Total No. of Printed Pages—16

5 SEM TDC CHM M 5 (N/O)

2018

(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. Select the correct answer from the following : 1×5=5

(a) Thermal (conrotatory) ring opening of *trans*-3,4-dimethyl cyclobutene gives

(i) *Z,Z*-hexa-2,4-diene

(ii) *E,E*-hexa-2,4-diene

(iii) *E,Z*-hexa-2,4-diene

(iv) *Z,E*-hexa-2,4-diene

(b) The product of the reaction

$$C_6H_{12}O_6 \text{ (glucose)} \xrightarrow[2)\ H_3O^+]{1)\ HCN} \xrightarrow{P/HI} ?$$

is

(i) D-glucitol

(ii) D-gluconic acid

(iii) *n*-heptanoic acid

(iv) 2-methyl heptanoic acid

(c) α-Terpineol is a

(i) diterpenoid

(ii) monoterpenoid

(iii) sesquiterpenoid

(iv) terpenoid

(d) Artimisinin is

(i) an antimalarial drug

(ii) an antibacterial drug

(iii) a sulpha drug

(iv) an antiseptic

(e) 2-Acetoxy benzoic acid is

(i) antiseptic

(ii) aspirin

(iii) paracetamol

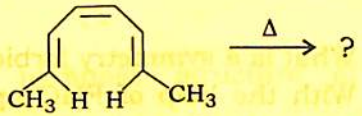
(iv) disinfectant

UNIT—I

Answer *any* **one** question

2. *(a)* Draw the MO of 1,3-butadiene indicating HOMO in the ground and excited states. 2

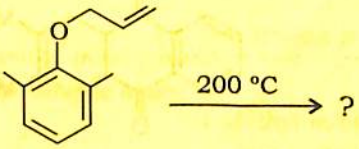
(b) Predict the stereochemical outcome from the following electrocyclic reaction : 1



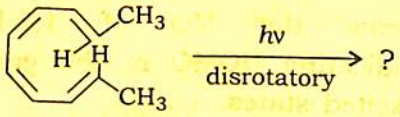
2*E*, 4*Z*, 6*E* octatriene

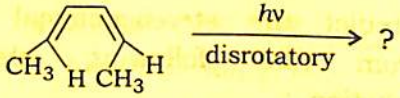
(c) The Diels-Alder reaction is a concerted [4 + 2] process. It proceeds with retention of configuration of both the diene and the dienophile. Explain with suitable examples. 1+1=2

(d) Complete the following reaction and suggest the mechanism : 2



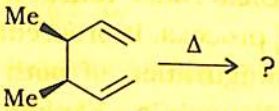
3. *(a)* Predict the stereochemical products obtained in the following electrocyclic reactions : 1×2=2

(i) 

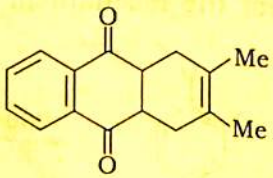
(ii) 

(b) What is a symmetry forbidden reaction? With the help of FMO approach, show that [4+2] cycloaddition is photochemically forbidden. 1+2=3

(c) Complete the following reaction : 1



(d) What diene and dienophile would you employ to synthesize the following compound? 1



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UNIT—II

Answer *any* **one** question

4. *(a)* Sketch the stable conformational structure of α-D-mannopyranose. 1

(b) How would you methylate the —OH groups of α-D-glucopyranose other than enomeric —OH group? 2

(c) How is the configuration of D-glucose determined? Explain. 3

Or

Discuss the pyranose structure of D-glucose.

(d) Define epimerization. Explain it considering the conversion of D-mannose to D-glucose. 1+2=3

(e) What happens when D-erythrose is subjected to Ruff degradation? 2

5. *(a)* Convert D-fructose to D-glucose and D-mannose. 2

(b) Complete the following reactions : 3

D-Erythrulose $\xrightarrow{HCN}$ Epimeric cyanohydrin

$\xrightarrow[2)\ H_2SO_4]{1)\ Ba(OH)_2}$ Epimeric polyhydroxy carboxylic acids $\xrightarrow{HI/red\ P}$ 2-Methyl substituted carboxylic acid

(c) How would you establish the ring structure of D-glucose? 4

(d) Glucose and fructose give same osazone. Explain giving reactions. 2

UNIT—III

Answer *any* **one** question

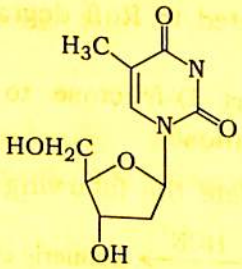
6. (a) Draw the structure of the following (any *one*) : 1

(i) dADP

(ii) ATP

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

(c) Identify the base and monosaccharide used to form the following nucleoside and then name it : 2



(d) What is stop codon? Give example. 2

(e) Write, how the DNA molecule is replicated during cell division. 2

(Continued)

