B.Sc. 6th Semester (Honours) Examination, 2022 (CBCS)

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

1. ***Answer any five questions from the following:*** **5 × 2 = 10**

a) Give an example of green organic reaction having 100% atom economy.

b) Elucidate the working definition of Green Chemistry.

c) Write down two reasons why 'Green Chemistry' is also called 'Sustainable Chemistry'?

d) How polarity of a molecule is associated with absorption of Microwave radiations?

e) The internal temperature of solvent heated under microwave irradiation can be greater than its boiling point— Justify or criticize the statement.

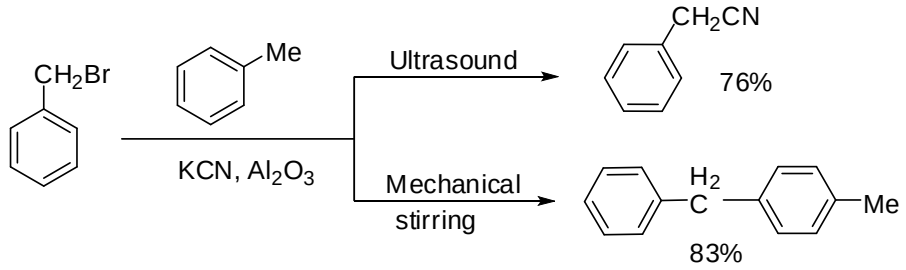
f) Why are ionic liquids termed as designer solvents?

g) Mention two advantages of using SC-CO_2 (supercritical CO_2) as solvent for organic synthesis.

h) What is a biofuel? Mention one advantage of biofuel over fossil fuel.

2. ***Answer any two from the following:*** **2 × 5 = 10**

a) Explain the different outcome of sonication reaction on the following substrate over mechanical stirring.

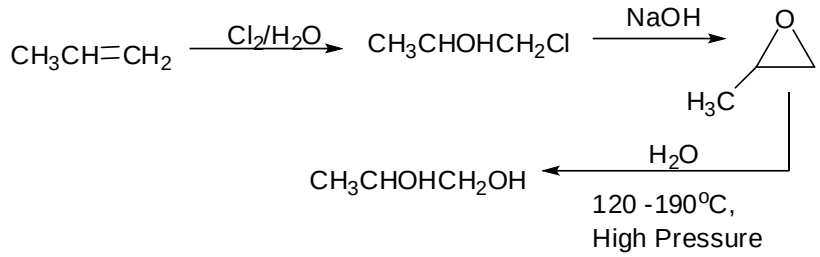


What do you mean by the term sonoluminesence? 3 + 2 = 5

b) Discuss principles 1 and 3 of green chemistry with suitable examples.

2.5 + 2.5 = 5

c) Calculate the atom economy (AE) of the following reaction.



Write down the green synthesis of adipic acid starting from cyclohexene as the starting precursor. 3 + 2 = 5

d) Give reasons why water is considered as a unique reaction medium in terms of economic and environmental benefits.Why water behaves differently under high temperature and pressure? 3 + 2 = 5

3. ***Answer any two questions from the following:*** **2 × 10 = 20**

a) Briefly explain why Flourous Biphasic Solvent (FBS) is ideal for hydroformylation of olefins (mention three points only). What is PEG-400? Give an example of asymmetric aldol reaction using PEG-400 as a solvent and point out the green context of the reaction. What are the advantages of PEG-400 over ionic liquids? 3 + 1 + 4 + 2 = 10

b) Bromination of acetanilide using bromate-bromide mixture in acetic acid is a green process—Discuss. Define bio-catalysis. NADPH is an excellent hydride doner–explain with a suitable example with mechanistic rationale. 3 + 2 + 3 + 2 = 10

c) Describe the synthesis of PLA (poly lactic acid) preferably using flow chart diagram. What are the advantages and disadvantages of PLA? Mention two uses of PLA? What do you mean by the tacticity of a bio-polymer? 3 + 4 + 2 + 1 = 10

B.Sc. 6th Semester (Honours) Examination, 2022 (CBCS)

Subject: Chemistry

Paper: DSE-3

(Polymer Chemistry Theory)

Time: 2 Hours **Full Marks: 40**

Figures in the right hand margin indicate full marks.

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

1. Answer *any five* questions from the following: 2×5= 10

a) What is a mocromolecule? Why is it called molecular colloid?

b) Mention the type of bond that exists between monomers in a polymer molecule. Cite an example.

c) Define condensation polymer and give an example.

d) Crosslinking increases the mechanical strength and thermal resistance of a polymer. - Justify.

e) Why is nylon 66 stronger than polythene?

f) Differetiate between monomers of polystyrene and Buna S.

g) Define 'number average molecular weight' and 'weight average molecular weight' of a polymer sample.

h) What is elastomer? What type of force is operating in it?

2. Answer *any two* questions from the following: 5×2 = 10

a) i) Differetiate between molecular structure and behaviour of thermoplastic and thermo-setting plastic. Give one example of each type.

ii) What is polydispersive index? What does it signify? 3+2

b) Define the term 'functionality'. How is it related to degree of polymerisation? 2+3

c) What do you mean by glass transition temperature (T_g) and crystalline melting

temperature (T_m)? Discuss the nature of the polymer above and below of T_g. 3+2

d) Discuss about stereopolymers of polypropylene with showing their structures. 3+2

3. Answer *any two* questions from the following: 10×2 = 20

a) i) Describe the osmotic pressure method for determination of molecular weight of a polymer. What type of molecular weight is obtained from this measurement and why?
ii) Calculate the average functionality of a mixture containing equimolecular amounts of ethylene glycol and glycerol.
iii) Discuss the enthalpy change in polymerization process.

(4+2)+2+2

b) i) Draw and explain the molecular weight distribution curves for monodisperse and polydisperse polymers.
ii) Show that $\bar{M}_w \geq \bar{M}_n$ for a polymer sample. When are they equal?
iii) Discuss the electrical conductivity of polyacetylene. What are its uses?
iv) Write the structure of the monomer of PVC.

3+3+3+1

c) i) Write down the distinct processes involved in addition polymerization and hence deduce the expression of rate for the polymerization of ethylene mentioning the assumptions therein.
ii) Write down the WLF equation and mention its significance.
iii) Viscosity of a polymer solution is greater than that of the solution of a simple small molecule. – Explain. (2+4)+3+1

d) i) How is bakelite made? What is its major use?
ii) What is the repeating unit of *cis*-polyisoprene? Write the name of its *trans*- form.
iii) Calculate the average degree of polymerization of nylon 6,6 having a number average molecular weight of 30,000 g mol^{-1}.
iv) What do you mean by free volume theory?

3+2 +3+2