OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

BSc Degree Rain Semester Examination, 20013/2014

CHM 314: Alicyclic, Bifunctional, Aliphatic and Terpenoids Compounds

TIME ALLOWED: 2 hours **DATE: April, 2015**

INSTRUCTIONS: Answer ALL Questions

1a(i). Write out the structures of the possible position and functional isomers of the diol represented by the molecular formula $C_3H_8O_2$. Name all the isomers accordingly.

1a(ii). The labels on two bottles containing butan-1,2-diol and butan-1,3-diol feli off in the laboratory. How would you set out to label them correctly? (equation only)

1b. Complete the following equations

$$HO\text{-}CH_2CH_2\text{-}OH + CH_3COOH \text{ (excess)} + H_2SO_4 \longrightarrow$$

$$HO\text{-}CH_2CH_2\text{-}OH + O{=}C(CH_3)_2 \longrightarrow$$

1c(i). Give the common name and IUPAC name of this compound

HOOC-CH(OH)-CH(OH)-COOH

1c(ii). Outline synthetic procedure for this compound $(CH_3)_2C(OH)CH_2COOH$, and give three of its chemical reactions.

1c(iii). Distinguish between the of action of heat on a named β and γ-hydroxy acids

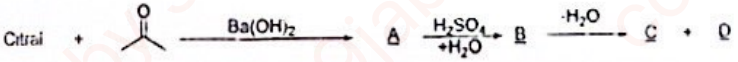
1d. Lactic acid is a monocarboxylic acid as well as a secondary alcohol. Give two equations in support of this statement.

2a). What is Wagner Meerwein's Rearrangement? Use any appropriate equation to illustrate it.

b). State Bredt's rule? Use a named terpene to demonstrate the rule.

c). Starting from *p*-toluic acid, show by equations only how you would synthesize α-terpineol.

d).



(i) Provide the structures and names of compounds A to D.

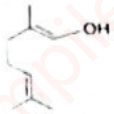
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
MID SEMESTER TEST 2014/2015 SESSION
CHM 314: Alicyclic, Bifunctional, Aliphatic & Terpenoid Compounds

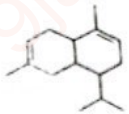
FEBRUARY 2016 TIME ALLOWED: 1HR

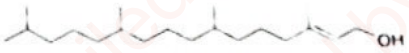
ATTEMPT ALL QUESTIONS (20 marks)

1a). State Isoprene rule

b). Show how many isoprene units are present in the following terpenes and hence classify them accordingly.

(i) 

(ii) 

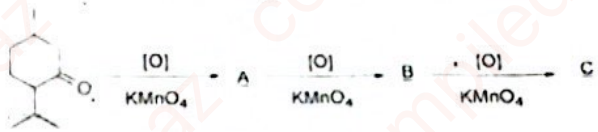
(iii) 

c) Menthol has molecular formula $C_{10}H_{20}O$ and it is optically active.

(i) Draw the structure of menthol showing all the chiral carbon atoms.

(ii) Draw and nameall the racemic modifications

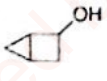
(iii) Provide the structure and the names of compounds A to C below

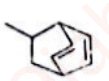


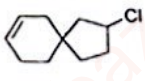
d). Starting with *p*-toluic acid, show by equations only how you would synthesize α-terpineol

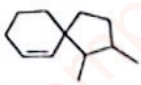
10 marks

2. a). Give the IUPAC name of the following compounds:

i 

ii 

iii. 

iv. 

b. Draw the correct structure of the following compounds showing the stereochemistry where necessary

i. trans,cis-2,3-dimethylcyclohexanol

ii. 2,4-dimethylcyclobuta-1,3-diene

iii. spiro[4.4]nona-2,7-diene

c. Using Newman projections, draw all the staggard and eclipsed conformers of 2,3-dibromopentane with respect to rotation about the C2–C3 bond. Identify the most stable conformer.

d. Draw the two possible chair conformers of (1R,3S,5R)-1-bromo-3-chloro-1,5-dimethylcyclohexane and indicate which is the preferred conformer and why?

10 marks

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

BSc (CHEMISTRY) DEGREE EXAMINATION

2014/2015 RAIN SEMESTER

CHM 314: ALICYCLIC, BI-FUNCTIONAL ALIPHATIC AND TERPINOID COMPOUNDS

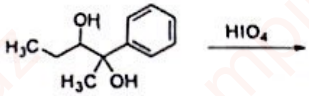
TIME: 2hours 15mins

INSTRUCTIONS: Answer four Questions in all.

SECTION A

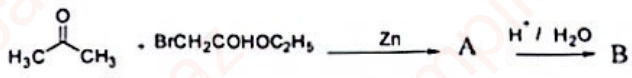
Answer any One Question from this Section

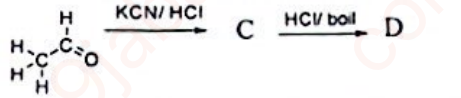
1a. Predicts the product formed from periodic acid cleavage of this compound.

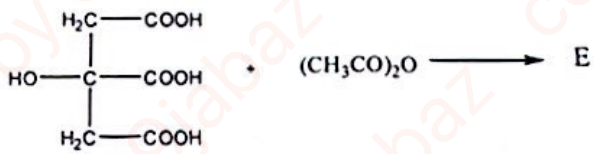


1b. Propose a detail mechanism for the transformation of 2,3-dimethylbutane-2,3-diol to 3,3-dimethylbutan-2-one in a typical pinacol-pinacolone acid catalyzed reaction

1c. Draw the structures and name the lettered compounds from the following chemical transformations:

i) 

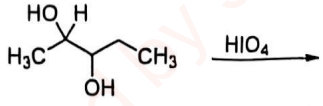
ii) 

iii) 

1d. Draw the structures of (S,S)-tartaric acid, (R,R)-tartaric acid and (R,S)-tartaric acid

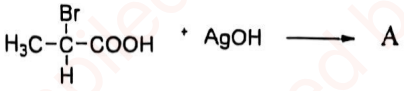
1e. with structures only show how tartaric acid can be isolated from algol. (25 marks)

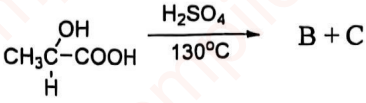
2a. Predict the product formed from periodic acid cleavage of this compound.

