2017

M.Sc. Part–II Examination

CHEMISTRY

PAPER—VIII

Full Marks : 75

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

(*Physical + Organic*)

New Syllabus

F.M. – 100   Time : 4 Hrs.

Answer Q. No. *1* and any *five* from the rest.

1. Answer any *ten* questions : $10 \times 2\frac{1}{2}$

    (i) Define the terms degree of polymerisation and kinetic chain length.

(ii) Write down the structures of the repeat unit of the following polymers :

    (a) Nylon 6

    (b) Polyethyleneterephthalate.

(iii) What do you mean by glass transition temperature (T_g) of a polymer ? How does it differ from crystalline mething temperature (T_m) ?

(iv) The number average molecular weight $(\overline{M}_n)$ of a sample of polyvinyl chloride (PVC) is 62500, calculate its number average degree of polymerisation $(\overline{X}_n)$.

(v) Give two examples of free radical initiators and an example of amionic initiator.

(vi) What do you mean by living polymerisation ? Give an example of a living polymer.

(vii) Give an example of an inhibitor and show how it inhibits free radical polymerisation.

(viii) The minimum functionality requirement of a monomer for condensation polymerisation is two(2) — Explain.

(ix) How molecular weight of polymer is controlled in condensation polymerisation ?

(x) Classify polythene on the basis of density.

(xi) Name five essential ingredients used in the compounding of rubber.

(xii) Mention the properties of isotactic polypropylene.

(xiii) Give an average composition of natural rubber latex.

(xiv) Name the raw materials used for the synthesis of eposy resins.

(xv) Give some examples of plasticizers used during compounding of PVC.

2. (a) Classify polymers on the basis of :

    (i) Thermal response ; and

    (ii) Application. $2\frac{1}{2} \times 2$

(b) Discuss the important properties of polymers.   8

(c) Name two monomers which undergo ring opening polymersation.   2

3. (a) Deduce a rate expression for the free radical polymerisation of a vinyl monomer involving only bimolecular termination. 7

   (b) Write down the mechanism of amionic polymersation. 5

   (c) Write a short note on auto acceleration. 3

4. (a) Deduce the carothers equation for condensation polymerisation. 6

   (b) Deduce a rate expression for acid-catalysed polyesterification reaction. 6

   (c) Write a short note on interfacial polymerisation. 3

Or

Write a short note on chain transfer.

5. (a) Suggest a method each for the experimental determination of number average molecular weight $(\overline{M}_n)$ and weight average molecular weight. 3

   (b) Show the relative positions of $\overline{M}_n$, $\overline{M}_w$, $\overline{M}_v$ and $\overline{M}_z$ on the molecular weight distribution curve. 4

   (c) A sample of polystyrene is composed of the following fractions of different-sized molecules :

Fraction	No. of molecules	Molecular weight
1	60	15,000
2	25	25,000
3	10	50,000
4	5	80,000

Calculate the number average and weight-average molecular weights of this polymer sample. 8

6. (a) For binary copolymerisation deduce the copolymer composition equation. 9

   (b) Draw the 'F$_1$' vs 'f$_1$' graphs for ideal copolymerisation. 3

   (c) State the merits and demerits of emulsion polymerisation. 3

7. (a) Why preservation of natural rubber latex is necessary ? How is it done ?   2+1

(b) Describe the manufacture of smoked sheet rubber from natural rubber latex.   6

(c) Name some rubber accelerators.   2

(d) Write a short note on vulcanisation of rubber.   4

8. (a) What is nitrile rubber ? Discuss in brief its preparation, properties and uses.   2+4+2+2

(b) What do you mean by phenolic resin ? Describe the manufacturing process of resol mentioning thereby the reactions involved.   1+4

9. Write short notes on any *three* of the following :   5×3

(a) Synthesis of high density polyethylene.

(b) Properties and uses of EPDM rubber.

(c) Synthesis of terylene.

(d) Properties and uses of butyl rubber.

(e) Difference between addition and condensation polymerisation.

(f) Determination of viscosity average molecular weight, $\overline{M}_v$, of polymers.

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Old Syllabus

F.M. – 75   Time : 3 Hrs.

Answer any *five* questions.

1. (a) Classify polymers on the basis of :

(i) Thermal response ; and

(ii) Application. $2\frac{1}{2}×2$

(b) Discuss the important properties of polymers.   8

(c) Name two monomers which undergo ring opening polymerisation.   2

2. (a) Deduce a rate expression for the free radical polymerisation of a vinyl monomer involving only bimolecular termination. 7

(b) Write a short note on auto acceleration. 3

(c) Write down the mechanism of amionic polymersation. 5

3. (a) Write a short note on chain transfer. 3

(b) Deduce the carothers equation for condensation polymerisation. 6

(c) Deduce a rate expression for acid-catalysed polyesterification reaction. 6

4. (a) Suggest a method each for the experimental determination of number average molecular weight $(\overline{M}_n)$, weight average molecular weight $(\overline{M}_w)$ and XZ-average molecular weight $(\overline{M}_z)$. 3

(b) Show the relative positions of $\overline{M}_n$, $\overline{M}_w$, $\overline{M}_v$ and $\overline{M}_z$ on the molecular weight distribution curve. 4

(c) A sample of polystyrene is composed of the following fractions of different-sized molecules :

Fraction	No. of molecules	Molecular weight
1	50	10,000
2	25	20,000
3	15	60,000
4	10	1,00,000

Calculate the number average and weight average molecular weights of this polymer sample. 8

5. (a) For binary copolymerisation deduce the copolymer composition equation. 10

(b) State three important differences between suspension and emulsion polymerisation. 3

(c) Write down the values of the product $r_1 r_2$ for the following copolymerisation processes :

   (i) Ideal copolymerisation ; and

   (ii) Alternate copolymerisation. 2

6. (a) Why preservation of natural rubber latex is necessary ? How is it done ? 2+1

(b) Describe the manufacture of smoked sheet rubber from natural rubber latex. 6

(c) Name some rubber accelerators. 2

(d) Write a short note on vulcanisation of rubber. 4

7. (a) What is nitrile rubber ? Discuss in brief its preparation, properties and uses. 2+4+2+2

(b) What do you mean by phenolic resin ? Describe the manufacturing process of resol mentioning thereby the reactions involved. 1+4

8. Write short notes on any *three* of the following : 5×3

(a) Synthesis of high density polyethylene.

(b) Properties and uses of EPDM rubber.

(c) Synthesis of terylene.

(d) Solution polymerisation.

(e) Difference between addition and condensation polymerisation.

(f) Cationic polymerisation.