**6 SEM TDC CHM M 5 (N/O)**

**2019**

( May )

CHEMISTRY

( Major )

Course : 605

**( Organic Chemistry )**

( New Course )

*Full Marks* : 48

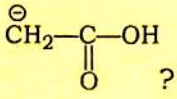
*Pass Marks* : 14

*Time* : 2 hours

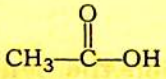
*The figures in the margin indicate full marks for the questions*

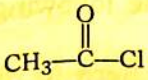
**1.** Choose the correct answer from the following : 1×5=5

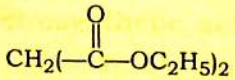
*(a)* Which one is the correct synthetic equivalent of the synthon

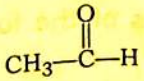


?

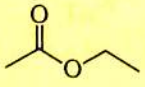
*(i)* 

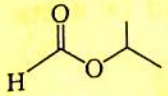
*(ii)* 

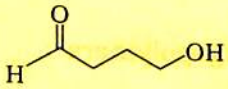
*(iii)* 

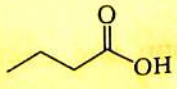
*(iv)* 

*(b)* A compound (MF $C_4H_8O_2$) shows a strong absorption band at 1718 $cm^{-1}$ and broadband in the region 3000 $cm^{-1}$–2500 $cm^{-1}$. Which of the following structures is in conformity with the IR data?

*(i)* 

*(ii)* 

*(iii)* 

*(iv)* 

(c) Which one of the following dyes is used to prepare Schiff's reagent?

(i) Crystal violet

(ii) Fuchsine

(iii) Malachite green

(iv) Phenolphthalein

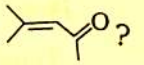
(d) Which one of the following is a compound lipid?

(i) Myricyl palmitate

(ii) Glyceryl linoleate

(iii) Phosphatidyl serine

(iv) Triolein

(e) What is the $\lambda_{max}$ of the compound  ?

(i) 253

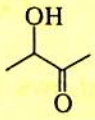
(ii) 249

(iii) 268

(iv) 239

**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 :



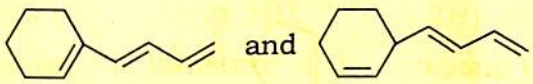

(b) Predict the appearance of high resolution *p*-NMR spectrum of *(i)* acetaldehyde and *(ii)* acetic acid.

(c) Give the preparation and uses of the following polymers :

PMMA and Saran

(d) What are the indigotin blue and indigotin white? Write their structures.

(e) Explain how the UV spectrum can be used to decide between the following isomeric compounds :



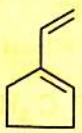
(A) and (B)

(f) Synthesize a known xanthan dye.

(g) Why is real-time in process analysis beneficial to green chemistry?

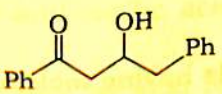
UNIT—I

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

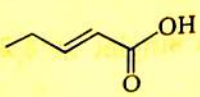


*Or*

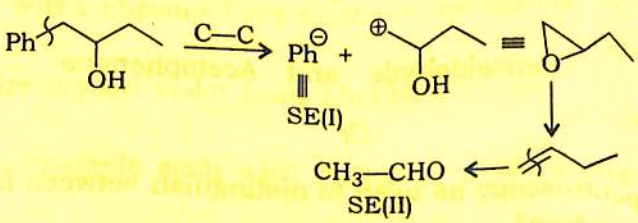
What do you understand by the terms synthon and synthetic equivalent? Synthesize the following compound with retro-analysis : 1+2=3




**4.** The following TM can be made through Wittig reaction. Synthesize it with proper retrosynthetic analysis : 2

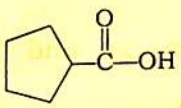



**5.** From the disconnection pattern shown below, synthesize the following TM : 2



*Or*

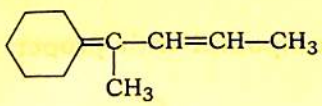
Mention the retrosynthetic procedure of the following compound so that diethyl malonate acts as one of the synthetic equivalents : 2



UNIT—II

Answer *any* **one** question

**6.** *(a)* Using Woodward-Fieser rules, calculate the value of absorption maxima for the following compound : 2



*(b)* Two isomers of *A* and *B* (MF $C_3H_6O$) exhibit the following peaks in the IR spectrum :