7. *(a)* What are coenzymes? Discuss their functions. 1+1=2

(b) Write in brief about the Watson and Crick double-helix model of DNA. 3

(c) What do you mean by the terms 'transcription' and 'translation'? 2

(d) How are the following compounds related? 2

Adenosine and AMP

UNIT—IV

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

(b) Synthesize chloroquine using the following sequential steps : 1+1+1=3

Step I : AAE to 5-diethyl amino 2-aminopentane

Step II : *m*-Chloroaniline + Oxalyl acetic ester → 4,7-dichloroquinoline

Step III : 4,7-dichloroquinoline + 5-diethyl amino, 2-amino pentane → Chloroquine

Or

Give the preparation of the following : 1½×2=3

(i) Sulphaguanidine from acetanilide

(ii) Ibuprofen by using green method

(c) What are antipyretics? Synthesize a drug which is used to bring down body temperature during fever. 2

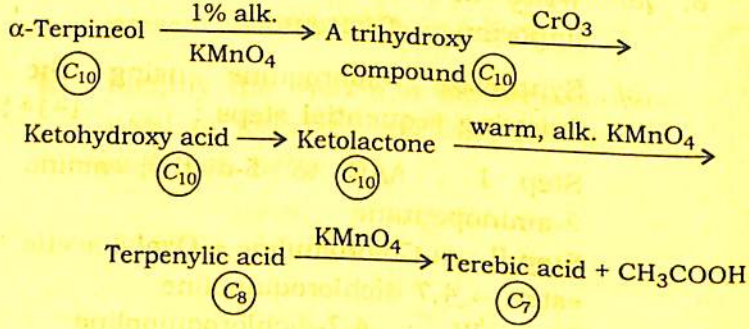
(d) Write down the laboratory synthesis of chloramphenicol. 2

UNIT—V

9. (a) Synthesize citral starting from acetylene and acetone. 3

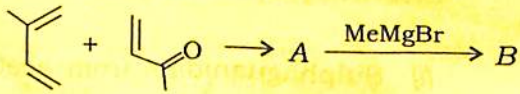
Or

Complete the following oxidative degradation reactions of α-terpeniol :



(b) What are geraniol and nerol? 2

(c) Find out *A* and *B* in the following reaction : 2



(Old Course)

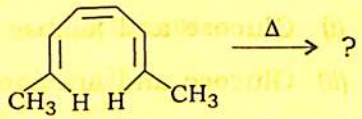
Full Marks : 48

Pass Marks : 19

Time : 3 hours

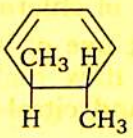
1. Select the correct answer/Answer the following : 1×5=5

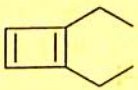
(a) The product obtained during the thermal reaction

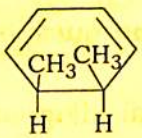


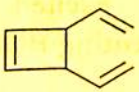
2*E*, 4*Z*, 6*E* octatriene

is

(i) 

(ii) 

(iii) 

(iv) 

(Turn Over)

(b) The pyrimidine bases present in DNA are

(i) cytosine and guanine

(ii) cytosine and thymine

(iii) cytosine and uracil

(iv) cytosine and adenine

(c) Sugars are characterized by the preparation of osazone derivative. Which sugars have identical osazones?

(i) Glucose and lactose

(ii) Glucose and arabinose

(iii) Glucose and fructose

(iv) Glucose and maltose

(d) Draw the structure of chloramphenicol. Give one important use of it. 1

(e) What are citral-a and citral-b? 1

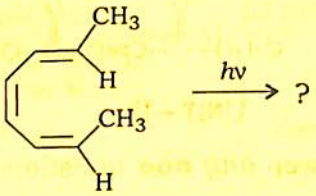
UNIT—I

Answer *any* **one** question

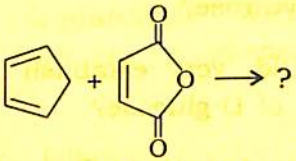
2. (a) Draw the π-orbital diagrams for the ground and the excited states of 1,3-butadiene indicating HOMO in each case. 2

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

(c) Predict the stereochemical products obtained in the following reactions : 1×2=2

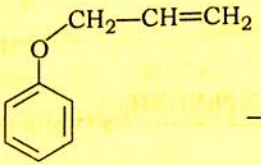
(i) 

2*E*, 4*Z*, 6*Z* octatriene

(ii) 

3. (a) Explain with the help of FMO theory that [1, 5] sigmatropic shift of hydrogen is thermally allowed and occurs in a suprafacial process. 3

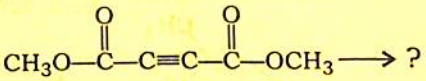
(b) Complete the following reaction and suggest the mechanism : 2



(c) Write the products with stereochemistry in the following Diels-Alder reaction : 1×2=2

(i)  + Dimethylmaleate ⟶ ?

