

2017

(May)

CHEMISTRY

(Major)

Course : 605

(Organic Chemistry)

(New Course)

Full Marks : 48

Pass Marks : 14

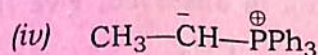
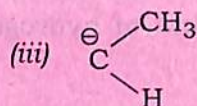
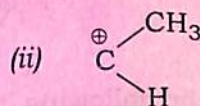
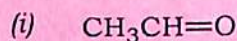
Time : 2 hours

The figures in the margin indicate full marks for the questions

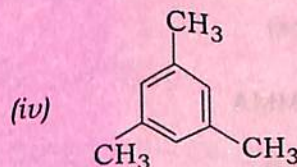
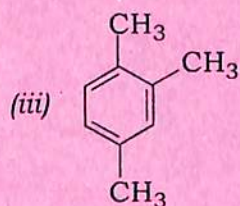
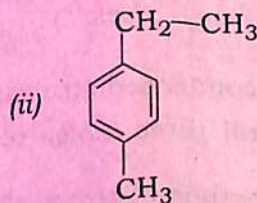
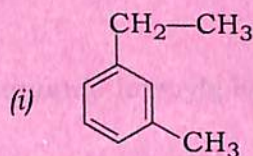
1. Choose the correct answer from the following :

1×5=5

(a) Which one of the following is the correct synthon of the synthetic equivalent $\text{Ph}_3\text{P} = \text{CH} - \text{CH}_3$?



(b) The NMR spectrum of the compound C_9H_{12} , exhibits τ 3.22 (s, 3H) and 7.75 (s, 9H). Which of the following structures is in conformity with the data?



(c) Which of the following is a xanthate dye?

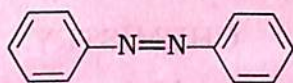
(i) Phenolphthalein

(ii) Fluorescein

(iii) Congo red

(iv) Orange II

(d) The compound



(azobenzene) having a chromophore $-N=N-$, is known as

(i) auxochrome

(ii) vat dye

(iii) mordant dye

(iv) chromogen

(e) In which region, NMR spectra are observed?

(i) Microwave

(ii) UV/visible

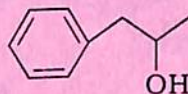
(iii) Radiofrequency

(iv) X-ray

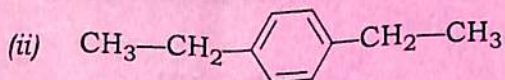
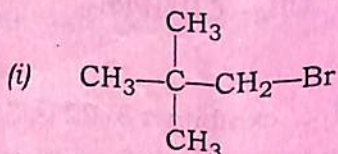
2. Answer any *five* from the following :

2×5=10

(a) Simply show that where to disconnect and mention the synthons and synthetic equivalents of the following :



(b) In which of the following molecules does spin-spin coupling occur? If splitting is observed, give the multiplicity of each kind of hydrogen :



(c) Draw the condensed structural formula of a triacyl glycerol obtained from glycerol and three moles of stearic acid.

(d) Give the method of preparation of the monomers of the following polymers (any one) :

(i) PMMA

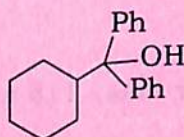
(ii) PAN

- (e) What are leucocompounds? How is Fuchsine prepared?
- (f) The IR spectrum of methyl salicylate shows the peaks 3300 cm^{-1} , 1700 cm^{-1} , 3050 cm^{-1} , 1540 cm^{-1} , 1590 cm^{-1} and 2950 cm^{-1} . Attribute these peaks to the following :

- (i) $-\text{CH}_3$
- (ii) $>\text{C}=\text{O}$
- (iii) $-\text{OH}$ group of the ring
- (iv) Aromatic ring

