deem in municipal water treatment

(v) Pollutants (gases, liquids and solids) discharged from a Thermal power plant.

(vi) Function of Cl₂ addition in municipal water treatment.
9. Discuss the working principle of:

   (i) X-ray fluorosence spectrophotometer
   (ii) FTIR spectrometer
   (iii) IR spectroscopy
   (iv) Gas-liquid chromatography.

10. (a) How NO\textsubscript{x} emission is control in thermal power plant.
   (b) Derive an expression of collection efficiency of an electrostatic precipitator as a function of gas flow rate.
   (c) Write the principle of ESP.

(Environmental Chemistry)
Answer any four questions

1. (a) Give two examples in each of the following:
   (i) Naturally occurring polymers
(ii) Thermoplastic polymers

(iii) Thermosetting polymers

(iv) Amorphous polymers

(v) Crystalline polymers.

(b) Describe the synthesis of phenol formaldehyde resin in detail.

2. (a) Classify polyethylene on the basis of density and mention their important properties and application.

(b) Describe the synthesis of high density polyethylene.

3. (a) What is nitrile rubber? Write the application of nitrile rubber.

(b) Draw a simple process flow diagram for the manufacture of styrene-butadiene rubber.

(c) Name a biodegradable polymer.
(d) Free radical polymerization of a vinyl derivative is inhibited in presence of benzoquinone. Explain why?

(e) Name the polymer used to make non-stick cookware.

4. (a) Discuss the functions of additives used in plastic industries.

(b) Describe the manufacturing process of polyvinyl chloride in detail.

5. (a) Define polyurethane.

(b) Discuss the properties of polyester and polyether based polyurethane.

(c) Discuss about the catalyst and surfactants used for the polyurethane synthesis process.

(d) Write the uses of polyurethane.

6. (a) What is nylon?
(b) Write the characteristics feature of Nylon 6 and Nylon 66. 2

(c) Describe the manufacturing process of Nylon 66. 5

(d) Lead-acid storage batteries cannot be made by Nylon. Explain why? 2

7. Write notes on any four of the following: $2 \frac{1}{2} \times 4$

(i) Vulcanization of rubber

(ii) Natural rubber

(iii) Compression moulding

(iv) Gough-Joule effect of natural rubber

(v) Viscose rayon

(vi) Glass Transition temperature.