

**B.Sc. CHEMISTRY (HONOURS)
SEVENTH SEMESTER
ORGANIC CHEMISTRY-V
BSC – 701**

**SET
A**

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

(Objective)

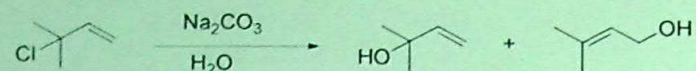
Marks: 20

Choose the correct answer from the following:

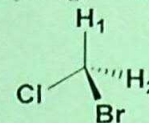
1×20=20

- Which of the following is non-aromatic?
 - Cyclobutadiene
 - Benzene
 - Naphthalene
 - Cyclopentadiene
- Which one of the following is anti-aromatic?
 - Cyclooctatetraene
 - Pyrrole
 - Furan
 - Cyclopentadienyl cation
- The geometry of a methyl radical ($\bullet\text{CH}_3$) is approximately:
 - Planar
 - Tetrahedral
 - Linear
 - Pyramidal
- The stability order of free radicals is:
 - $3^\circ > 2^\circ > 1^\circ > \text{methyl}$
 - $\text{methyl} > 1^\circ > 2^\circ > 3^\circ$
 - $1^\circ > 2^\circ > 3^\circ > \text{methyl}$
 - $2^\circ > 3^\circ > 1^\circ > \text{methyl}$
- Which of the following statements about carbenes is correct?
 - Carbenes always have a positive charge on carbon
 - Carbenes contain a divalent carbon atom with two nonbonding electrons
 - Carbenes are aromatic species
 - Carbenes cannot be intermediates in organic reactions
- Which of the following is not true about a nucleophile?
 - Nucleophiles are Lewis acids
 - All molecules or ions with a free pair of electrons
 - Donates an electron pair to an electrophile to form a chemical bond
 - A nucleophile becomes attracted to a positive charge
- The correct increasing order of the following leaving groups is
 - $\text{OH}^- < \text{CN}^- < \text{F}^- < \text{Cl}^- < \text{Br}^- < \text{I}^-$
 - $\text{CN}^- < \text{F}^- < \text{Cl}^- < \text{Br}^- < \text{I}^- < \text{OH}^-$
 - $\text{F}^- < \text{Cl}^- < \text{Br}^- < \text{I}^- < \text{OH}^- < \text{CN}^-$
 - $\text{Cl}^- < \text{Br}^- < \text{I}^- < \text{OH}^- < \text{CN}^- < \text{F}^-$
- In NGP reaction, the presence of which atom at β -position with respect to the leaving group is necessary?
 - Al-atom
 - B-atom
 - S-atom
 - Ga-atom

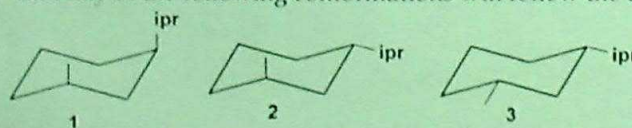
9. Predict the type of the following reaction



- S_N1 reaction
 - Nucleophilic substitution reaction at the allylic Carbon
 - S_NAr reaction
 - S_Ni reaction
10. If chlorobenzene is treated with KNH_2 in liquid NH_3 , the product obtained is
- Aniline
 - Toluene
 - Benzene
 - Naphthalene
11. The molecule $\text{HOCH}_2\text{-CH(OH)-CH(OH)-CH(OH)-CH(OH)-CH}_2\text{OH}$, will have following number of optical isomers:
- 16 active isomers
 - 4 active and 4 inactive isomers
 - 8 active isomers 2 inactive isomers
 - 6 active and 2 inactive isomers
12. In the compound given below, the hydrogens H_a and H_b are



- enantiotopic
 - homotopic
 - diastereotopic
 - isotopic
13. Consider the following statements about trans- and cis-decalins
- cis-decalin is more stable than trans-decalin
 - trans-decalin is more stable than cis-decalin
 - trans-decalin undergoes ring-flip
 - cis-decalin undergoes ring-flip
- The correct statements about the above are:
- A and C
 - B and C
 - B and D
 - A and D
14. Which of the following is true of any (R)-enantiomer?
- It rotates plane-polarized light to the right
 - It rotates plane-polarized light to the left
 - It is a racemic form
 - It is the mirror image of the corresponding (S)-enantiomer
15. Stability of the following conformations will follow the order



