Total No. of Printed Pages—15

5 SEM TDC CHM M 5 (N/O)

2016

(November)

CHEMISTRY

(Major)

Course : 505

(Organic Chemistry)

The figures in the margin indicate full marks for the questions

(New Course)

Full Marks : 48

Pass Marks : 14

Time : 2 hours

1. *(a)* Select the correct answer of the following : 1×3=3

(i) Which of the following pairs give the same osazone?

(1) Sucrose, Fructose

(2) Mannose, Fructose

(3) Glucose, Galactose

(4) Maltose, Lactose

(ii) The enzyme which hydrolyzes triglycerides to fatty acids and glycerol is called

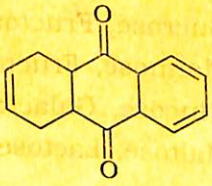
(1) maltase
(2) zymase
(3) lipase
(4) pepsin

(iii) In DNA, the complementary bases are

(1) adenine and guanine; thymine and cytosine
(2) uracil and adenine; cytosine and guanine
(3) adenine and thymine; guanine and cytosine
(4) adenine and thymine; guanine and uracil

(b) Draw the structure of Ranitidine (Zantac). 1

(c) What dienes and dienophiles would you employ to synthesize the following compound? 1

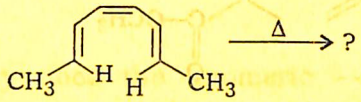


UNIT—I

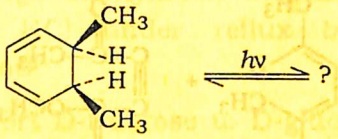
Answer *any* **one** question

2. *(a)* Predict the stereochemical products obtained in the following electrocyclic reactions (any *one*) : 1

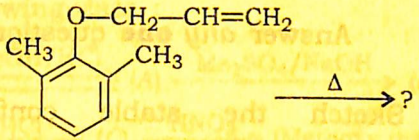
(i)



(ii)



(b) Complete the following reaction and discuss the mechanism involved : 3

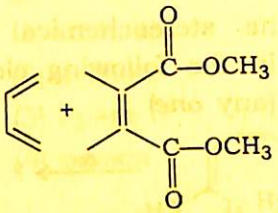


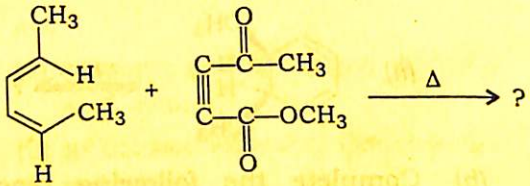
(c) Explain briefly as to how a conjugated diene under photochemical conditions undergoes cyclization via a disrotatory path. 3

3. *(a)* How would you convert *trans*-5,6-dimethyl-1,3-cyclohexadiene into its *cis*-isomer? 2

(b) Draw the MO of 1,3-butadiene indicating HOMO in the ground and excited state. 3

(c) Write the products with stereochemistry in the following Diels'-Alder reaction (any *one*) : 2

(i) 

(ii) 

UNIT—II

Answer *any* **one** question

4. (a) Sketch the stable conformational structure of the anomer of α-D-gluco-pyranose. 2

(b) Explain the products obtained in the following periodic oxidation of α-D-fructopyranose : 3

α-D-fructopyranose $\xrightarrow[\text{reflux}]{\text{D MeOH/HCl}}$ (*A*) $\xrightarrow[-\,HCO_2H]{HIO_4}$ (*B*)

$\xrightarrow{Br_2 | H_2O}$ (*C*) $\xrightarrow{SrCO_3}$ strontium salt

$\xrightarrow[-\,MeOH]{H_3O^+}$ hydroxypyruvic acid + glycolic acid

(c) Explain that C-2 epimeric aldoses give the same lower aldose by Ruff degradation. 3

(d) What is epimerization? Explain it considering the conversion of D-mannose to D-glucose. 3

5. (a) Why does the anomeric —OH group undergo methylation with CH_3OH and with HCl under reflux but others do not? 2

(b) Convert D-fructose to D-glucose. 3

(c) Determine whether D-glucose is in a furanose or a pyranose form from the following data : 4

$$\text{D-glucose} \xrightleftharpoons{MeOH/HCl} (A) \xrightarrow{Me_2SO_4/NaOH} (B)$$

$$\xrightarrow{\text{dil.HCl}} (C) \xrightarrow{HNO_3} \text{(Methoxy malonic acid + Dimethoxy glyceric acid + dimethoxy succinic acid + Methoxy acetic acid)}$$

