

M.Sc. 4th Semester Examination, 2013

CHEMISTRY

PAPER—CEM - 404

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

(Organic Special)

Answer any *four* questions

1. (a) Make a comparative chart for the following rubbers in respect of the points mentioned :

Rubbers : (i) Natural rubber (ii) SBR
(iii) Neoprene (iv) Polyurethane rubber

Points : (i) Chemical structure (ii) Vulcanisation agent used in vulcanising the rubber (iii) Stretching crystallisation.

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(Turn Over)

- (b) Write down the average compositions of natural rubber latex and smoked sheet rubber. 2 + 2
- (c) How is natural rubber latex stabilised? Name two coagulating agents used to coagulate natural rubber latex. 1 + 1
2. (a) State the purpose of compounding of rubber. Name the principal compounding ingredients of rubber with suitable examples in each case. 2 + 4
- (b) Mention the changes that take place in the properties of rubber during vulcanisation. 2
- (c) Suggest a mechanism for the vulcanisation of natural rubber using sulfur, accelerator and ZnO as the vulcanisation system. 2
3. (a) Describe the suspension polymerisation process for the synthesis of PVC. 5
- (b) Why PVC must be plasticised? Name some plasticizers of PVC. 1 + 1

- (c) Suggest a mechanism for the heat degradation of PVC. Give some examples of stabilisers. 2 + 1
4. (a) Write down a typical composition of the polymerisation system for the synthesis of SBR through emulsion polymerisation process. 2
- (b) Give an example of a flame resistant rubber. Mention its major uses. 1 + 3
- (c) Name the monomers used to synthesise nitrile rubber. Write down its chemical structure. Mention the important properties of nitrile rubber. 1 + 1 + 2
5. (a) Name the monomers used to synthesise epoxy resin. How are the monomers prepared? Write down the reaction between the monomers that leads to the formation of epoxy resin. 1 + 2 + 2
- (b) Define the term 'melt flow index' as applicable to polyethylene. How is it related to molecular weight of polyethylene? 2 + 1

- (c) Write a short note on environmental stress cracking of polyethylene. 2
6. (a) What are phenol-formaldehyde resins? Describe the synthesis of 'B' stage and 'C' stage resins mentioning the raw materials used and the reactions involved in the synthesis. 1 + 5
- (b) Mention the main properties and applications of alkyd resins. 2 + 2
7. Write short notes on any *four* of the following: $2\frac{1}{2} \times 4$
- (i) Manufacture of smoked sheet rubber from natural rubber latex.
- (ii) Properties and applications of polycarbonates.
- (iii) Synthesis of high density polyethylene.
- (iv) Properties and uses of EPDM rubber.
- (v) Synthesis of nylon 66.
- (vi) Non-sulphur vulcanisation of rubber.

(*Physical Special*)

Answer any *four* questions

1. (a) Write critical notes on sampling of gases and vapours. 4
- (b) How do you propose to control particulate emission ? 4
- (c) What is Flameless Atomic Absorption method ? 2
2. (a) CO in an air sample can be monitored by Gas Chromatographic method. Explain. 4
- (b) What are the pre-concentration techniques involved before analysis of the sampled water ? Illustrate them. 4
- (c) List the ten important water quality parameters. 2
3. (a) Describe the Ion Selective Electrode method for the analysis of the fluoride parameter in water sample. 4

- (b) The Flame Ionization Detector is most useful for the analysis of hydrocarbons. Explain it. 3
- (c) Give an account of air quality standards of primary air pollutants. 3
4. Describe the principle of the following instrumental techniques in the analysis of pollutants : 5 + 5
- (i) Atomic Absorption Spectrophotometry (AAS).
- (ii) Non Dispersive Infrared Spectrometry (NDIS)
5. (a) Write an account on monitoring of SO₂ in air. 4
- (b) For analysis of natural and waste water, two principle types of sampling procedures are employed. Explain. 4
- (c) How pH of a sampled water is measured ? 2
6. (a) Draw the conventional flow diagram of municipal waste water treatment plant. 3

- (b) Describe the different processes by which industrial waste water can be treated. 5
- (c) Write the principle of reverse osmosis. 2
7. (a) Write the effluent discharges from a thermal power plant and chloro-alkali plant. 4
- (b) Write the problems associated with the agricultural run off in the water bodies. 3
- (c) Write the principle of electrocoagulation used in the treatment of water. 3
8. (a) Discuss the sources of contamination in ground water. 4
- (b) Discuss the continuous emission monitoring system. 6
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