- $1 > 2 > 3$
- $2 > 3 > 1$
- $3 > 2 > 1$

16. Which following set of starting materials is necessary to carry out a standard Mannich reaction?
- Carboxylic acid, ammonia, and bromine
 - Aldehyde, amine, and an alkyl halide
 - Ketone, primary alcohol, and HCl
 - Aldehyde (or ketone), formaldehyde, and a secondary amine
17. Beckmann rearrangement converts oximes into
- Aldehyde
 - Amide
 - Ester
 - Acid
18. Which of the following reagents is essential in the Arndt-Eistert reaction?
- SOCl_2
 - CH_2N_2
 - CH_3MgBr
 - ZnCl_2
19. Robinson annulation reaction is a combination of
- Michael addition and Aldol condensation
 - Aldol reaction and Claisen rearrangement
 - Diels-Alder reaction and Friedel-Crafts acylation
 - Cannizzaro reaction and Perkin reaction
20. Pinacol is classified as which type of compound
- Vicinal diol
 - Geminal diol
 - Polyhydroxy alcohol
 - Cyclic alcohol

-- --- --

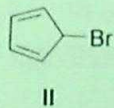
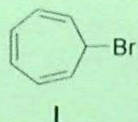
(**Descriptive**)

Time : 2 hrs. 30 min.

Marks : 50

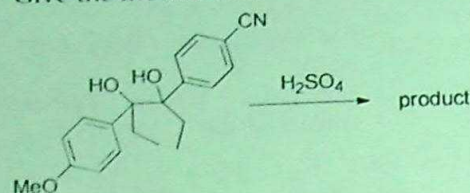
[Answer question no.1 & any four (4) from the rest]

1. a. Explain why cycloheptatrienyl bromide (I) is ionic in nature but not cyclopentadienyl bromide (II). 3+2+2+3=10



- What are nucleophiles? Explain hard and soft nucleophiles with appropriate examples.
- Calculate the optical rotation of an enantiomeric mixture having the following data. Specific rotation of the compound = 40° , the mixture contains 60% of d-isomer and 40% l-isomer.

- d. What will be the most possible product of the following reaction. Give the mechanism.



2. a. Draw the dipolar structures for the following compounds

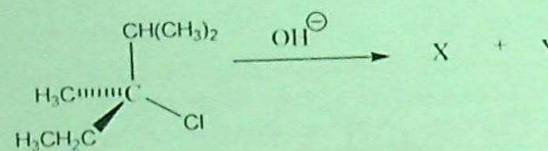


3+3+4
=10

- b. Why is pyrrole aromatic in nature?
c. Addition of singlet carbene to alkene is stereospecific, while addition of triplet is not - Explain.

3. a. What are the factors that affect $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. Explain.
b. Identify the products X and Y in the following reaction and give its mechanism. Write the evidences in favour of your mechanism.

3+4+3
=10



(S)-3-Chloro-2,3-dimethylpentane

- c. Justify the following statement:

The presence of electron withdrawing group like NO_2 at the ortho and para positions with respect to the leaving group increases the reactivity of chlorobenzene towards the aromatic nucleophilic substitution reactions.

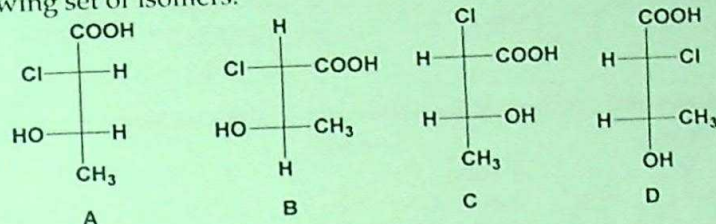
4. a. Define neighbouring group participation reaction? What is anchimeric assistance? Illustrate with an example.
b. What is kinetic isotope effect? Explain with an example how this isotope effect leads to the conclusion that o-hydrogen is involved in the formation of benzyne intermediate?

