2024/11

SET A

B.Sc. CHEMISTRY
FIRST SEMESTER
ORGANIC CHEMISTRY I
BSC - 101
[USE OMR FOR OBJECTIVE PART]

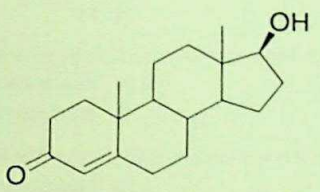
Duration : 3 hrs. **Full Marks : 70**

(Objective)

Time : 30 min. **Marks : 20**

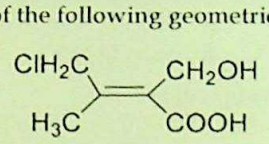
Choose the correct answer from the following: ***1×20=20***

1. The total number of chiral carbon & numbers of optical isomers of the following compound

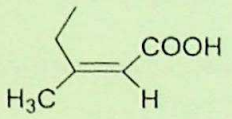


   a. 4 & 16
   b. 5 & 32
   c. 6 & 32
   d. 6 & 64

2. The configuration of the following geometrical isomers is



(i)



(ii)

   a. i→E, ii→Z
   b. i→Z, ii→Z
   c. i→E, ii→E
   d. i→Z, ii→E

3. Select correct statement from the following options.
   a. Meso compound contain both plane and centre of symmetry.
   b. Meso compound possess either plane or centre of symmetry.
   c. Meso compound does not posess either plane or centre of symmetry.
   d. Meso compounds are externally compensated form.

4. According to Baeyer strain theory, smaller cycloalkanes are highly strained due to
   a. Torsional strain
   b. Angle strain
   c. Steric strain
   d. Angle strain and torsional strain

5. In Gauche butane conformation, the dihedral angle between the two $-CH_3$ groups is:
   a. 60°
   b. 90°
   c. 120°
   d. 180°

6. The IUPAC name of the following organic compound is

a. Bicyclo[3.1.1]heptane
b. Bicyclo[2.1.1]heptane
c. Bicyclo[3.2.1]heptane
d. Bicyclo[3.1.2]heptane

7. Which of the following is an example of a nucleophile?
a. BF_3
b. H_3O^+
c. NH_3
d. $AlCl_3$

8. The type of hybridization of carbon of methyl carbocation is
a. sp^3
b. sp
c. sp^3d
d. sp^2

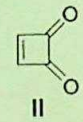
9. If ethene is allowed to react with HBr, ethyl bromide is produced. This is an example of
a. substitution reaction
b. elimination reaction
c. addition reaction
d. rearrangement reaction

10. Homolytic cleavage of a covalent bond means breaking of the bond to form
a. two free radicals
b. two same ions
c. one radical and one ion
d. cation and anion

11. The actual electrophile for sulphonation via electrophilic aromatic substitution is
a. conc. H_2SO_4
b. SO_2
c. SO_3
d. conc. H_2SO_3

12. The aromatic compound from the following will be?

I



II

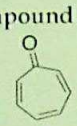
III

IV

a. I
b. II
c. III
d. IV

13. The most reactive compound among the given will be

I



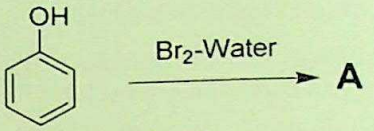
II

III

IV

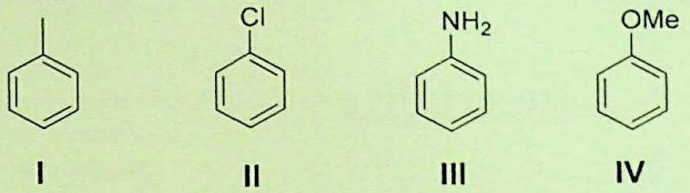
a. I
b. II
c. III
d. IV

14. The product (A) of the following reaction will be



a. 2-Bromophenol
b. 4-Bromophenol
c. both (a) & (b)
d. 2, 4, 6-tribromophenol

15. Which of the following molecules will not give Friedel Crafts C-acylation product

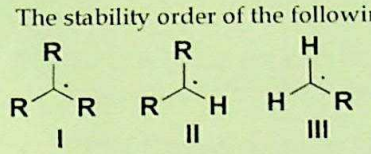


a. I
b. II
c. III
d. IV

16. In the Corey-House synthesis, R_2CuLi would not preferably react with which of the following alkyl halides

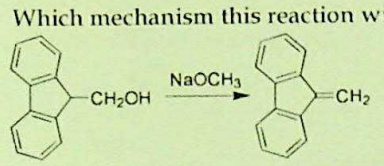
a. Cyclohexyl bromide ($C_6H_{11}Br$)
b. Ethyl chloride (C_2H_5Cl)
c. tert-Butyl iodide (C_4H_9I)
d. n-Propyl iodide (C_3H_7I)

17 The stability order of the following radical is



a. I>II>III
b. I>III>II
c. III>II>I
d. II>I>III

18. Which mechanism this reaction will follow

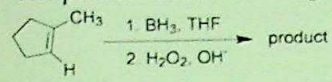


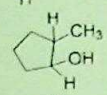
a. E1 elimination
b. E2 elimination
c. E1cB elimination
d. SN^1 reaction pathway

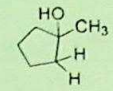
19. Oxymercuration-Demercuration reaction gives

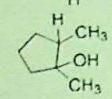
a. Hoffmann product
b. Markonikov product
c. Anti-Markonikov product
d. (a) and (c) both

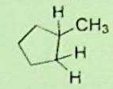
20. The product of the following reaction is



a. 

b. 

c. 

d. 