(d) $$\text{Erythrose} \xrightarrow{KCN} \xrightarrow[H_2SO_4]{Ba^{+2}} \xrightarrow{\Delta} \xrightarrow[H_3O^+]{Na/Hg} (A) + (B)$$

$$(A) \xrightarrow{HNO_3} \text{Dibasic acid (optically active)}$$

$$(B) \xrightarrow{HNO_3} \text{Dibasic acid (optically inactive)}$$

Identify *A* and *B*. 2

UNIT—III

Answer *any* **one** question

6. *(a)* Synthesize one important pyrimidine base present only in RNA. 3

(b) How are enzymes classified on the basis of their functions? 3

(c) How does DNA replicate? How is the process responsible for preservation of heredity? 3

7. *(a)* What are complementary bases? Draw the structure to show hydrogen bonding between adenine—thymine and guanine—cytosine. 3

(b) Write a short note on coenzyme. 3

(c) Discuss the double-helical structure of DNA. 3

UNIT—IV

Answer *any* **one** question

8. *(a)* Synthesize a drug which is used to bring down body temperature during fever. 2

(b) Draw the structure of chloramphenicol. What type of drug is it? 1+1=2

(c) Sulpha drugs work like antibiotics but they are not antibiotics. Is this a valid statement and why? 2½

(d) Name the food sources and the deficiency diseases caused due to lack of vitamin C. 2½

9. (a) Write in brief about the medicinal importance of curcumin. 2

(b) Carry out the synthesis of an antimalarial-chloroquine using the following sequential steps : 1½+1½+1=4

Step I : Synthesis of 5-dimethylamino-2-amino pentane from AAE.

Step II : Synthesis of 4,7-dichloro-quinoline from *m*-chloroaniline and oxalyl acetic ester.

Step III : Synthesis of chloroquine from above amino and quinoline derivatives.

(c) Name the chemical responsible for antiseptic properties of Dettol. 1

(d) Synthesize sulphanilamide from sulphanilic acid. 2

UNIT—V

Answer *any* **one** question

10. *(a)* Synthesize (±) α-terpineol from *p*-toluic acid. 3

(b) Establish the structure of citral on the basis of analytical and synthetic evidences. 4

11. *(a)* What are geraniol and nerol? How would you assign their configuration? 1+2=3

(b) Complete the following oxidative degradation reactions of α-terpineol : 4

α-terpineol (C_{10}) $\xrightarrow{1\%\ \text{alk. } KMnO_4}$ trihydroxy compound (C_{10})

$\xrightarrow{CrO_3 \text{ in AcOH}}$ [ketohydroxy acid] (C_{10}) $\longrightarrow$

ketolactone (C_{10}) $\xrightarrow{\text{warm, alk. } KMnO_4}$ terpenylic acid (C_8)

$\xrightarrow{KMnO_4}$ terebic acid (C_7)

(Continued)

(Old Course)

Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. *(a)* Select the correct answer of the following : 1×3=3

(i) Glucose is stored in our body as

(1) carbohydrate

(2) fat

(3) glycogen

(4) lipid

(ii) The relationship between the nucleotide triplets and the amino acid is called

(1) enzyme

(2) genetic code

(3) replication

(4) mutation

(iii) The function of enzymes in the living system is to

(1) provide energy

(2) transport oxygen

(3) provide immunity

(4) catalyze biochemical reaction

(b) What type of drug is chloramphenicol? 1

(c) Giving one example, state isoprene rule. 1

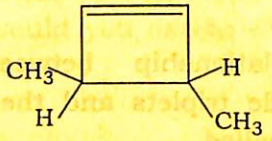
UNIT—I

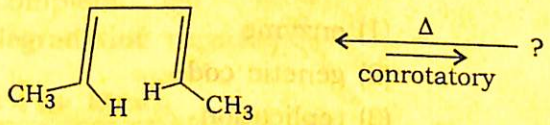
Answer *any* **one** question

2. *(a)* Draw the π-orbital diagrams for the ground state of 1,3-butadiene indicating HOMO. 3

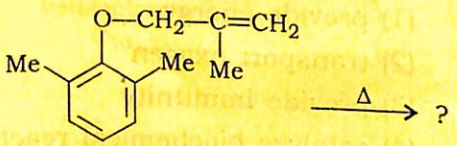
(b) Explain that [4+2] cycloaddition is photochemically forbidden. 2

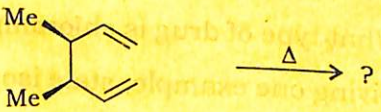
(c) What stereochemical products are obtained in the following reactions (any *one*)? 2





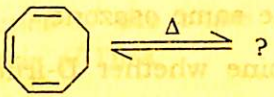
3. *(a)* What is sigmatropic rearrangement? Predict the products obtained in the following reactions : 1+1+1=3





(b) What is meant by a pericyclic reaction? With the help of FMO approach, show that Diels'-Alder reaction is a concerted stereospecific reaction. 1+2=3