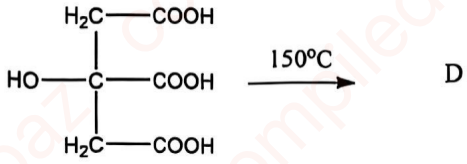
ii) 

2b. Propose a detailed mechanism for the conversion of cis-3-hexene to the epoxide (3,4-epoxyhexane) and the acid catalysed ring opening reaction to give glycol (hexane-3,4-diol)

2c. Draw the structures and name the lettered compounds from the following chemical transformations:

i) 

ii) 

iii) 

2d. Draw the structures of the optical isomers of lactic acid (α-hydroxyl propionic aci

2e. Proposed a useful pathway to the synthesis of citric acid from glycerol.

SECTION B

Answer any One Question from this Section

1a). The structure A below is a bicyclic monoterpene.

A

The unsaturated derivatives of A occur naturally in oil of turpentine as B and C ($C_{10}H_{16}$). Ozonolysis of C gave D ($C_9H_{13}O$).

i). what is the name of the structure A?

ii). suggest appropriate structures and names of the compounds B and C.

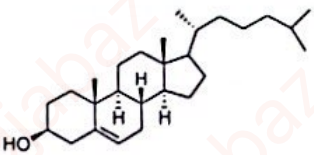
iii). Give the product(s) and name(s) of the ozonolysis of compound C.

iv). under acidic condition, D isomerizes to give a cyclohexenone derivative. Show the mechanism involved in the reaction.

b). (i) State Bredt's rule

(ii) Use a named terpene to illustrate the Bredt's rule.

c). The structure of cholesterol is as shown below:



i). Draw the structure of 5α-cholest-7-en-3β-ol

ii). How many stereocentres, stereoisomers and pairs of enantiomers does cholesterol have?

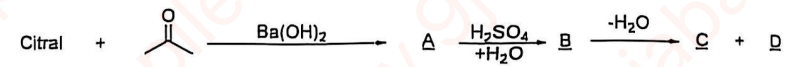
iii). Briefly explain the health implication of high level of cholesterol in man.

iv). Distinguish between the 'good' and 'bad' cholesterol.

2a i). What is Wagner Meerwein's Rearrangement? Use any <u>one</u> appropriate equation to illustrate it.

ii). By chemical equations only, explain how you would synthesize Bornane using Wolff Kishner reduction of camphor.

b).

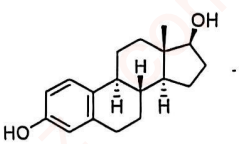


(i) Provide the structures and names of compounds <u>A</u> to <u>D</u>

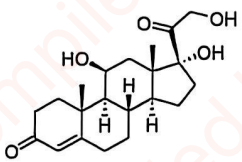
(ii) If H_2SO_4 is replaced with H_3PO_4, what will happen to products <u>C</u> and <u>D</u>?

c). i). What are the functions of adrenocortical hormones?

ii). Give the common and IUPAC names of the following structures;



I



II

iii). Give 2 simple chemical test to distinguish between **I** and **II**.

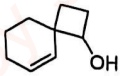
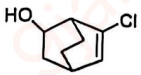
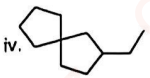
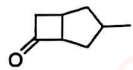
iv). What diagnostic IR features that distinguish between **I** and **II**

SECTION C

Answer only two questions from this section

1. a. Briefly explain the terms constitution, configuration and conformation in organic chemistry

b. Give the IUPAC name of each of the following compounds:

i  ii.  iii.  iv.  v 

c. Draw the correct structure of the following compounds, showing the stereochemistry where necessary:

i. 2,3-dimethylspiro[4.5]decan-2-ol

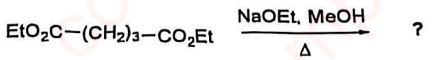
ii. cis,trans-2,5-dimethylcyclohexanol

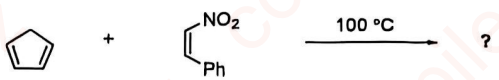
iii. 1,3,3-trimethylbicyclo[3,2,1]octan-2-one

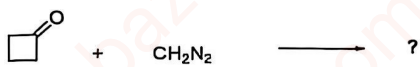
2. a. Discuss the geometry and the type of strain present in cyclopentane.

b. Complete the following reactions

i. 

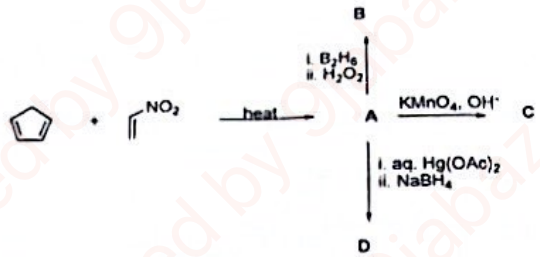
ii. 

iii. 

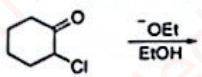
iv. 

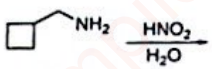
c. Using Newman projections, draw all the staggard and eclipsed conformers of 2,3-dimethylbutane with respect to rotation about the C2 - C3 bond. Identify the most stable conformer.

3. a. Identify the lettered structures in the scheme below:

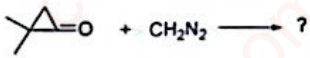


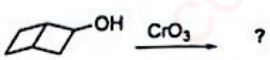
b. Suggest the **product(s)** and provide a reasonable **mechanism** for the following reactions:

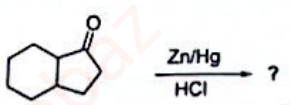
i. 

ii. 

c. What products do you expect for the following reactions:

i. 

ii. 

iii. 

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DEPARTMENT OF CHEMISTRY
MID SEMESTER TEST 2015/2016 SESSION
CHM 314: Alicyclic, Bifunctional, Aliphatic & Terpenoid Compounds

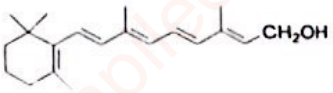
FEBRUARY 2017 **TIME ALLOWED: 1 HR**

ATTEMPT ALL QUESTIONS (20 marks)

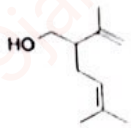
1a). State Isoprene rule

1b). Show how many isoprene units are present in the following terpenes and hence classify them accordingly.

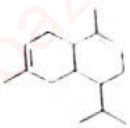
(i)



(ii)



(iii)

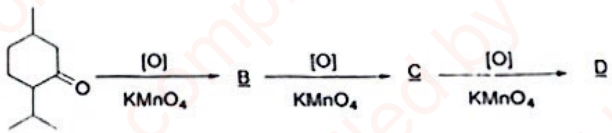


c). Which of the above terpene(s) does not obey the special isoprene rule and what is/are their name(s)?

d). Complete the following equations by writing the structures of the lettered compounds:

(i) Menthol $\xrightarrow[\text{(ii) Dehydrogenation}]{\text{(i) Dehydration}}$ A

(ii)



d). Starting with α-terpineol, show by equations only how you would synthesize carvone.

