2015

(May)

CHEMISTRY

(Major)

Course : 605

(Organic Chemistry)

Full Marks : 48

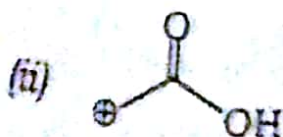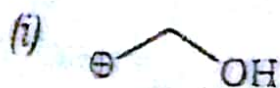Pass Marks : 19

Time : 3 hours

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

1. Give the correct answer from the following :

$1 \times 5 = 5$

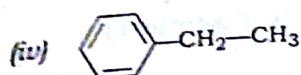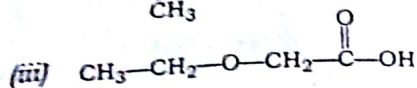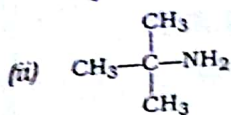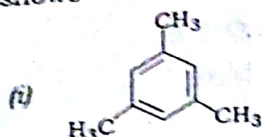(a) Write down the synthetic equivalents (SE) of the following synthons :

(i)

(ii)

(Turn Over)

(b) Which of the following compounds shows 4NMR signals?

(i)

(ii) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-NH_2$

(iii) $CH_3-CH_2-O-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(iv)

(c) Which of the following is a basic azo dye?

(i) Orange–I

(ii) Congo red

(iii) Butter yellow

(iv) Methyl red

(d) Which of the following polymers does not exist in isotactic, syndiotactic and atactic forms?

(i) Polypropylene

(ii) Polyethylidene chloride

(iii) Polyvinyl chloride

(iv) Polyacronitrile

(e) Which of the following techniques cannot be considered as Green synthetic method?

(i) Derivatization method

(ii) Microwave assisted reaction

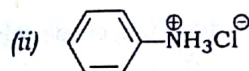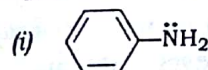(iii) Ultrasound assisted reaction

(iv) Use of catalytic reagent

2. (a) Describe the synthesis of the following target molecule (TM) showing the mode of disconnection :   3
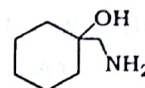
(b) Which of the following will have greater λ_{max} and why?   1

(i)

(ii)

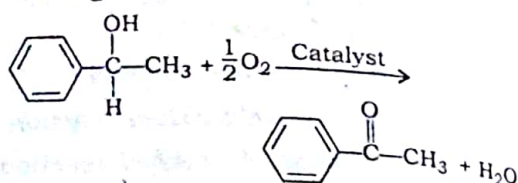(c) Give the names of the monomer units that are used to produce the following :   1+1=2

(i) Terylene

(ii) Nylon-6,6

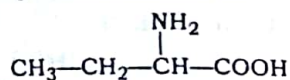*(d)* Calculate the atom efficiency of the following reaction :   3

$$\text{C}_6\text{H}_5\underset{\underset{\text{H}}{|}}{\overset{\overset{\text{OH}}{|}}{\text{C}}}\text{-CH}_3 + \tfrac{1}{2}\text{O}_2 \xrightarrow{\text{Catalyst}}$$

$$\text{C}_6\text{H}_5\overset{\overset{\text{O}}{\|}}{\text{C}}\text{-CH}_3 + \text{H}_2\text{O}$$

UNIT—I

3. Synthesize the following compound with the help of retrosynthetic analysis :   1+2=3

$$\text{CH}_3\text{-CH}_2\text{-}\underset{\underset{\text{NH}_2}{|}}{\text{CH}}\text{-COOH}$$
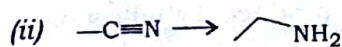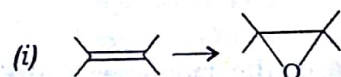
Or

Name the three basic operations required in retrosynthetic analysis. Give two synthetic equivalents of $^{\oplus}\text{SO}_3\text{H}$ and $\text{Cl}^{\oplus}$.   1+2=3

4. Synthons may or may not be reaction intermediate of a synthesis. Explain.   2

5. How will you carry the following conversions?   1×2=2

(i) $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2 \longrightarrow$ (epoxide of tetramethylethylene)

(ii) $-\text{C}\equiv\text{N} \longrightarrow \text{CH}_2\text{CH}_2\text{NH}_2$

Or

Define the terms, 'target molecule' and 'synthons'.   2
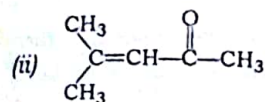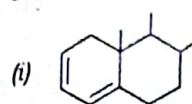
UNIT—II

6. Using Woodward's rule, predict the wavelength of maximum absorption for each of the following compounds :   1+1=2

(i) (octahydronaphthalene structure)

(ii) $\underset{\underset{\text{CH}_3}{|}}{\overset{\overset{\text{CH}_3}{|}}{\text{C}}}=\text{CH}-\overset{\overset{\text{O}}{\|}}{\text{C}}-\text{CH}_3$

7. *(a)* Why is TMS used as an internal standard in NMR spectroscopy?   1

(b) A compound with molecular weight 116 gave the following spectral information :

(i) UV : 283 mμ ε_{max} 22

(ii) IR : 3000–2500 (*b*), 1715 (*s*), 1342 cm^{-1} (*w*)

(iii) NMR : 7·88 τ singlet (3*H*), 7·40 τ triplet (2*H*), 7·75 τ triplet (2*H*) and −11 τ singlet (1*H*)

Find the structural formula of the compound.   5

(6)

Or

Explain clearly the term 'spin-spin coupling'. Why does a peak for a particular set of protons split into a multiplet? Give examples.

$3+1+1=5$

UNIT—III

8. (a) What do you mean by essential fatty acids? What are the functions of fats?

$1+1=2$

Or

What are the functions of triglycerides? Explain.

2

(b) What is rancidity? How can you prevent rancidity?

$1+1=2$

Or

What are the 'bad' fats and which foods contain them?

2

UNIT—IV

9. (a) What are the requirements of a substance to act as a dye? Name two substances which meet these requirements.

$1+1=2$

(7)

Or

Account for the colour changes occurring when phenolphthalein is used as indicator in acid-base titration.

2

(b) How are the following compounds synthesized in the laboratory? $1\frac{1}{2}\times2=3$

(i) Malachite green

(ii) Fluorescein

Or

Write the structural formulas of the following dyes and mark the chromophore and auxochrome in each case :

$1\times3=3$

(i) Congo red

(ii) Alizarin

(iii) Rosaniline

UNIT—V

10. (a) Write a stepwise mechanism for the polymerization of propylene in the presence of sulphuric acid.

2

(b) A polymer sample contains 30% molecules of molecular mass 20000, 40% molecules of molecular mass 30000, and the rest of molecular mass 60000. Calculate the number and weight average molecular mass of the polymer sample. Estimate the polydispersity index of the sample. $2+1=3$

Or

Arrange the following polymers in increasing order of their intermolecular forces. Also classify them as addition and condensation polymers : 1+2=3

Polystyrene, terylene, natural rubber

(c) Giving suitable example, illustrate the mechanism of anionic addition polymerization. 2

UNIT—VI

11. (a) Write the advantages of using water as Green solvent. 2

Or

Why biocatalyst has many advantages in the context of Green chemistry?

(b) What is phase-transfer catalyst? Give an example. 1

★ ★ ★