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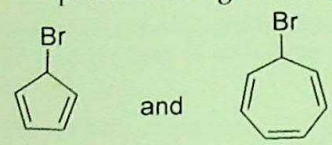
Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

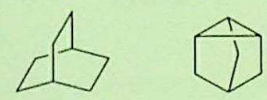
[Answer question no.1 & any four (4) from the rest]

1. **a.** Which of the following compounds will give precipitation in the presence of $AgNO_3$? Explain. **3+2+2+3 = 10**



I II

b. Give IUPAC name for the following polycyclic cycloalkane molecules:



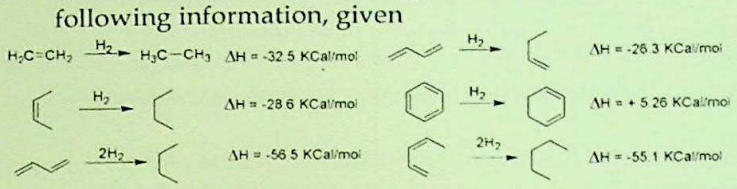
A B

c. Define nucleophiles and electrophiles with examples.

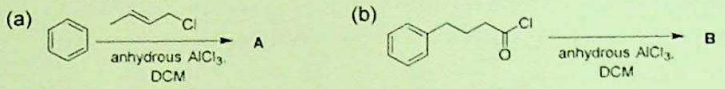
d. Chlorination of butane leads to form the following two products, 1-chlorobutane and 2-chlorobutane. Theoretical prediction of 1-chlorobutane is 60% while 2-chlorobutane is 40% but experimentally the reverse thing observed. Write down the reaction equation and explain your answer.

2. **a.** How to make **acetophenone** from **benzene**? Discuss the reaction with mechanism. **3+3+4 =10**

b. Calculate the resonance energy of benzene based on the following information, given



c. Write the products (**A** & **B**) with justification of the following reactions.



3. **a.** Which one of the following is aromatic? Explain. **3+2+3+2 =10**

b. How will you convert **benzene** to **nitrobenzene**? Discuss the reaction with mechanism.

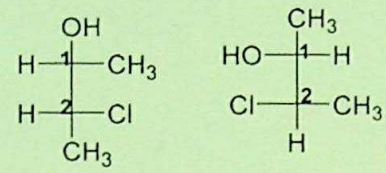
c. Write down the products A, B and C

d. What will be the product of the following reaction

4. **a.** Match the list I with II. Give reasons. **3+4+3 =10**

List I	List II
A. Meso compound	1. An equimolecular mixture of enantiomers
B. Racemates	2. Stereo isomers that are not mirror images
C. Diastereomers	3. Molecule with plane or centre of symmetry
D. Enantiomers	4. An equimolecular mixture of enantiomers

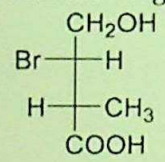
b. For following two isomers **A** and **B**, find the configurations of chiral centres **1** and **2** in each case and also establish whether the molecules are homomers, enantiomers or diastereomers.



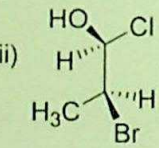
c. Write a short note on Bayers strain theory.

5. **a.** Give any one method for preparation of cycloalkanes. **2+4+4 =10**

b. Convert the following structures as per the instruction:

(i) 

to Wedge and Newman's projection

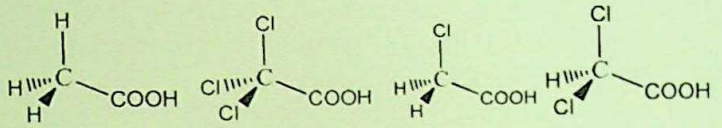
(ii) 

to Fisher and Sawhorse projection

c. Cyclohexane exists in chair and boat conformations. Which conformation is more stable and why? Also draw Newman's projection for chair and boat conformation, indicating axial and equatorial bonds in chair conformation and flagpole bonds in boat conformation.

6. **a.** Discuss the formation of ethyne (C_2H_2) molecule with a neat diagram using hybridization. What is the shape of this molecule? **2+3+3+2 =10**

b. Define inductive effect. Arrange the following acids in order of their increasing acidic strength and justify your answer.



c. What is hyperconjugation? Give reason why the stability of the carbocations follow the order as shown below.

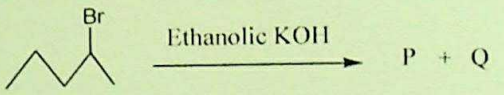
$(CH_3)_3\overset{\oplus}{C} > (CH_3)_2\overset{\oplus}{C}H > CH_3\overset{\oplus}{C}H_2$

d. Give reason why ortho-nitrophenol is more volatile than para-nitrophenol.

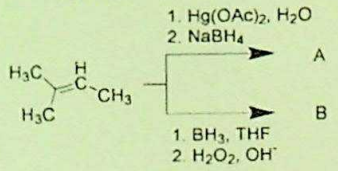
7. **a.** Give reason why CCl_4 molecule has no dipole moment despite the presence of four C-Cl polar bonds. **2+4+4 =10**

b. What are free radicals? How are they formed? Discuss the shape and relative stability of the 1°, 2° and 3° free radicals.

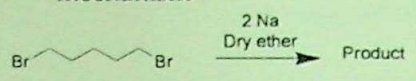
c. Define elimination reaction? What are Saytzeff and Hofmann rule? Complete the following reaction and give their IUPAC name.



8. **a.** Predict the products A and B of the following reaction. Show detailed mechanism for the formation of both the products A and B. **4+3+1+2 =10**



b. Predict the product of the following reaction. Deduce the mechanism



c. Which metal is used in Frankland reaction?

d. Name the three steps of halogenation reaction of alkanes in presence of high temperature or light. Which step amongst the three is the rate determining step?

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