10 marks

2. a. Give the IUPAC name of the following compounds:

i.

ii

iii

iv

v.

b. Draw the correct structure of the following compounds showing the stereochemistry wher necessary:

i. trans,cis-2,3-dimethylcyclohexanol

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

BSc (CHEMISTRY) DEGREE RAIN SEMESTER EXAMINATION, 2015/2016

CHM 314: ALICYCLIC, BI-FUNCTIONAL ALIPHATIC AND TERPINOID COMPOUNDS

TIME: 2 hours 30mins

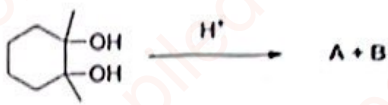
INSTRUCTIONS: Answer three Questions in all. Each Section in a separate Booklet

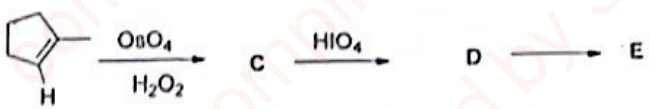
SECTION A

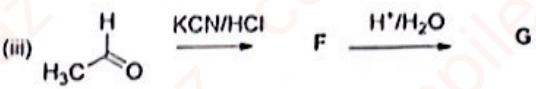
1a (i) What are possible structures for the optically active tartaric acid?

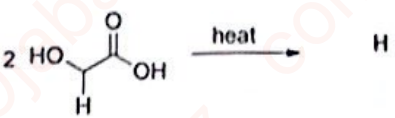
(ii) With the aid of chemical equations **only** highlight how you would prepare tartaric acid from algol

1b Predict the products of the following reactions:

(i) 

(ii) 

(iii) 

(iv) 

1c Starting with ethyne and other laboratory reagents show how you could prepare tartaric acid.

20 marks

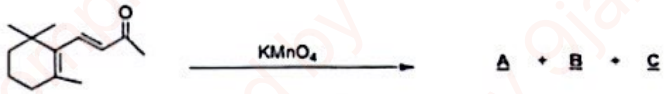
SECTION B

Attempt any One Question from this Section

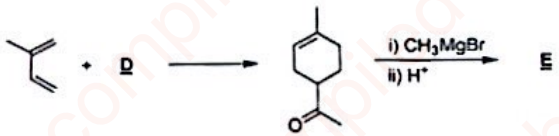
1a). (i) State Bredt's rule

(ii) Use a named terpene to illustrate accordingly the above rule.

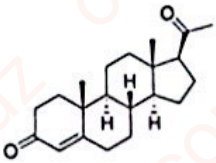
b). (i) Provide the structure and names of compounds A to C



(ii) Complete the equation by writing the structures of the lettered compounds



c). The most important progestin is progesterone (structure shown below):



(i) Give the IUPAC name of the above structure.

(ii) What are the roles of this hormone in women?

(iii) Draw the structure of the named synthetic analog the above hormone that is taken as oral contraceptive.

(iv) How many stereogenic centres does progesterone have and how many stereoisomers are possible? **20 marks**

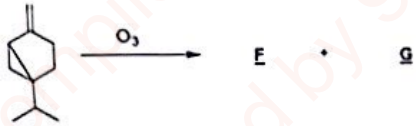
2a i). What is Wagner Meerwein's Rearrangement? Use any one appropriate equation to illustrate it.

ii). By chemical equations only explain how you would synthesize Bornane using Wolff Kishner reduction of camphor?

b). (i) Show by chemical equations only, how you will distinguish between α- and δ-pinene? Give all the reaction conditions and names of the product.

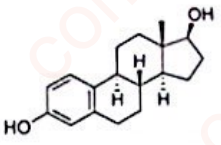
(ii) Androstenedione is used to increase the production of the hormone testosterone to enhance athletic performance, increase energy among others. Draw the structure of this steroid and give its IUPAC name?

(iii) Provide the structures and names of the lettered compounds

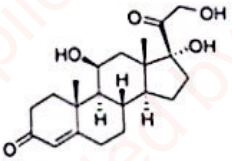


c). i) What are the functions of adrenocortical hormones?

ii) Give the common and IUPAC names of the following structures;



I



II

iii) Give 2 simple chemical test each to distinguish between I and II.

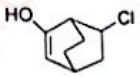
iv) Give 2 diagnostic IR features will distinguish between I and II

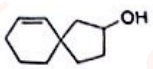
SECTION C

Attempt any One Question from this Section

1. a. Give the IUPAC name of the following compounds:

i. 

ii. 

iii 

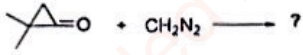
b. Draw the correct structure of the following compounds showing the stereochemistry where necessary:

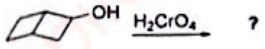
i. *trans,cis*-2,3-dimethylcyclohexanol

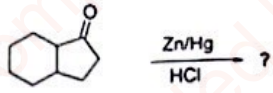
ii. 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one

iii. 2,6,7-trimethylspiro[3.4]octane

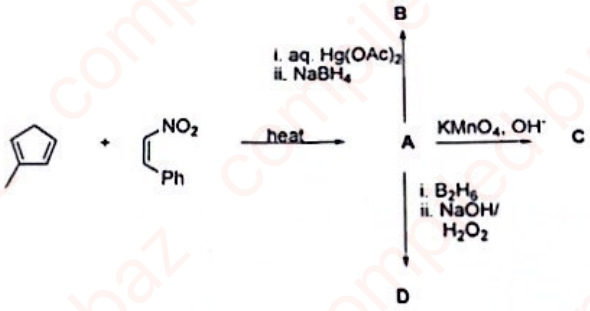
c. What products do you expect for the following reactions:

i. 

ii. 

iii. 

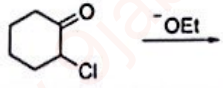
d. Identify the lettered structures in the scheme below.

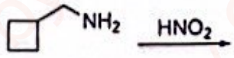


20 marks

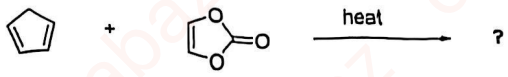
2. a. Discuss the geometry and the type of strain present in cyclopropane.

