

B.Sc 6th Semester (Honours) Examination, 2020 (CBCS)

Subject: Chemistry

Paper: DSE – 3

(Polymer Chemistry Theory)

Time: 2 Hours

Full Marks: 40

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

Answer any *eight* questions from the following:

8 x 5 = 40

- i) Classify substituted polyolefins according to their stereoisomeric microstructures. Draw the various microstructures of polypropylene with proper labeling.
- ii) Write down the Mark-Houwink –Sakurada equation. How can the equation be utilized to get average molecular weight of a polymer?
- iii) Nylon-6,6 was synthesized by condensation polymerization of hexamethylenediamine and adipic acid in 1:1 mole ratio. Calculate the acid equivalent of the polymer whose average degree of polymerization is 440.
- iv) How would you determine experimentally whether the polymerization of an unknown monomer was proceeding by a step or a chain mechanism?
- v) Write the repeating formulas and names based on common nomenclature (non-IUPAC) for Nylon-6,10 and Nylon-6.
- vi) Write down the main physical characteristics of thermoplastic, elastomer and thermoset polymers giving at least one example of each.
- vii) What do you understand by the terms glass transition temperature (T_g) and melting temperature (T_m) of a polymer? Discuss with specific volume vs. temperature curve to explain the two transition parameters.
- viii) Why are colligative properties like depression of freezing point or elevation of boiling point are unsuitable to determine the average molecular weight of high molecular weight polymers? Name a colligative property which can be successfully utilized to determine the molecular weight of such polymer samples. Briefly explain the underlying principle.
- ix) What do you mean by ‘number average’ and ‘weight average’ molecular weights? Are they same for a polydisperse sample? If not, which one is greater and why?
- x) What is PVC? Describe briefly the procedure of manufacture of PVC from its raw materials.

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Subject: Chemistry

**Paper: DSE-3
(Green Chemistry)**

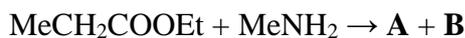
Time: 2 Hours

Full Marks: 40

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

Answer *any eight* questions from the following 8 × 5 = 40

1. State and explain any two principles of Green Chemistry.
2. Mention three types of ionic liquids and cite any two examples of green synthesis using ionic liquids as solvent.
3. Write short notes on the following:
 - (i) Immobilized solvents and (ii) Bio-diesel
4. Identify **A** & **B** and calculate *percentage atom economy* of the following reaction:



5. State important characteristics of *Rightfit Pigment* and briefly explain how it has been established as better alternative compared to toxic inorganic pigments.
 6. Describe two important green syntheses that can be carried-out in solvent free conditions.
 7. Point out differences between the following pairs:
 - (i) Bio-catalysis & Photo-catalysis
 - (ii) Catalytic reagents & Stoichiometric reagents
 8. Discuss the application of surfactant absorbed carbon dioxide for precision cleaning and service industry.
 9. State important applications of Polylactic acid (PLA) and describe an efficient synthesis of this polymer following green protocols starting from corn.
 10. Describe the green synthesis of (i) adipic acid from cyclohexene and (ii) benzoic acid from toluene.
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