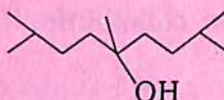
UNIT—I

3. Synthesize the following compound with proper retrosynthetic analysis : 3



Or

- Synthesize the following tertiary alcohol with retrosynthetic analysis : 3

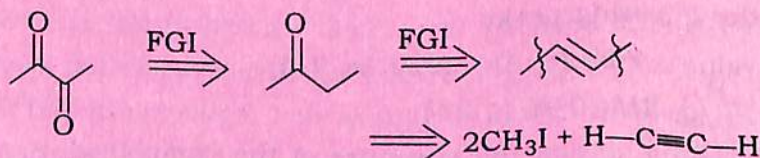


4. How would you synthesize the following TM, working reverse with Wittig reaction? 2



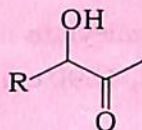
Or

- From the disconnection pattern shown below, synthesize the following TM : 2



5. Mention where to disconnect the following α -hydroxyketone and suggest its synthesis :

3

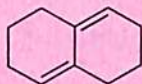


UNIT—II

Answer *any one* question

6. (a) Calculate λ_{\max} in UV spectrum for the following compound :

2



- (b) Distinguish between the isomers of compound having molecular formula C_3H_6O using IR technique.

2

- (c) A compound with molecular mass 116 gives the following information on analysis :

UV : 283 $m\mu$ $\epsilon_{\max} 22$

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

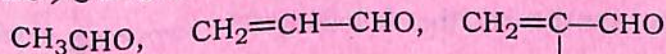
NMR δ value : 2.12 (s, 3H), 2.60 (t, 2H), 2.25 (t, 2H), 11.1 (s, 1H)

Assign the structure of the compound.

3

7. (a) Compare the $>C=O$ stretching absorptions in the following compounds :

3



CH_3

(i)

(ii)

(iii)

- (b) A compound with molecular formula $C_{10}H_{20}O$ shows a strong absorption at 1705 cm^{-1} in its IR spectrum and NMR spectrum of the compound shows the following peaks :

δ value : 7.22 (s, 5H), 3.59 (s, 2H)

2.77 (q, 2H), 0.95 (t, 3H)

Giving reasons, assign the structure of the compound.

4

UNIT—III

8. Answer any *two* questions :

2×2=4

- (a) What is rancidity? How can you prevent rancidity?
- (b) What are phosphoglycerides? Mention their biological importances.
- (c) What is saponification value of a fat? What is its significance in determining the quality of lipid?

UNIT—IV

Answer *any one* question

9. (a) What are the chromophores and auxochromes present in the following dyes?

1+1=2

(i) Methyl orange

(ii) Indigotin

(b) What are the requisites for a compound to be acted as a dye?

1

(c) Synthesize alizarin from phthalic anhydride.

2

10. (a) How will you synthesize fluorescein?

2

(b) How would you prepare Congo red from naphthionic acid? Discuss its use as acid-base indicator.

2+1=3

UNIT—V

Answer *any one* question

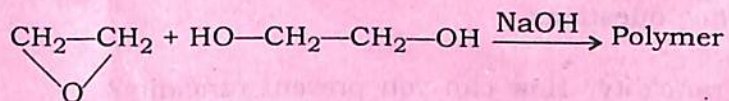
11. (a) How are Nylon-6 and Nylon-6,6 manufactured? Show the process through which molecular chains are held together in them.

1+1+1=3

(b) Rubber and gutta-percha both are polyisoprene derivatives. Upon ozonolysis both form laevulic aldehyde ($\text{CH}_3\text{COCH}_2-\text{CH}_2-\text{CHO}$). On the basis of this information, how would you assign their structural segments and relationships?

2

- (c) Give the possible structure of the polymer obtained in the following reaction : 1



12. (a) Define isotactic, syndiotactic and atactic polymers with suitable illustrations. 1+1+1=3
- (b) Discuss how you would prepare the following (any one) :
- (i) Phenol-formaldehyde resin
- (ii) A polyester 2
- (c) What change occurs in the chain structure when rubber is vulcanized? 1

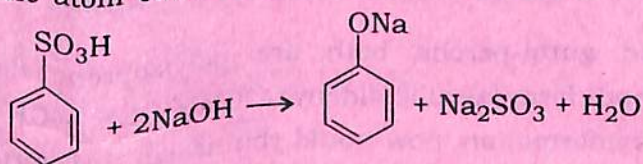
UNIT—VI

Answer any **one** question

13. (a) "Synthetic methods should be designed to maximize the incorporation of all the starting materials in the process into the final product." Explain the statement with suitable example. 2
- (b) Give one Green reaction which can be carried out in aqueous medium. 1
14. (a) Give any three basic principles to plan a Green synthesis. 1½
- (b) Explain that catalytic reagents (as selective as possible) are superior to stoichiometric reagents. 1½