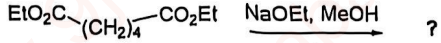
b. Suggest the **product(s)** and provide a reasonable **mechanism** for the reactions following:

i. 

ii. 

iii. 

iv. 

v. 

c. Using Newman projections, draw all the staggard and eclipsed conformers of 2,3-dichloropentane with respect to rotation about the C2 - C3 bond. Identify the most stable conformer.

d. Distinguish between conformation and configuration **20 marks**

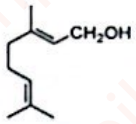
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
MID SEMESTER TEST 2017/2018 SESSION
CHM 314: Alicyclic, Bifunctional, Aliphatic & Terpenoid Compounds

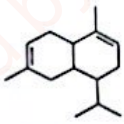
DECEMBER 2018 **TIME ALLOWED: 1 HR**

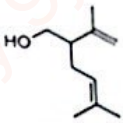
ATTEMPT ALL QUESTIONS (15 marks)

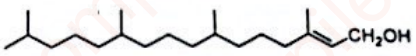
1a). State Isoprene rule

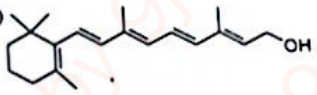
b). Show how many isoprene units are present in the following terpenes and hence classify and name them accordingly.

(i) 

(ii) 

(iii) 

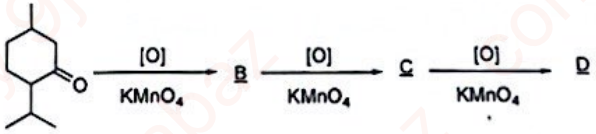
(iv) 

(v) 

c). Which of the above terpene(s) does not obey the special isoprene rule and what is/are their name(s)?

d). Complete the following equations by writing the structures of the lettered compounds;

(i) Menthol $\xrightarrow[\text{(ii) Dehydrogenation}]{\text{(i) Dehydration}}$ A

(ii) 

e). (i) Starting with isoprene, show by equations only how you would synthesize α-terpineol.

(ii) What is the general name of this reaction?

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
B.Sc. Degree (Chemistry) Examination Part III
CHM 314: ALICYCLIC, BIFUNCTIONAL, ALIPHATIC AND TERPENOID COMPUNDS
Rain Semester Examination 2018/2019 Session

Time Allowed: 2 Hours **Date: 13th December, 2019**
Instructions: Answer each section in separate booklets.

SECTION A

Attempt any **Two** Questions from this Section

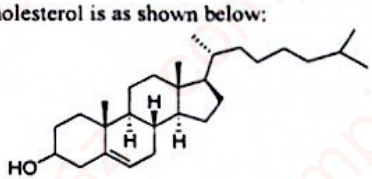
1a). (i) State Bredt's rule.
(ii) Use a named terpene to illustrate accordingly the above rule.

b). Compound **F**, is a monoterpenoid compound with a melting point of 83°C and molecular formula $C_{10}H_{16}O_2$. It gives positive test with 2,4-DNP. It displayed acidic property, as it is soluble in alkali. It gives intense green colour with aqueous $FeCl_3$. It is UV active with λ_{max} 274 nm.

i). Suggest a structure for the terpenoid compound?
ii). Account for the acidic property of the compound?
iii). By equations only, show the tautomerism in the compound, if any.

c). Show by chemical equations only, how you would distinguish between α- and δ-pinene.

d). The structure of cholesterol is as shown below:



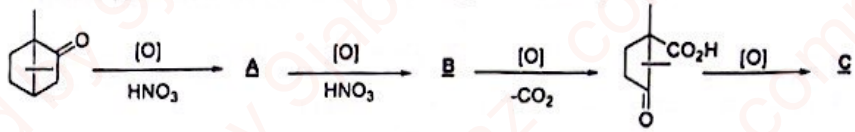
i). Draw the structure of 5α-cholest-7-en-3β-ol
ii). How many stereogenic centres, stereoisomers and pairs of enantiomers does cholesterol have?
iii). Briefly explain the health implication of high level of cholesterol in man.
iv). Distinguish between 'good' and 'bad' cholesterol.

(30 mks)

2a). i). What is Wagner-Meerwein rearrangement? Use any one appropriate equation to illustrate it.

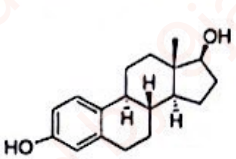
ii). By chemical equations only, explain how you would synthesize Bornane using Wolff Kishner reduction of camphor.

b). Provide the names and structures of the following lettered compounds:

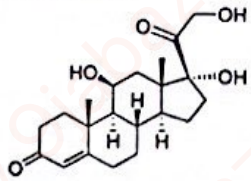


c). i). What are the functions of adrenocortical hormones?

ii). Give the common and IUPAC names of the following structures;



I



II

iii). Give 2 simple chemical tests each to distinguish between I and II

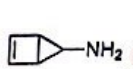
iv). Give 2 diagnostic IR features that will distinguish I from II

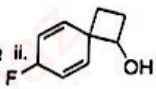
(30 mks)

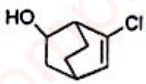
SECTION B

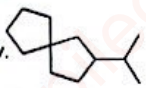
(Attempt **ALL** questions in this Section)

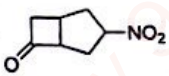
3a.) Give the IUPAC name of each of the following compounds:

i. 

ii. 

iii. 

iv. 

v. 

b.) Draw the correct structure of the following compounds showing the stereochemistry where necessary:

i). 2,2,4,4-tetramethylcyclo-1,3-dione

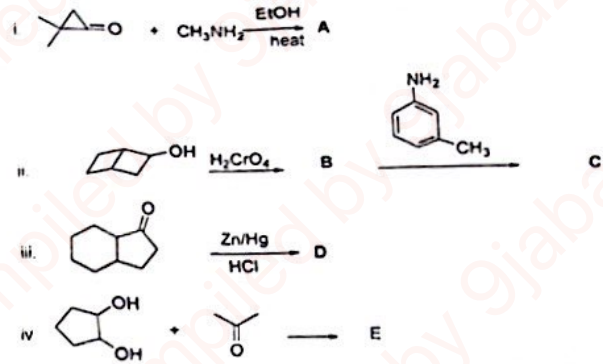
ii). 5,5-dimethylcyclohexane-1,3-dione

iii). 6-oxaspiro[4,5]decane

iv). 3-(4-hydroxylcyclohexan-1-yl)butanoic acid

v). (1-methylethyl)cylohexane

c.) What products do you expect for the following reactions:



d. i). Name the geometry and the type of strain present in cyclopropane.

ii). Draw both the Chair and Haworth projection of α-D-glucose

iii). Draw the chair configuration for both cis and trans-1-bromo-3-methylcyclohexane

(20 marks)

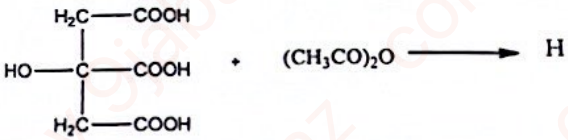
4a) i). Draw all the possible structures for the optically active tartaric acid?

ii). Starting with ethyne and other laboratory reagents, show how you could prepare tartaric acid.