3+4+3
=10

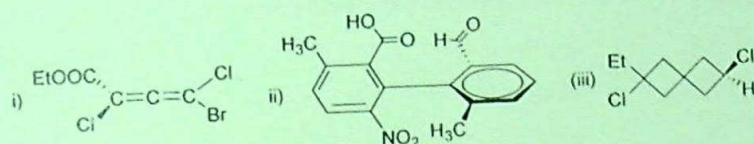
- c. If o-bromo anisole is treated with KNH_2 in liquid NH_3 , what are the different possible products obtained? Write the reaction and identify the cine product from them.

5. a. Find homomers, enantiomers and diastereomers from the following set of isomers.

3+3+2+
2=10

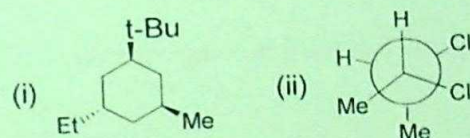


- b. Give R/S configurations for the following molecules



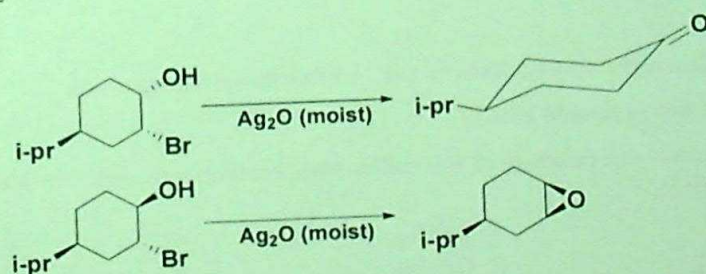
- c. What do you mean by locked conformations? Give example.

- d. Draw a chair conformation for (i) and Fischer projection for (ii)



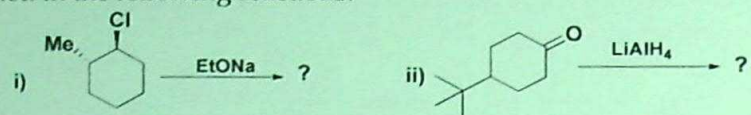
6. a. Justify the formation of the products in the following reactions.

4+3+3
=10



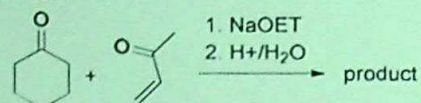
b. Explain what you mean by Stereo selective and stereo specific reactions. Explain with appropriate examples.

c. Write down the structure/conformation of the major product formed in the following reactions.

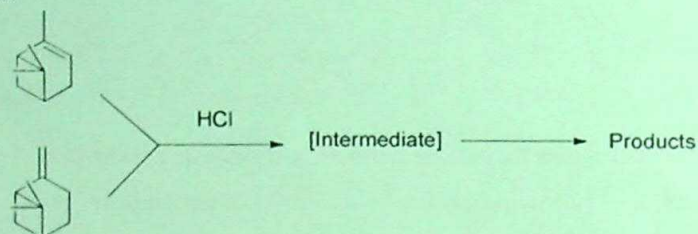


7. a. Write down the product of the following reaction with proper mechanism.

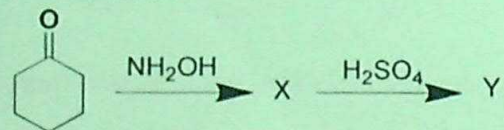
4+3+3
=10



b. Write the structure of intermediate and products of the following reaction



c. Write down the structure of X and Y of the following reaction. Show the mechanism.

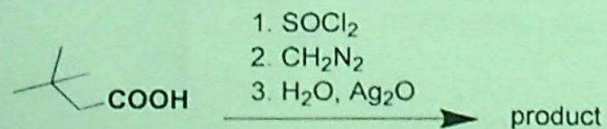


8. a. Write down the mechanism of the Hofmann rearrangement.

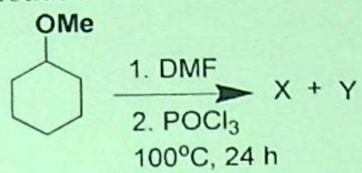
3+2+3+
2=10

b. What is the peroxide effect?

c. Write down the product of the following reaction and describe the mechanism.



- d. Write down the product of the following reaction and mention the major product.



= = *** = =