Or

Calculate the atom efficiency of the following reaction : 1½



(Old Course)

Full Marks : 48

Pass Marks : 19

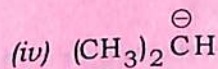
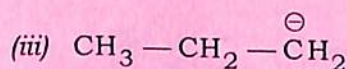
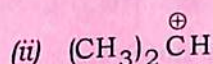
Time : 3 hours

The figures in the margin indicate full marks for the questions

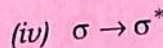
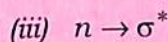
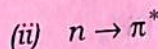
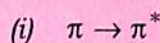
1. Choose the correct answer from the following :

1×5=5

(a) The correct synthon of the synthetic equivalent of $[(\text{CH}_3)_2\text{CH}]_2\text{CuLi}$ is



(b) In a carbonyl compound, the increase in polarity of a solvent, which one of the following transitions shifts to shorter wavelength?



(c) Which of the following is a xanthene dye?

(i) Phenolphthalein

(ii) Orange II

(iii) Fluorescein

(iv) Congo red

(d) The multiplicity of the signals of $\text{CH}_3 - \text{CH}_2 - \text{OH}$ in NMR spectroscopy is

(i) two triplet and a quartet

(ii) singlet, triplet and quartet

(iii) three singlet

(iv) None of the above

(e) Which one of the following is a thermosetting polymer?

(i) Nylon-6

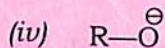
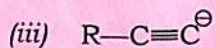
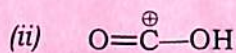
(ii) Nylon-6,6

(iii) Bakelite

(iv) SBR

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

(a) Write down the synthetic equivalents for the following synthons : ½×4=2

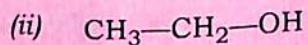
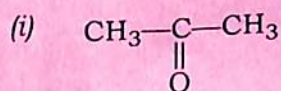


(b) Write short notes on : 1+1=2

(i) Bathochromic or red shift

(ii) Hypsochromic or blue shift

(c) Give the approximate IR absorption bands of the following compounds : 1+1=2



(d) Give the names and structures of the monomer units that are used to prepare the following polymers : 1+1=2

(i) Orlon

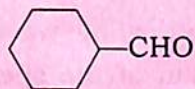
(ii) Neoprene

(e) What are acidic azo dyes? How is methyl orange prepared? 1+1=2

(f) What is the range of infrared radiations? What are the units used in IR spectroscopy? 1+1=2

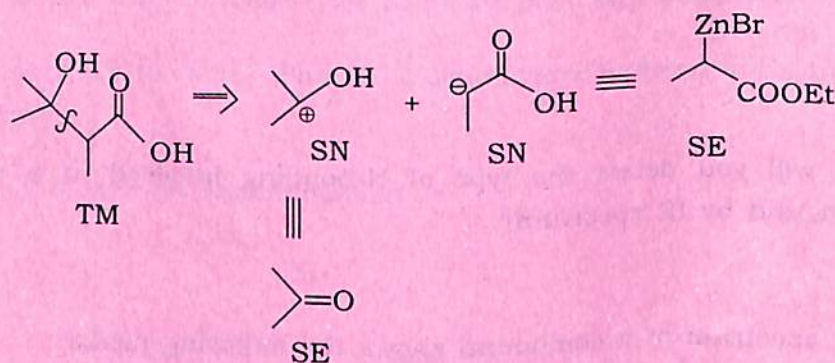
(g) Write the advantages of using water as Green solvent. 2

3. Synthesize the following compound with proper retrosynthetic analysis : 3

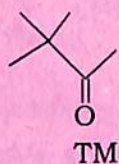


Or

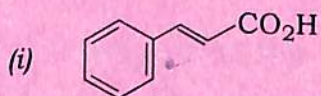
From the disconnection pattern shown below, propose the synthesis for the TM : 3



4. What do you mean by FGI? How would you synthesize the following TM working reverse with pinacol-pinacolone transform? 1+2=3



5. Simply show where to disconnect the following and mention their synthons and synthetic equivalents : 1+1=2

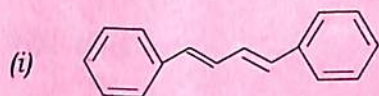


UNIT—II

Answer any **one** question

6. (a) Indicate the increasing order of wavelength λ_{\max} of the following compounds in the UV region of the spectrum :

2



- (b) How will you detect the type of H-bonding involved in a particular compound by IR spectrum?