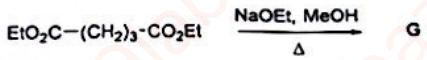
iii). Propose a detailed mechanism for the transformation of 2,3-dimethylbutane-2,3-diol to 3,3-dimethylbutan-2-one in a typical pinacol-pinacolone acid catalyzed reaction.

vi). Propose a detailed mechanism for the transformation of 1,6-dimethyl-7-oxylbicyclo [4.1.0]heptane to give 1,2-dimethylcycloheptane-1,2-diol in a typical acid catalyzed ring opening reaction of epoxides.

b). Draw the structure and name the lettered compound from the following reaction:



c). Complete the following reaction;



(20 marks)

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

B.Sc. (CHEMISTRY) DEGREE EXAMINATION

2019/2020 Rain Semester

CHM 314: ALICYCLIC, BIFUNCTIONAL, ALIPHATIC AND TERPENOID COMPOUNDS

TIME ALLOWED: $2\frac{1}{4}$ hours **DATE: September 30, 2021**

Instructions: Write your Name and Registration Number. Also append your signature on your answer scripts.

ATTEMPT ALL QUESTIONS

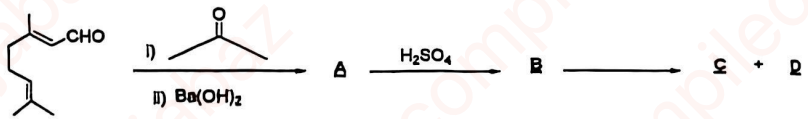
SECTION A

1. (a) A terpenoid compound **X**, $C_{10}H_{16}O$
   - forms an oxime
   - on oxidation, it forms mono carboxylic acid without any change in number of C-atoms per molecule
   - it adds on bromine to form a tetrabromide
   - compound **X** does not form a cyclo product with maleic anhydride

   (i) Deduce appropriate inference for each of the above with chemical equation(s)
   (ii) Suggest appropriate structure for this terpenoid.

(b) (i) State Bredt's rule.
(ii) Use a named terpene to illustrate accordingly the above rule.

(c)



(i) Complete the equation by writing the structures and the names of the lettered compounds **A** to **D**.
(ii) If H_2SO_4 is replaced with H_3PO_4 what transformation would you expect on product **C** and **D**?

2. (a) (i) What is Wagner Meerwein's Rearrangement? Use any one appropriate equation to illustrate it.
(ii) By chemical equations only, explain how you would synthesize Bornane using Wolff Kishner reduction of camphor.

(iii) Show by chemical equations only, how you would distinguish between α- and δ-pinene.

(b) The structure **E** below is a bicyclic monoterpene:

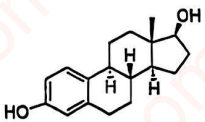
E

The unsaturated derivatives of **E** occur naturally in oil of turpentine as **F** and **G** ($C_{10}H_{16}$). Ozonolysis of **G** gave **H** ($C_9H_{13}O$).

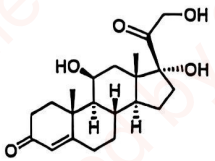
(i) What is the name of **E**?
(ii) Deduce appropriate structures and names of **F** and **G**
(iii) Give the product(s) and name(s) of ozonolysis of **G**.
(iv) Under acidic condition, **H** isomerizes to give a cyclohexenone derivative. Show the mechanism involved in the reaction.

(c) (i) What are the functions of adrenocortical hormones?

(ii) Give the common and IUPAC names of the following structures;



I

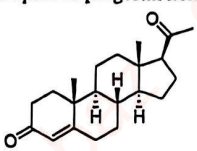


II

(iii) Give 2 simple chemical tests each to distinguish between **I** and **II**

(iv) Give 2 diagnostic IR features that will distinguish **I** from **II**

(d) Progesterone is an important progestin hormone (structure shown below):



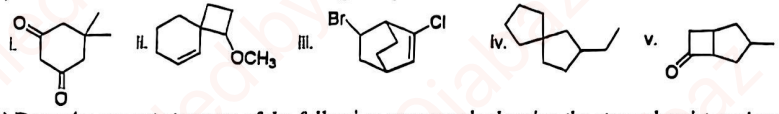
(i) Give the IUPAC name of the structure above.
(ii) What is/are the role of this hormone in women?

(iii) Draw the structure and the IUPAC name of the synthetic analogue of the above steroidal hormone that is taken as oral contraceptive.

(iv) How many stereogenic centres does progesterone have? and how many stereoisomers are possible?

Section B

3. (a) Give the IUPAC name of the following compounds:

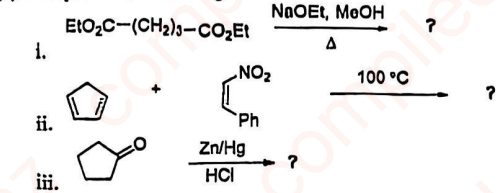


(b) Draw the correct structure of the following compounds showing the stereochemistry where necessary:

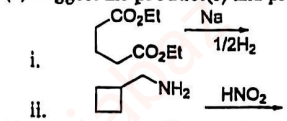
i. trans,cis-2,3-dimethylcyclohexanol
ii. 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one
iii. spiro[4.4]nona-2,7-diene
iv. 2,3-dimethylspiro[4.5]decan-2-ol
V. spiro[5,4]decan-1,6-diene

(c) Describe the geometry and the type of strain present in cyclopentane.

4. (a) Complete the following reactions



(b) Suggest the **product(s)** and provide a reasonable **mechanism** for the following reactions:

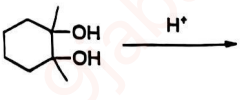


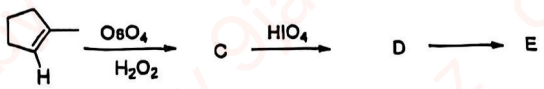
(c) Draw the possible conformers of cyclohexane and indicate which is the preferred conformer and why?

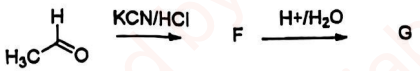
5. (a) (i) With the aid of chemical equations **only** highlight how you would prepare tartaric acid from argol (crude tartar).