*(i)* 1710 cm

*(ii)* 3300 $cm^{-1}$, 1640 $cm^{-1}$

Write these structures. 2

*(c)* Three isomeric compounds having molecular formula $C_5H_{10}O$ display the following NMR spectral characteristics. Identify the compounds : 3

*(i)* A triplet at $\delta$ 1·05 and a quartet at $\delta$ 2·47

*(ii)* Two singlets

*(iii)* A doublet at $\delta$ 1·0, a singlet at $\delta$ 2·1 and a septet at $\delta$ 2·2

**7.** *(a)* Using NMR, how will you distinguish between the following pairs of compounds? 2+2=4

Benzaldehyde and Acetophenone

*Or*

How can IR spectroscopy be used to distinguish between inter and intra-molecular H-bonding? 4

(b) A compound with molecular formula $C_{10}H_{12}O$ shows a strong absorption at 1705 $cm^{-1}$ in the IR spectrum and NMR spectrum of the compound shows the following peaks :

δ value 7·22 (s, 5*H*), 3·59 (s, 2*H*), 2·77 (*q*, 2*H*), 0·95 (*t*, 3*H*)

Giving reasons, assign the structure of the compound. 3

UNIT—III

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

(a) What are oils and fats? What is the importance of hydrogenation of oils? Explain with examples.

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

(c) What is saponification value of a fat or oil? Calculate the saponification value of tristearin. (Molecular mass 890)

(d) What are compound lipids? Give their biological importance.

UNIT—IV

Answer *any* **one** question

**9.** (a) Synthesize indigotin from anthranilic acid. 2

(b) Why do we use methyl orange as acid-base indicator? 2

(c) What are the chromophores and auxochromes present in the following dyes? 1

(i) Alizarin

(ii) Congo red

**10.** (a) Discuss briefly the relationship between colour and constitution on the basis of Witt's chromophore-auxochrome theory. 2

(b) Synthesize crystal violet from Michler's ketone. 2

(c) Give one example each with structure of a xanthen dye and mordant azo dye. 1

## UNIT—V

Answer *any* **one** question

**11.** *(a)* What are Ziegler-Natta catalysts? Discuss their importance in the formation of addition polymer. 1+2=3

*(b)* What is the significance of vulcanization in rubber industry? 2

*(c)* What are phenol-formaldehyde resins? Outline the reactions involved for the formation of Bakelite. 1+1=2

**12.** *(a)* Complete the following reactions (any *one*) : 2

*(i)* Ethylene glycol + Adipic acid $\longrightarrow$ Polymeric diol

$$\xrightarrow{\text{Toluene diisocyanate}} \text{Polyurethan foam}$$

*(ii)* Cyclohexanone + Hydroxylamine $\longrightarrow$

$$\xrightarrow{H_2SO_4} \text{Caprolactum} \longrightarrow \longrightarrow \text{Nylon 6}$$

*(b)* What type of alkenes prefer to undergo cationic polymerization? Discuss the role of electron donating groups in cationic polymerization. 1+2=3

*(c)* *(i)* Write the structure of copolymer of styrene and maleic anhydride. 1

*(ii)* Give the structures of the monomers of Teflon and Orlon. ½+½=1

## UNIT—VI

**13.** *(a)* What are ionic liquids? Mention one advantage of using ionic liquids instead of conventional organic solvents. 1+1=2

*Or*

Define atom economy of a reaction. Give one example. 2

*(b)* Give one example of—

ultrasound-assisted reaction

*Or*

microwave-assisted reaction in solid state. 1

( Old Course )

*Full Marks* : 48

*Pass Marks* : 19

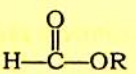
*Time* : 3 hours

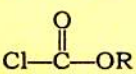
*The figures in the margin indicate full marks for the questions*

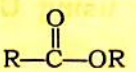
**1.** Choose the correct answer from the following : 1×5=5

*(a)* Which one is the correct synthetic equivalent of the synthon $O{=}\overset{\oplus}{C}{-}OR$ ?

*(i)* $CO_2$

*(ii)* 

*(iii)* 

*(iv)* 

*(b)* High resolution NMR spectrum of 1,1,2-trichloroethane consists of

*(i)* a singlet

*(ii)* a singlet and a doublet

*(iii)* a doublet

*(iv)* a doublet and triplet

*(c)* Which dye is used as an indicator, as red in basic solution and blue in acidic solution?

*(i)* Phenolphthalein

*(ii)* Methyl red

*(iii)* Congo red

*(iv)* Methyl orange

*(d)* Which one of the following is a non-edible oil?