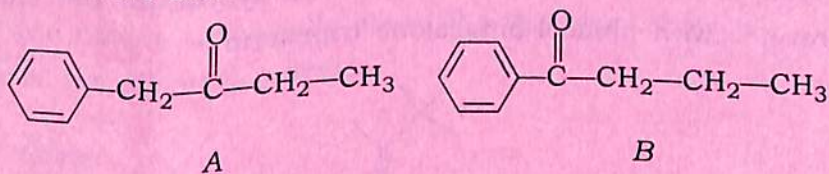
2

- (c) PMR spectrum of a compound shows the following peaks :

NMR δ value : 7.22 (s, 5H), 3.59 (s, 2H), 2.77 (q, 2H), 0.97 (t, 3H)

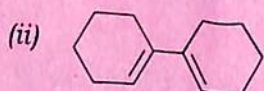
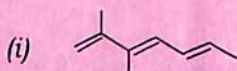
In the IR spectrum, there is a strong absorption band at 1705 cm^{-1} . Giving reasons, find out which of the following structures is in keeping with the above data :

3



7. (a) Calculate λ_{\max} for the following structures (any one) :

2



- (b) Explain the term 'spin-spin coupling'. Why does a peak for a particular set of protons split into a triplet? Give example.

3

(c) A compound having molecular formula $C_{10}H_{14}$ gives the following NMR data :

(i) Singlet (δ 0.88) 9H

(ii) Singlet (δ 7.28) 5H

Assign the structure to the compound on the basis of the above data. 2

UNIT—III

8. Answer any two questions :

2×2=4

(a) What are triglycerides? Give two examples with structures.

(b) What is iodine value? What is its significance in determining the quality of a lipid?

(c) Write a note on rancidification.

UNIT—IV

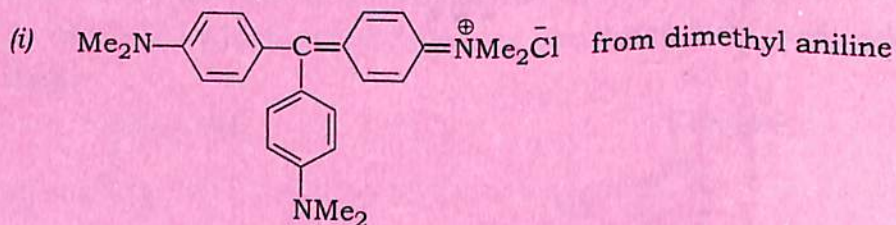
Answer any one question

9. (a) Explain the terms 'chromophores' and 'auxochromes' giving suitable examples.

1+1=2

(b) Suggest synthesis of the following :

1½×2=3



(ii) Indigotin from anthranilic acid

10. (a) Why do we use methyl orange as acid-base indicator?

2

(b) What is the difference between phthalein and xanthene? How would you prepare phenolphthalein?

1+2=3

UNIT—V

Answer any **one** question

11. (a) Discuss the mechanism of anionic polymerization of methyl methacrylate. 2
(b) How would you prepare the following (any two)? 2×2=4
(i) Nylon-6
(ii) Urea-formaldehyde resin
(iii) Neoprene
12. (a) Illustrate the process of condensation polymerization with particular emphasis in the formation of polyester. 2
(b) Write a short note on Ziegler-Natta polymerization. 2
(c) What is the significance of the process of vulcanization in the rubber industry? 2

UNIT—VI

13. Why are the uses of most of the organic solvents not preferred in Green chemistry? Give two examples of ultrasound and microwave assisted reactions. 2+1=3

Or

Why biocatalyst has many advantages in the context of Green chemistry? Name two Green catalysts and their uses. 2+1=3
