

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)? 2
- (b) Explain the function of Glass electrode. 3
- (c) Discuss the principle of High performance liquid chromatography (HPLC). 3

(Turn Over)

2. (a) What are the pre-concentration techniques involved before analysis of the sampled water? Discuss. 3
- (b) Describe the method for the estimation of the following parameters in water sample. $2\frac{1}{2} \times 2$
- (i) Dissolved oxygen
- (ii) Nitrite.
3. (a) Explain the working principle of Hollow cathode lamp. 2
- (b) Describe the principle of the Non-Dispersive Infrared Spectrometry (NDIS) 3
- (c) Why ICPEES is superior to other atomizing devices? 2
- (d) What type samples are analyzed by Flame Ionization Detector? 1
4. (a) Explain an account on monitoring of SO_2 in air spectrophotometrically. 3

- (b) Give an account of air quality standards of primary air pollutants. 3
- (c) What are the advantages of Graphite furnace over AAS? 2
5. (a) Discuss oxygen sag curve in detail. 4
- (b) Describe the different processes by which industrial waste water can be treated. 4
6. (a) Give the collection mechanism for fabric filter. 4
- (b) Discuss the operating principle of electrostatic precipitator. 4
7. (a) Describe working principle of cyclone with help of a neat sketch. 3
- (b) Discuss the dust discharge system in cyclone. 2
- (c) Discuss the change of efficiency if the following changes are made in a cyclone 3
- (i) increase cyclone size

- (ii) lengthen the cyclinder
- (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*) : 2 × 4

- (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 Cl_2 addition in municipal water treatment.

9. Discuss the working principle of : 4 × 2
- (i) X-ray fluorescence spectrophotometer
 - (ii) FTIR spectrometer
 - (iii) IR spectroscopy
 - (iv) Gas-liquid chromatography.
10. (a) How NO_x emission is control in thermal power plant. 3
- (b) Derive an expression of collection efficiency of an electro static precipitator as a function of gas flow rate. 3
- (c) Write the principle of ESP. 2

(*Environmental Chemistry*)

Answer any **four** questions

1. (a) Give *two* examples in each of the following : 5
- (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. 5
2. (a) Classify polyethylene on the basis of density and mention their important properties and application. 5
- (b) Describe the synthesis of high density polyethylene. 5
3. (a) What is nitrile rubber? Write the application of nitrile rubber. 3
- (b) Draw a simple process flow diagram for the manufacture of styrene-butadiene rubber. 3
- (c) Name a biodegradable polymer. 1

- (d) Free radical polymerization of a vinyl derivative is inhibited in presence of benzoquinone. Explain why? 2
- (e) Name the polymer used to make non-stick cookware. 1
4. (a) Discuss the functions of additives used in plastic industries. 4
- (b) Describe the manufacturing process of polyvinyl chloride in detail. 6
5. (a) Define polyurethane. 1
- (b) Discuss the properties of polyester and polyether based polyurethane. 3
- (c) Discuss about the catalyst and surfactants used for the polyurethane synthesis process. 3
- (d) Write the uses of polyurethane. 3
6. (a) What is nylon? 1

- (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 can not 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.