

Total number of printed pages-7

14 (CHM-2) CHM 205

2019

CHEMISTRY

Paper : CH 205

(Green Chemistry 2)

Full Marks : 40

Time : Two hours

The figures in the margin indicate full marks for the questions.

1. Answer **any four** questions : $4 \times 1 = 4$

(a) Which of the following is NOT a physical treatment of waste material ? 1

(i) Filtration

(ii) Centrifugation

(iii) Precipitation

(iv) Absorption

(b) Define Environmental Quotient. 1

Contd.

(c) Turnover frequency of catalyst A is more than that of catalyst B. State which catalyst is more active. 1

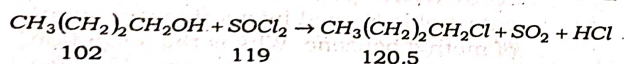
(d) Green chemistry is not different from traditional chemistry in as much as it, embraces the same _____, and _____ that has always been central to classical chemistry. (Fill up the gaps) 1

(e) Wittig reaction is an atom economic reaction. 1
(True/False)

(f) Sustainability is a transition from _____ sources of energy to _____ one. (Fill up the gaps) 1

2. Answer **any two** questions : 2×3=6

(a) Define atom economy. Calculate the % atom economy for the following reaction 1+2

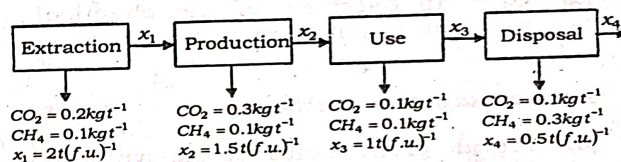


(b) Using suitable examples, illustrate how green chemistry is synonymous with sustainable chemistry. 3

(c) Comment on the usefulness of CO₂ as a solvent in organic synthesis. 3

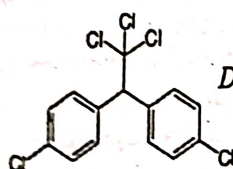
3. Answer **any two** questions : 2×4=8

(a) What is environmental burden? Calculate the total environmental burdens (in f.u.) due to the emissions of (i) CO₂ (ii) CH₄ in the system shown below : 4



(b) Compare aerobic and anaerobic waste treatment processes. Show how catechol is formed by aerobic treatment of methyl benzene. Why is the formation of catechol important in terms of green chemistry? 4

- (c) Taking DDT (dichlorodiphenyltrichloroethane) — a wonder chemical that gave its inventors a Nobel Prize - as an example, illustrate how environmental persistence of a chemical product must be considered as one of the criteria for designing new insecticides. 4



DDT: An Effective Insecticide

- (d) Give an overview of the chemical recycling of polymers to monomers. 4

4. Answer **any two** questions: 2×4=8

- (a) Provide green routes for the synthesis of (**any two**) 2+2

(i) Caprolactum

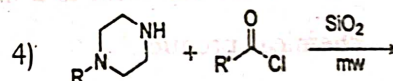
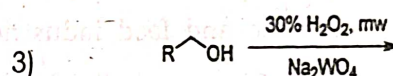
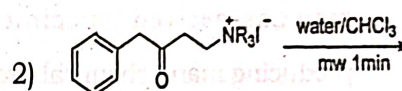
(ii) Ibuprofen

(iii) Acetic acid

- (b) Discuss briefly the problems associated with the conventional synthesis of

phenol via benzene sulfonation. Provide an alternative method for synthesis of phenol from green chemistry perspective. 4

- (c) Write down the products of any two of the following reactions and highlight the greenness of the reactions: (**any two**) 2+2



5. Answer **any two** questions: 2×4=8

- (a) Define biomass as a renewable raw material (RR.M) and list the major advantages and current disadvantages of utilizing plant biomass for meeting our need of materials and fuel. 4

(b) What are the major components of lignocellulosic biomass? Discuss the various ways in which it may be transformed into chemicals and fuels.

4

(c) Succinic acid, Comment on the green chemistry advantages of utilizing biomass-derived succinic acid for producing many chemical products that are useful in the pharmaceutical, cosmetic and food industries, among other. Give *one* indicative reaction to convert succinic acid to a more useful chemical product.

4

6. Answer **any two** questions: $2 \times 3 = 6$

(a) What are the green credentials of photochemical processes in chemical transformations?

3

(b) What do you mean by "Sustainable Development"? Identify the targets that should be attained for sustainable development under green chemistry perspective.

3

(c) Write a short-note on the sustainable use of water.

3