

**M.Sc. 4th Semester Examination, 2014**

**CHEMISTRY**

PAPER – CEM - 404

*Full Marks : 40*

*Time : 2 hours*

Answer any **four** questions

*The figures in the right-hand margin indicate marks*

1. (a) Describe the manufacture of pale crepe rubber from natural rubber latex. 4
- (b) What happens to the morphology of raw rubber when it is stretched to at least 700 % elongation ? 2
- (c) Explain the term 'racking' as applicable to raw natural rubber. 2
- (d) State the Gough-Joule effect of natural rubber. 2

( Turn Over )

( 2 )

2. (a) Explain the function of processing aids in the compounding of rubber. Give examples of processing aids. 2 + 1
- (b) What do you mean by reinforcing fillers ? Give examples of reinforcing fillers and extenders. 1 + 1 + 1
- (c) Write down the purpose of vulcanisation of rubber. How the saturated rubbers are vulcanised ? 2 + 2
3. (a) Mention the important properties of butyl rubber and state the special fields of application of butyl rubber based on These properties. 2 + 2
- (b) Write a short note on curing of neoprene rubber. 4
- (c) State the reasons for the use of neoprene rubber as adhesives. 2
4. (a) Describe the 'Philips process' for the manufacture of high density polyethylene. 5
- (b) Classify polyethylene based on density. 2

- (c) How does the density of polyethylene change with crystallinity ? State the properties of high density crystalline polyethylene. 1 + 2
5. (a) Why are polycarbonates named so ? 1
- (b) Mention the names of raw materials used for the synthesis of polycarbonates. Show with suitable chemical reactions the synthesis of a polycarbonate from the raw materials. 1 + 3
- (c) Mention the important properties of polycarbonates. 2
- (d) Define the term 'epoxy equivalent weight' (EEW). How is it related to the epoxide content of the epoxy resin ? State the properties of epoxide resin that depend on the bisphenol A moiety of the epoxy resin. 1 + 1 + 1
6. (a) Name the raw materials used for the synthesis of nylon 66. Why is it named so ? Describe with a neat flow diagram the manufacturing process of nylon 66 from its raw materials. 1 + 1 + 5

( 4 )

(b) How chlorosulphonated polyethylene (hypalon) is produced from low density polyethylene (LDPE) ? Mention the main applications of hypalon. 2 + 1

7. Write short notes on any *four* of the following :

(i) Compression moulding  $2\frac{1}{2} \times 4$

(ii) Properties of stereoregular polyethylene

(iii) Viscose rayon

(iv) Properties and uses of polystyrene

(v) Synthesis of EPDM

(vi) Accelerators and accelerator activators.

*(Inorganic Special )*

*(Environmental Chemistry)*

Answer any **four** questions

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

- (b) Derive an expression to calculate the collection efficiency of an ESP as function of gas flow rate. 3
- (c) Write the principle of reverse osmosis. 2
2. (a) Describe the method for the estimation of total hardness (Ca and Mg) in water sample. 5
- (b) Write critical notes on sampling of gases and vapours. 5
3. (a) How atmospheric particulate matter is analysed using X-ray fluorescence spectrophotometry? Explain. 4
- (b) How do you draw samples of automotive emissions using Impingers and Electrostatic samplers?  $2\frac{1}{2} + 2\frac{1}{2}$
- (c) Write down the principle involving analysis of Mercury by AAS. 1
4. (a) (i) Define B.O.D.
- (ii) Write down the expression for B.O.D. in mg/l.

- (iii) Discuss the complete B.O.D. curve. 1 + 1 + 2
- (b) The B.O.D<sub>5</sub> of a waste water is determined to be 150 mg/l at 20°C. The  $K$  value is 0.23 day<sup>-1</sup>. What would be the B.O.D<sub>8</sub> if the test were run at 15°C.
- (i) Determine ultimate B.O.D. ( $L_0$ )
- (ii) Determine Temperature correction for  $K$  value for 15°C, where  $\theta = 1.047$ .
- (iii) Determine B.O.D. at 8 days,  $Y_8$ . 2 + 2 + 2
5. (a) Describe the method for the estimation of the following water quality parameters in water samples : 3 + 3
- (i) C.O.D.
- (ii) Nitrite ( $\text{NO}_2^-$ )
- (b) Chemiluminescence is the standard method for monitoring of  $\text{NO}_x$ . Explain. 4
6. (a) Describe the working principle of the Neutron Activation Analysis. 3

- (b) Give a block diagram of the FTIR spectrometer. In what ways is it superior to IR spectrophotometry? 3 + 3
- (c) Write down the differences between GSC and GLC. 1
7. (a) Explain the principle of Ion Exchange chromatography. 3
- (b) How do the sensitivities of Atomic Absorption Spectrophotometry and Inductively coupled plasma Emission spectrometry compared? 2
- (c) Define Anode Stripping Voltammetry and Cathode stripping Voltammetry and mention the steps involved in these two processes.  $1\frac{1}{2} + 1\frac{1}{2}$
- (d) Write the Ilkovic equation for limiting diffusion current in polarography. Explain the terms involved in the equation. 2
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