(c) Complete the following electrocyclic reaction : 1



UNIT—II

Answer *any* **one** question

4. (a) Represent β-D-fructopyranose in Haworth projection and its stable conformation. 2

(b) Convert D-ribose to a pair of epimeric-D-aldohexoses by using Fischer-Kiliani synthesis. 3

(c) Explain that both α-D-glucopyranose and α-D-allopyranose give the same strontium salt, having same specific rotation, by using periodic oxidation. 4

α-D-glucopyranose
or
α-D-allopyranose

$$\xrightarrow[\text{MeOH/HCl}]{} ? \xrightarrow{HIO_4} ? \xrightarrow{Br_2|H_2O} ? \xrightarrow{SrCO_3} \text{strontium salt}$$

having same specific rotation

(d) Complete the following reactions : 2

$$\text{D-glucopyranose} \xrightarrow[\text{or } NaBH_4]{\text{Na-Hg}|H_2O} \text{optically active glucitol}$$

$$\xrightarrow{HI/\text{red P}} ?$$

5. *(a)* Explain why D-glucose and D-fructose give the same osazone. 1½×2=3

(b) Determine whether D-fructose is in a furanose or a pyranose form from the following evidences : 4

$$\text{D-fructose } C_6H_{12}O_6 \underset{}{\overset{MeOH/HCl}{\rightleftharpoons}} (A) \xrightarrow[NaOH]{\text{excess } Me_2SO_4} (B) \xrightarrow{\text{dil. HCl}} (C)$$

$$\xrightarrow{\text{dil. } HNO_3} (D) \xrightarrow[H_2SO_4]{KMnO_4} \delta\text{-lactone} \xrightarrow[HNO_3]{\text{oxidation}}$$

Arabinotrimethoxy glutaric acid

(c) What happens when allopyranose reacts with acetone in presence of H_2SO_4? 2

(d) Convert D-fructose to epimeric aldohexoses. 2

UNIT—III

Answer *any* **one** question

6. *(a)* Draw the structures of the—

(i) nucleoside of guanosine;

(ii) nucleotide of AMP. 1+1=2

(Continued)

(b) How would you synthesize thymine from urea or thiourea? 2

(c) What kinds of specificity the enzymes display in their action? 2

(d) State the constitutional differences between DNA and RNA. Write down the names of the bases produced on hydrolysis of DNA. 2+1=3

7. (a) Synthesize one important purine present in both DNA and RNA. 2

(b) Write a note on replication of DNA. 2

(c) In what ways enzymes differ from a typical inorganic catalyst? Outline the steps in an enzyme-catalyzed reaction. 1+2=3

(d) Distinguish between nucleotide and nucleoside. 2

UNIT—IV

Answer *any* **one** question

8. (a) Draw the structure of Ibuprofen. Give one important use of it. 2

(b) How do the sulpha drugs prevent the growth and multiplication of bacteria when administered into a host body? 3

(c) Synthesize a drug which can be used as analgesic and antipyretic from phenol. 2

(d) Define broad spectrum and narrow spectrum antibiotics giving one example of each. 2

9. (a) Draw the structures of sulphaguanidine and mention one specific use of it. 1+1=2

(b) Write in brief about the medicinal importance of Azadirachtin (Neem). 2

(c) Give the preparation of the following : 2+2=4

(i) Ibuprofen by using green method

(ii) Paracetamol

(d) What is tincture of iodine? What is its use? 1

UNIT—V

Answer *any* **one** question

10. (a) How would you synthesize α-terpineol from diethyl malonate? 3

(b) Complete the following reactions : 2

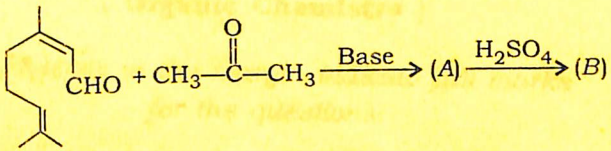
$$\underset{C_{10}H_{16}O}{\text{Citral}} \xrightarrow{H_2/\text{cat.}} (A) \xrightarrow[CrO_3]{\text{oxidation}}$$

a dicarboxylic acid + a ketone

(c) What happens when nerol is treated with dil. H_2SO_4? Write the mechanism of the reaction involved. 2

11. (a) How will you establish the position of double bonds (α, β and isolated) in citral? 2

(b) Predict the products obtained in the following sequence of reactions : 2



(c) Complete the following reactions : 3

6-Methylhept-5-en-2-one $\xrightarrow[\text{Reformatsky reaction}]{\text{Zn/A bromoester}}$ (A)

$\xrightarrow{Ac_2O}$ $\xrightarrow[+ \text{ calcium formate}]{\text{calcium salt}}$ Citral

★★★