(ii) *trans*-, *trans*-2,4-hexadene +



UNIT—II

Answer *any* **one** question

4. (a) What are the structures of D-threose and D-erythrose? 1

(b) How would you establish the ring structure of D-glucose? 4

(c) Explain that both α-D-glucopyranose and α-D-allopyranose give the same strontium salt having same specific rotation, by using periodic oxidation. 3

(d) Complete the following reactions : 1½×2=3

(i) D-fructose (Open str) $\xrightarrow{H_2/Ni}$? $\xrightarrow[[O]]{\text{controlled } HNO_3}$? $\xrightarrow{\Delta}$?

? $\xrightarrow[PH_{3\text{-}5}]{\text{Na-Hg}}$ a pair of epimers

(ii) $C_6H_{12}O_6$ (Glucose) $\xrightarrow{3\ PhNHNH_2}$ D-glucosazone $\xrightarrow{CuSO_4}$ Glucosotriazole

(Continued)

5. *(a)* Convert D-ribose to a pair of epimeric D-aldohexoses by using Fischer-Kiliani synthesis. 2

(b) Determine whether D-fructose is a furanose or a pyranose structure from the following sequential steps : 4

$$C_6H_{12}O_6 \text{ (fructose)} \xrightarrow[\text{2) Excess } Me_2SO_4 \text{ NaOH}]{\text{1) MeOH/HCl}} (A) \xrightarrow{\text{dil HCl}} (B)$$

$$\xrightarrow{\text{dil } HNO_3} (C) \xrightarrow{KMnO_4/H_2SO_4} \delta\text{-lactone} \xrightarrow[HNO_3]{\text{Oxidation}}$$

D-Arabinotrimethyl glutaric acid

(c) What is mutarotation? Why does D-glucose show the phenomenon of mutarotation? 1+2=3

(d) Complete the following reaction : 2

$$\text{An aldohexose} \xrightarrow{Br_2/H_2O} (A) \xrightarrow{CaCO_3} \text{Cal. salt}$$

$$\xrightarrow{H_2O_2/Fe_2(SO_4)_3} (B)$$

UNIT—III

Answer *any* **one** question

6. *(a)* Synthesize guanine from uric acid. 2

(b) What are complementary bases? Draw the structures to show hydrogen bonding between guanine and cytosine. 1+2=3

(c) Write a short note on coenzyme. 2

(d) Draw the structure of the following nucleotide (any *one*) : 2

(i) Uridine 5′ phosphate (UMP)

(ii) Deoxy guanosine 5′ phosphate (dGMP)

7. (a) Explain the stereospecificity of enzyme with the help of a suitable example. 2

(b) How thymine be synthesized from urea? 2

(c) What do you understand by the term genetic code? Discuss briefly the chemical basis of heredity. 1+2=3

(d) Write the structures and names of purines and pyrimidines present in DNA. 2

UNIT—IV

Answer *any* **one** question

8. (a) Synthesize an antibiotic which is active against certain gram-positive bacteria and gram-negative bacteria. 3

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

(c) Write the structure of vitamin C. Name the food sources and the deficiency disease caused due to the lack of vitamin C. 1+1+1=3

(Continued)

(d) Synthesize paracetamol from *p*-nitrophenol. 2

9. (a) Draw the structure with the name of an antimalarial which is active against vivax and falciparum malaria. 2

(b) Give the preparation of the following (any *one*) : 2

(i) Ibuprofen from isobutyl benzene

(ii) Sulphaguanidine

(c) How does sulpha drugs prevent the growth and multiplication of bacteria when administered into host body? 3

(d) Draw the structure of curcumin and write in brief about its medicinal importance. 1+1=2

UNIT—V

Answer *any* **one** question

10. (a) What is isoprene rule? Indicate the isoprene units in the structure of citral. 1+1=2

(b) Complete the following reactions : 1½×2=3

(i) Geranial $\xrightarrow{\text{alk. } KMnO_4}$ (*A*) $\xrightarrow{CrO_3}$ Acetone + Oxalic acid + Laevulic acid

(ii) Isoprene + MVK $\longrightarrow$ (A) $\xrightarrow[2)\ H_3O^+]{1)\ MeMgBr}$

An optically active monterpenoid

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

11. (a) How would you synthesize citral by using the following sequence of reactions? 2

6-Methylhept-5-en-2-one $\xrightarrow[2)\ H_3O^+]{1)\ I—CH_2—COOC_2H_5/Zn}$ (A)

$\xrightarrow{Ac_2O}$ Geranic ester $\xrightarrow[(HCO_2)_2Ca]{\text{cal. salt +}}$ Citral

(b) What happens when—

(i) citral is treated with aqueous Na_2CO_3;

(ii) geraniol is oxidized with $Na_2Cr_2O_7$ / H_2SO_4? 1+1=2

(c) Synthesize α-terpineol from *p*-toluic acid. 3

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