PG/IVS/CHEM-404/12

M.Sc. 4th Semester Examination, 2012

CHEMISTRY

PAPER— CEM-404

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

(*Organic and Physical Special*)

Answer any *four* questions

1. (*a*) Describe the manufacturing process of pale crepe rubber from natural rubber latex. 5

(*b*) What do you mean by "racking" of raw natural rubber ? State the Gough - Joule effects of raw rubber. $1\frac{1}{2}+1\frac{1}{2}$

(*c*) Mention the main applications of natural rubber. 2

2. (*a*) Mention the names of the vulcanising agents used to vulcanise the following rubbers : $\frac{1}{2} \times 4$

   (*i*) SBR

   (*ii*) Butyl rubber

   (*iii*) Chloroprene rubber

   (*iv*) Polyurethane rubber.

   (*b*) What are accelerators ? Classify these on the basis of their efficiency. Give an example in each case. 1 + 2

   (*c*) What do you mean by reinforcing fillers ? Give some examples. 1 + 1

   (*d*) Mention the changes that take place during vulcanisation. Define the term "coefficient of vulcanisation." 2 + 1

3. (*a*) What is butyl rubber ? Starting from the raw materials describe the process for the synthesis of butyl rubber. 1 + 4

   (*b*) State the important properties of butyl rubber and also mention its applications based on those properties. 2 + 2

(*c*) Write down the structure of an oil resistant rubber. 1

4. (*a*) Classify polyethylene on the basis of density. 2

(*b*) Describe the Ziegler process for the synthesis of polyethylene. Mention the type of polythene synthesised by the Ziegler process. 4 + 1

(*c*) State the properties of highly crystalline high density polythene. Mention the uses of LLDPE. $1\frac{1}{2}+1\frac{1}{2}$

5. (*a*) Write down the reactions involved in the synthesis of polycarbonates. 3

(*b*) Define the term EEW. How is it related to the epoxide content(%) of the epoxy resin ? 1 + 1

(*c*) Name the properties that depend on the (*i*) bisphenol *A* moiety (*ii*) the ether linkages and (*iii*) the hydroxyl and epoxy groups. Name the curing agents used to cure the bisphenol *A* derived epoxy resins. 1 + 1 + 1 + 2

6. (*a*) Describe the synthesis of viscose rayon from cellulose. 5

(*b*) Name the monomer used for the synthesis of nylon 6. Compare the properties of nylon 6 and nylon 66. 1 + 2

(*c*) What do you mean by ABS ? Mention its uses. 1 + 1

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

(*i*) Phenol-formaldehyde resins

(*ii*) Compounding of PVC

(*iii*) Compression moulding

(*iv*) Environmental stress cracking of polythene

(*v*) Synthesis of stereospecific polypropylene

(*vi*) Properties and uses of chlorosulfonated polyethylene.

(*Inorganic Special*)
(*Environmental Chemistry*)

Answer any *four* questions

1. (*a*) How Arsenic is analyzed by Atomic Absorption Spectrophotometry (AAS) ? 3

(*b*) Explain in what respect Fourier transform infra-red (FTIR) spectroscopy is superior to IR spectroscopy ? 3

(*c*) Explain the principle of the high performance liquid chromatography (HPLC). 4

2. (*a*) In what ways NO_x in an air sample can be monitored ? 4

(*b*) How do you draw samples of automative emissions using Impingers and Electrostatic Samplers ? 3 + 3

3. (*a*) Describe the method for the estimation of nitrite in water sample. 4

(*b*) What type of filters are used in the sampling of particulates ? 2

(*c*) Explain the function of glass electrode. 3

(*d*) Defined C.O.D. 1

4. (*a*) Describe the method for the estimation of the following parameters in water sample : 3 + 3

(*i*) Dissolved oxygen (D.O.)
(*ii*) Total hardness.

(*b*) Explain the working principle of inductively coupled plasma Emission Spectroscopy. 4

5. (*a*) Discuss the method of estimation of B.O.D. in water sample. 4

(*b*) Write short note on "Ozone hole". 3

(*c*) Write down the differences between GSC and GLC. 2

(*d*) What do you mean by neutron activation analysis ? 1

6. (*a*) What is softening of water ? Discuss the ion exchange softening process in detail. 3

(*b*) What are the basic differences between chemical coagulation and electrocoagulation ? 3

(*c*) What are the sources of contamination in ground water ? 2

(*d*) Write down the principle of reverse osmosis. 2

7. (*a*) What are the material of construction normally used for discharge and collecting electrode in electrostatic precipitator ? 2

(*b*) Derive an expression to calculate the collection efficiency of an ESP as function of gas flow rate. 3

(*c*) Discuss the operating principle of a cyclone separator. 5