2007

CHEMISTRY

PAPER-VIII

Full Marks : 75

Time : 3 hours

Answer any **five questions**, taking at **least two** from each Group

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers whene ver necessary

Write the **answers** Question of each Group **in separate books**

(Polymer Science for Organic and Physical Special)

GROUP -A

1. (a) In what respects do polymer molecules differ from simple molecules ? 4

(b) Why **the glass transition temperature**, *Tr,* is also **called the second** order transition temperature'? **Discuss** the effect of chemical structure on T. and *Tm* of polymers. 2+4

(c) Draw a molecular weight distribution curve for a polymer sample and hence define the term `polydispersity index' and explain its significance. 5

2. (a) Discuss how the viscosity **average molecular weight,** M,, of a polymer can be **determined.** 6

(b) Derive a rate expression for the self-catalysed polyesterification. 5

(c) What do you mean by tacticity of a polymer? Explain how tacticity affects the properties of the polymers ? 4

3. Define copolymerisation. Establish the copolymer composition equation for binary copolymerisation. What is the significance of monomer reactivity ratios? What are the conditions for ideal, alternating and azeotropic copolymerisations? 15

4. What are the common techniques of polymerisation ? Give brief description of each highlighting relative advantages and disadvantages. 15

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

(a) Chain transfer in free radical polymerisation and its effect on molecular weight of the polymer.

(b) **Inhibition and retardation** in free radical vinyl **polymerisation.**

(c) Cationic **and anionic** polymerisations.

(d) Control of molecular weight in bifunctional step growth polymerisation reactions.

GROUP–B

6. (a) What are phenolics ? Write down the chemical **reactions leading to the formation of A stage, B stage and C stage resin mentioning suitable reaction conditions**. **What are the important applications of phenolic resins ?** 7

(b) Name the compounding ingredients added to PVC **with one example in each case**. Write down a **formulation** of a PVC **compound** to be **used as a garden hose.** **3+2**

(c) What do you **mean by 'environmental stress cracking** ? **Name one antioxidant** added to polyethene. 2+1

7. (a) What is natural rubber latex ? Give **an average compo - sition** of N.R. **latex vis-a**-vis the coagulum. Why **preservation** of N.R. **latex** is necessary? How is it **done ?** **8**

(b) **Describe the manufacture** of crepe rubber from N.R. latex. 7

8. (a) **Describe the emulsion polymerisation** process for the synthesis of styrene **butadiene** rubber (**SBR) mentioning** thereby the role of each **ingredient used.** 9

(b) Write a **note on vulcanisation** of rubber. 6

9. How is styrene made'? Describe a method of synthesis of polystyrene. State. the properties of polystyrene and its major uses and applications. 15

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

(a) Synthesis and properties of stereoregular polyethylene

(b) Nylon 66

(c) Properties and applications of butyl rubber and silicone rubber

(d) Thermoplastic elastomers.

(Inorganic Special)

GROUP-A

1. (a) Write down the industrial applications, the advantages and disadvantages of a gravity settler.

(b) Discuss the collection mechanism for fabric filter.

(c) What are the factors that-affect the selection of bag house? **5+5+5**

2. (a) Discuss the operating principle of a cyclone separator.

(b) Discuss the dust discharge and collection system in cyclone.

(c) State the effects on the efficiency of cyclone if the **following changes are made**

(i) Increasing dust concentration

(ii) **Increasing** dust density. 6+5+4

3. (a) Discuss the operating principle of electrostatic precipitator.

(b) Derive the **expression** for collection efficiency of **electrostatic** precipitator. 10+5

4. (a) Discuss about the sources, sinks, effects and control measures of the air pollutant NOR . 2+3+2+4

(b) What is fly ash ? Describe its range of composition. 1+3

5. (a) How does Pb (C2H5)4 act as antiknocking agent during the combustion of gasoline ? 4

(b) Give an account on inorganic particulate matter. And show its difference from organic particulate matter. 4+2

(c) How does particulate matter affect **our climate?**

(d) Write a short note on soot particle. **2**

GROUP -B

6. (a) Name some common volatile organic compounds.

(b) Discuss the classification of volatile organic compound control techniques.

(c) Discuss the thermal oxidation process of volatile organic compounds. 4+6+5

7. (a) Describe the venturi scrubber system in detail.

(b) Discuss the problems associated with the venturi scrubber. 10+5

8. Discuss the types of water pollutants and their effects. 15

9. (a) Illustrate the Nitrogen cycle in our environment. 3

(b) `Without carbon dioxide the Earth may turn into the Moon, and due the presence of its excess quantity the Earth may share the fate of the neighbouring planet the Venus.' Elucidate. 5

(c) Divide the major regions of the atmosphere with their respective altitudes, temperature ranges and important species. 4

(d), **How is it possible to measure global warning'?** **3**

10. **(a) Write the name of the different inorganic and organic components present in soil.** **3**

(b) How is our environment can be polluted due to radioactive elements? **4**

(c) How does $SO_{,,}$ can be removed from flue gas by chemical methods? 3

(d) Why **is the pH of seawater constant** at 8.1 ± 0.2 ? 3

(e) Explain the roles '**of natural ligands in natural water.** **2**