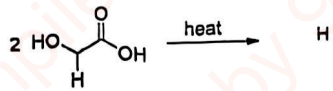
(ii) Draw the structures of (S,S)-, (R,R)- and (R,S)-tartaric acid.

(b) Predict the products of the following reactions:

(i) 

(ii) 

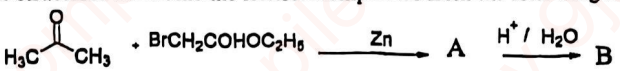
(iii) 

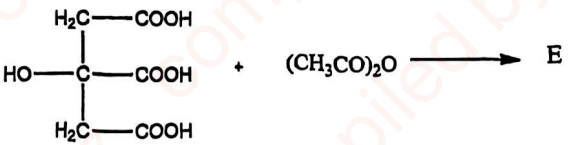
(iv) 

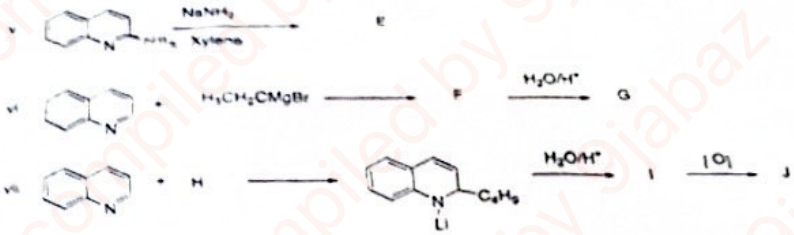
(c) Starting with ethyne and other laboratory reagents show how you could prepare tartaric acid.

(d) Propose a detail mechanism for the transformation of 2,3-dimethylbutane-2,3-diol to 3,3-dimethylbutan-2-one in a typical pinacol-pinacolone acid catalysed reaction

(e) Draw the structures and name the lettered compounds from the following transformations

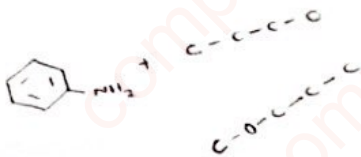
i) 

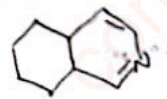
ii) 

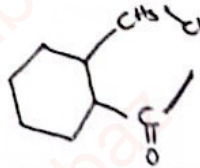


4. Outline the synthesis of isoquinoline starting with an aromatic aldehyde and amino ethanol

5. Illustrate the reaction pathway for the synthesis of quinoline compounds starting with aniline and 3-oxoethylbutanoate (a β-ketoester) under two different reaction conditions of:
(a) Room temperature and (b) At about 140 °C .







OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
B.Sc., Degree (Chemistry) Examination
Part III Rain Semester 2021/2022

CHM 314: ALICYCLIC, BI-FUNCTIONAL ALIPHATIC AND TERPENOID COMPOUNDS

Time Allowed: 2¼ Hrs

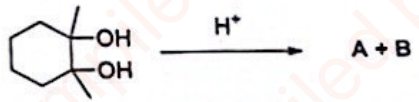
ATTEMPT ALL QUESTIONS

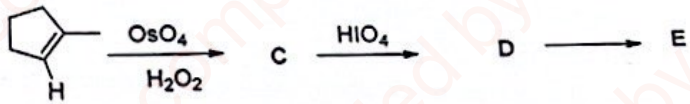
DATE: June, 2023

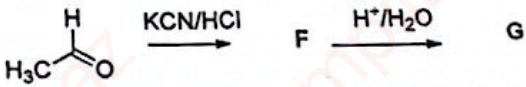
SECTION A

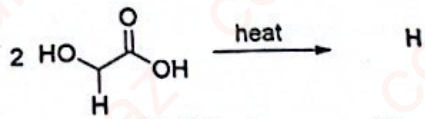
1a. (i) What are possible structures for optically active tartaric acid?
(ii) With the aid of chemical equations only highlight how you would prepare tartaric acid from ethyne

1b. Predict the products of the following reactions:

(i) 

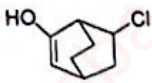
(ii) 

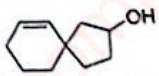
(iii) 

(iv) 

2a. Give the IUPAC name of the following compounds:

i. 

ii. 

iii. 

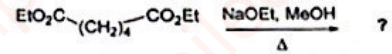
b. Draw the correct structure of the following compounds showing the stereochemistry where necessary:

i. *trans,cis*-2,3-dimethylcyclohexanol

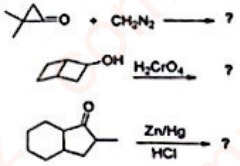
ii. 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one

iii. 2,6,7-trimethylspiro[3.4]octane

3a. Suggest the **product(s)** and provide a reasonable **mechanism** for the following reaction:



b. Predict the products of the following reactions:



SECTION B

4. a). A terpenoid compound A, $C_{10}H_{16}O$

- forms an oxime
- on oxidation, it forms mono carboxylic acid without any change in number of C-atoms per molecule
- it adds on bromine to form a tetrabromide
- compound A does not form a cyclo product with maleic anhydride

(i). Deduce appropriate inference for each of the above with chemical equation(s)

(ii). Suggest appropriate structure for this terpenoid.

b). (i) State Bredt's rule.

(ii) Use a named terpene to illustrate the above rule.

c). (i) List the 3 important classes of steroids from plant origin?

(ii) What are the functions/importance of cardiotonic glycosides?

(iii) Give the structure and the IUPAC name of Digitoxigenin.

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
MID SEMESTER TEST 2021/2022 SESSION
CHM 314: Alicyclic, Bifunctional, Aliphatic & Terpenoid Compounds

May, 2023 **Time Allowed: 1 Hr**

Attempt All Question

1a). Compound **A**, $C_{10}H_{16}O$ found in lemon grass oil reacts with acetone to give **B**, $C_{13}H_{20}O$. On hydration and dehydration, a mixture of 2 naturally occurring isomeric forms **C** and **D** are obtained.

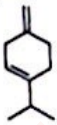
(i) With appropriate chemical equation(s) and hence deduce the structures of the compounds A, B, C and D.