*(i)* Cottonseed oil

*(ii)* Linseed oil

*(iii)* Soya bean oil

*(iv)* Coconut oil

(e) The monomers of Buna-S rubber are

(i) styrene and butadiene

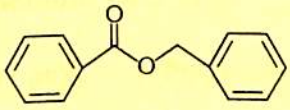
(ii) isoprene and butadiene

(iii) vinyl chloride and sulphur

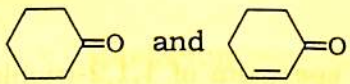
(iv) butadiene

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

(a) Simply show where to disconnect and mention the synthons and their synthetic equivalents



(b) How can you distinguish the following compounds using UV and IR spectra?




(c) How can phthalic acid be converted into fluorescein?

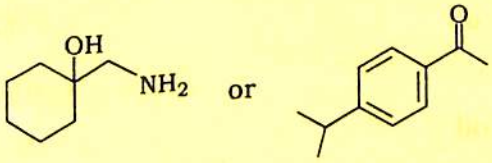
(d) Give biological importance of lipids.

(e) Explain the difference between polyesters and polyacrylates giving one example for each.

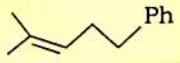
(f) Write the advantages of using water as green solvent.

## UNIT—I

**3.** Disconnect and synthesize the following : 2

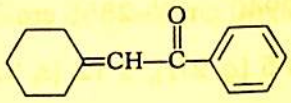


**4.** How would you synthesize the following TM working reverse with alcohol disconnection? 3

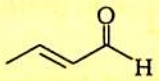



*Or*

What is Wittig reaction? Synthesize the following TM, working reverse with Wittig transform : 1+2=3




**5.** Using disconnection approach, synthesize the following molecule : 2

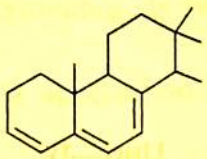



(Aldol transform)

## UNIT—II

Answer *any* **one** question

**6.** *(a)* Calculate $\lambda_{max}$ for the following compound : 2



*(b)* Write a short note on fingerprint region in an IR spectrum. 3

*Or*

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

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

*(i)* Singlet $\delta = 0{\cdot}88$, $9H$

*(ii)* Singlet $\delta = 7{\cdot}28$, $5H$

Assign the structure of the compound. 2

**7.** *(a)* Explain terms of bathochromic or red shift and hypsochromic or blue shift with suitable examples. 2

*(b)* Write a note on Fermi resonance. 2

*(c)* An organic compound having MF $C_4H_8O$ exhibits the following spectral informations :

UV : 275 nm ($\varepsilon_{max}$ 17)

IR : 1715 $cm^{-1}$, 2940 $cm^{-1}$–2855 $cm^{-1}$

NMR : $\delta$ values 2·5 (*q*, 2*H*), 2·12 (s, 3*H*) and 1·07 (*t*, 3*H*)

Assign the structure. 3

## UNIT—III

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

*(a)* What are triglycerides and phosphoglycerides? Give one example for each with structure.

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

*(c)* What is saponification value of fat? What is its significance in determining the quality of lipid?

## UNIT—IV

Answer *any* **one** question

**9.** *(a)* What are the chromophore and auxochrome present in the following? 1×2=2

*(i)* Indigotin

*(ii)* Rosaniline

*(b)* Give the synthesis of the following dyes : 1½×2=3

*(i)* Crystal violet

*(ii)* Congo red

**10.** *(a)* Account for the colour changes occurring when methyl orange is used as indicator in acid-base titration. 2

*(b)* How would you synthesize malachite-green and *para*-rosaniline? 1½+1½=3

UNIT—V

Answer *any* **one** question

**11.** *(a)* What are copolymers? Illustrate the formation of a typical copolymer. 1+1=2

*(b)* Discuss the mechanism of anionic polymerization of methyl methacrylate. 2

*(c)* What do you understand by the term 'biodegradable polymers'? Give two examples. 1+1=2

*(d)* Give an example of epoxy resin. 1

**12.** *(a)* Discuss the mechanism of a peroxide initiated chain growth polymerization involving any vinyl polymer. 3

*(b)* Write a note on phenol-formaldehyde resin. 2

*(c)* What is neoprene? Give its application. 2

UNIT—VI

**13.** Why are the uses of most organic solvents not preferred in green chemistry? Mention four alternative ways for replacement of organic solvents. 1+2=3

*Or*

Why biocatalyst has many advantages in the context of green chemistry? Name two green catalysts and their uses. 3

★ ★ ★