(ii) Draw and name the structure of the synthetic form of C and D.

b). Name the following monoterpenoid compounds based on the p-menthane structure;

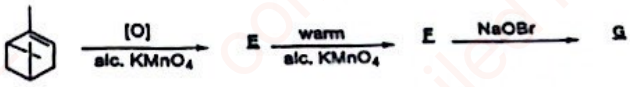
(i) 

(ii) 

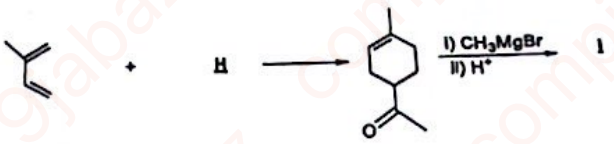
(iii) 

c). Complete the equation by writing the structures of the lettered compounds:

(i)



(ii)



- 15 marks

Department of Chemistry
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
Part III B.Sc. Chemistry Degree Examination
RAIN SEMESTER EXAMINATION, 2022/2023 SESSION

CHM 314: ALICYCLIC, BI-FUNCTIONAL, ALIPHATIC AND TERPENOID COMPOUNDS

Date: Friday, 19th July 2024 **Time Allowed: 2 Hours**

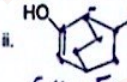
INSTRUCTIONS: Answer all questions from both sections in the same booklet. Provide answers to new questions on a fresh page. Do not muddle up your answers.

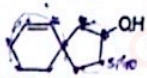
SECTION A

1(a). With the aid of chemical equations only highlight the acid catalyzed ring opening reaction of epoxides.

(b). Give the IUPAC name of the following compounds:

i. 

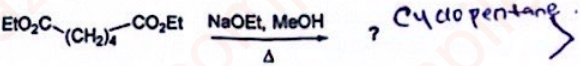
ii. 

iii. 

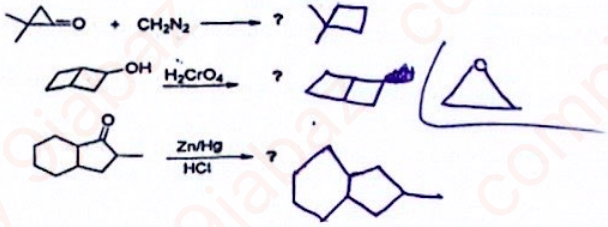
(c). Draw the correct structure of the following compounds showing the stereochemistry where necessary:

i. *trans,cis*-2,3-dimethylcyclohexanol
ii. 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one
iii. 2,6,7-trimethylspiro[3.4]octane

2(a). Suggest the **product(s)** and provide a reasonable **mechanism** for the reactions following:



(b). Predict the products of the following reactions:



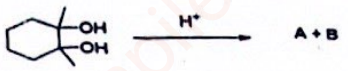
3(a). (i) What are possible structures for the optically active tartaric acid ((2R,3R)-2,3-

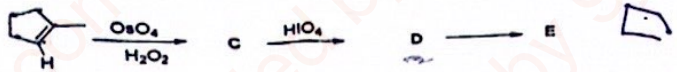
dihydroxybutanedioic acid)?

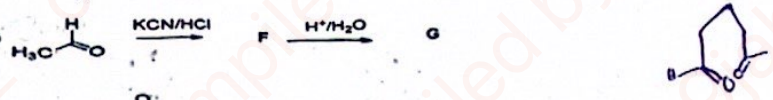
(ii) With the aid of chemical equations only highlight how you would prepare tartaric acid from ethyne

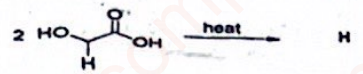
(b). With the aid of chemical equations only highlight how you would prepare tartaric acid from Algol

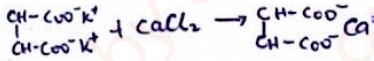
(c). Predict the products of the following reactions:

(i) 

(ii) 

(iii) 

(iv) 



SECTION B

4 (a). Compound I, $C_{10}H_{16}O_2$
- It is soluble in alkali
- It gives intense colour with $FeCl_3$
- It is optically active but exists only as racemate.

i). Give the structural forms of I.

ii). What is the name of compound I?

(b). (i) State Bredt's rule.

(ii) Use a named terpene to illustrate the above rule.

(c). i) What is Wagner Meerwein's Rearrangement? Use any one appropriate equation to illustrate it.

ii) By chemical equations only, illustrate how you would synthesize Bornane using Wolff Kishner reduction of camphor.

iii) Using chemical equations only, distinguish between α- and δ-pinene.

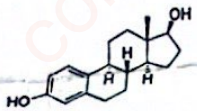
5 (a). The structure J below is a bicyclic monoterpene:

J

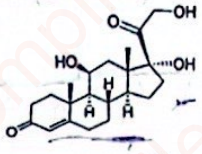
The unsaturated derivatives of J occur naturally in oil of turpentine as K and L ($C_{10}H_{16}$). Ozonolysis of L gave M ($C_9H_{13}O$).

i) What is the name of J?
ii) Give appropriate structures and names of K and L
iii) Write the product(s) and name(s) of ozonolysis of L.
iv) Under acidic condition, M isomerizes to give a cyclohexenone derivative. Show the mechanism involved in the reaction.

b). i). What are the functions of adrenocortical hormones?
ii). Give the common and IUPAC names of the following structures;



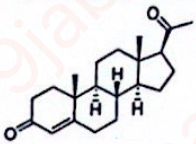
I



II

iii). Give 2 simple chemical tests each to distinguish between I and II
iv). Give 2 diagnostic IR features that will distinguish I from II

c). Progesterone is an important progestin hormone (structure shown below):



i). Give the IUPAC name of Progesterone.
ii). What is/are the role of this hormone in women?
iii). Draw the structure and the IUPAC name of the synthetic analogue of the above steroidal hormone that is taken as oral contraceptive.

iv). How many stereogenic centres does progesterone have? and how many stereoisomers are possible?

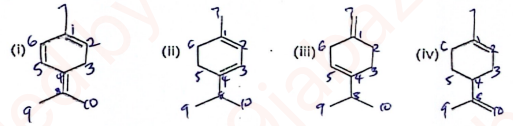
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
CHM 314 MID SEMESTER TEST 2023/2024 SESSION
May, 2025 **Time Allowed: 45 mins**

1a). Compound A, $C_{10}H_{16}$ found in *Ocimum basilicum*, on catalytic hydrogenation give decane. It forms a cyclo product with maleic anhydride. Ozonolysis of A produces formaldehyde, methylglyoxal and laevulaldehyde.

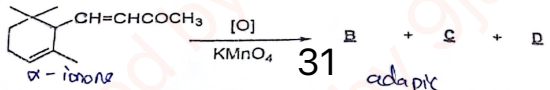
(i) Deduce the appropriate inference for each of the above with chemical equations.

(ii) Suggest appropriate structure for this monoterpenoid.

b). Name the following monoterpenoid compounds based on the p-menthane structure;



c). Complete the equation by writing the structures and names of the lettered compounds:



aOBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

BSc (CHEMISTRY) DEGREE MID-SEMESTER EXAMINATION, 2023/2024

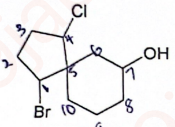
CHM 314: ALICYCLIC, BI-FUNCTIONAL ALIPHATIC AND TERPINOID COMPOUNDS

TIME: 30mins

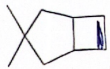
INSTRUCTIONS: Answer ALL Questions

1a. Give the IUPAC nomenclature for the following structures:

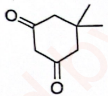
i).



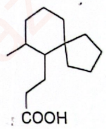
ii).



iii



IV



V

1b, .With structures and relevant laboratory reagent, show how you can you prepare Tartaric acid starting from algol..

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY

B.Sc. (CHEMISTRY) DEGREE EXAMINATION
RAIN SEMESTER, 2023/2024 SESSION

CHM 314: Alicyclic, Bifunctional, Aliphatic and Terpenoid Compounds

TIME ALLOWED: 2 Hours **DATE: Friday, 18th July 2025**

INSTRUCTIONS: Answer All Questions in Both Sections

SECTION A

1(a) (i) State Bredt's rule.
(ii) Use a named terpene to illustrate the above rule.

(b) Compound **A**, is a monoterpenoid compound with M.P.of 83°C and molecular formula $C_{10}H_{16}O_2$. It gives positive test with 2,4-DNP. It displayed acidic property; as it is soluble in alkali. It gives intense green colour with aqueous $FeCl_3$. It is UV active with λ_{max} 274 nm.

(i) What is the structure of the terpenoid compound?
(ii) Account for its acidic property of the compound?
(iii) By equations only, show the tautomerism in the compound.

(c) (i) What is Wagner Meerwein's Rearrangement? Use any one appropriate equation to illustrate it.

(ii) By chemical equations only, explain how you would synthesize Bornane using Wolff Kishner reduction of camphor.

(iii) Show by chemical equations only, how you would distinguish between α- and δ-pinene.

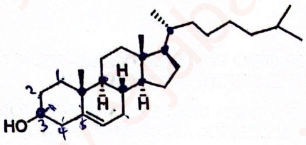
(d) The structure **B** below is a bicyclic monoterpene:

B

The unsaturated derivatives of **B** occur naturally in oil of turpentine as **C** and **D** ($C_{10}H_{16}$). Ozonolysis of **D** gave **E** ($C_9H_{13}O$).

(i) What is the name of **B**?
(ii) Deduce appropriate structures and names of **C** and **D**
(iii) Give the product(s) and name(s) of ozonolysis of **D**.
(iv) Under acidic condition, **E** isomerizes to give a cyclohexenone derivative. Show the mechanism involved in the reaction. **[20 marks]**

2(a) The structure of cholesterol is as shown below:

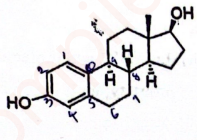


(i) Draw the structure of 5α-cholest-7-en-3β-ol

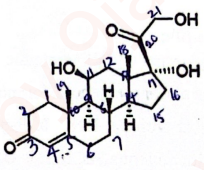
(ii) How many stereogenic centres, stereoisomers and pairs of enantiomers does cholesterol have?

(b) (i) What are the functions of adrenocortical hormones?

(ii) Give the common and IUPAC names of the following structures;



I

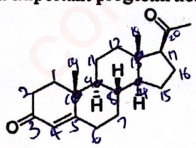


II

(iii) Give 2 simple chemical tests each to distinguish between I and II

(iv) Give 2 diagnostic IR features that will distinguish I from II

(d) Progesterone is an important progestin hormone (structure shown below):



$2\times2\times2\times2\times2\times2\times2$

64
64
128
128
256

(i) Give the IUPAC name of the structure above.

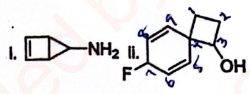
(ii) What is/are the role of this hormone in women?

(iii) Draw the structure and the IUPAC name of the synthetic analogue of the above steroidal hormone that is taken as oral contraceptive.

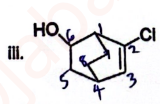
(iv) How many stereogenic centres does progesterone have? and how many stereoisomers are possible? **[20 marks]**

SECTION B

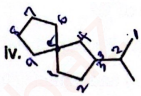
3(a) Give the IUPAC name of the following compounds:



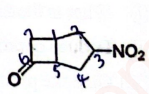
i. ii.



iii.



iv.



v.

(b) Draw the correct structure of the following compounds showing the stereochemistry where necessary:

~~trans,cis-2,3-dimethylcyclohexanol~~

(i) 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one

(ii) spiro[4.4]nona-2,7-diene

(iii) 2,3-dimethylspiro[4.5]decan-2-ol

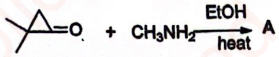
(iv) *trans,cis*-2,3-dimethylcyclohexanol

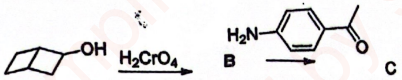
(v) 2,6,7-trimethylspiro[3.4]octane

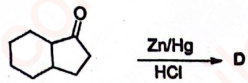
(vi) cyclopentan-2,3-dial

(vii) cyclohex-3-enecarboxylic acid

(c) What products do you expect for the following reactions:

I. 

II. 

III. 

IV 

(d)(i) Name the geometry and the type of strain present in cyclopropane.

(ii) Draw both the Chair and Haworth projection of α-D-glucose

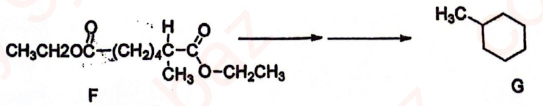
(iii) Draw the chair conformation for both cis and trans-1-bromo-3-methylcyclohexane **[20 marks]**

4 (i) Draw all the possible structures for the optically active tartaric acid?

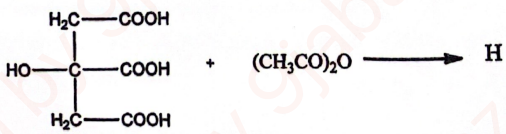
(ii) Starting with ethyne and other laboratory reagents show how you could prepare tartaric acid.

(iii) Propose a detail mechanism for the transformation of 2,3-dimethylbutane-2,3-diol to 3,3-dimethylbutan-2-one in a typical pinacol-pinacolone acid catalyzed reaction.

(vi) Show how compound F (a 1,7 diester) could be transformed to compound G, indicating the necessary reagent(s) and mechanism involved.



(v) Draw the structure and name the lettered compound from the following transformation



[25 marks]