

B.Sc. 1st Semester (Honours) Examination, 2021 (CBCS)
Subject: Chemistry
Paper: CC-1
(Organic Chemistry-I)

Time: 2 Hours

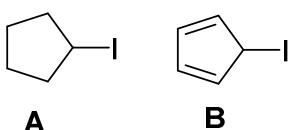
Full Marks: 40

Candidates are required to give answers in their own words as far as practicable

Answer any eight questions from the following

$8 \times 5 = 40$

1. The following iodides **A** and **B** were treated with silver perchlorate in propionic acid under identical reaction condition.



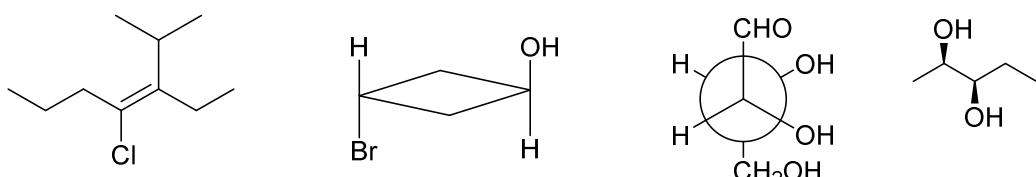
Which will undergo ready solvolysis? Give the structure of intermediates/transition state (if any) in both the cases. Comment on the stability of the such intermediates/transition state (if formed) with proper reasoning.

2. 8-Hydroxyquinoline can be separated from 4-hydroxyquinoline by steam distillation. Account for this observation.

Give one example for each of the following:

- A molecule having a centre which is simultaneously stereogenic and chirotopic.
- A molecule belonging to $C_{\infty v}$ point group.
- A molecule containing a pseudo-asymmetric centre.

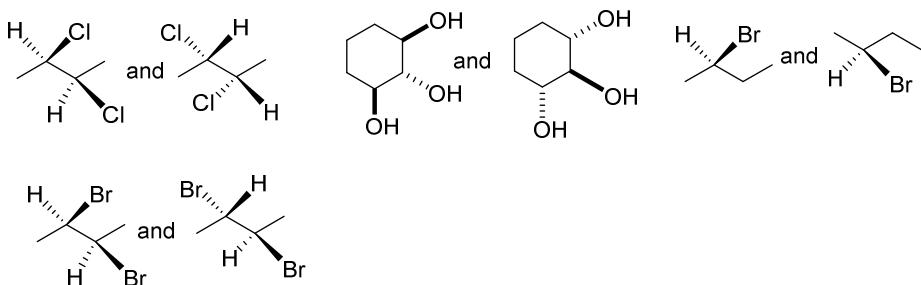
3. Write down the *R/S* or *E/Z* descriptors wherever applicable.



Calculate the Double Bond Equivalent (DBE) of a compound having molecular formula C_9H_7N and draw its probable structure that may have a real existence.

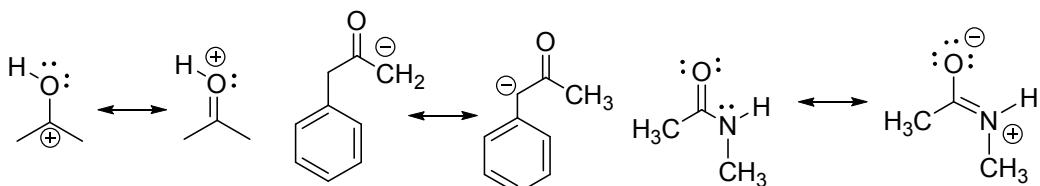
4. What are carbenes? Draw the orbital diagram of a carbene which is most likely to give stereospecific addition products when reacted with *cis*-2-butene. Explain your answer.
 Carbocations, carbanions or free radicals at benzylic position is always stable— Justify or criticize.

5. Assign the following pairs as enantiomers/ diastereomers/ homomers (any three).



Meso compounds may have multiple chiral centres still they are not optically active. Why?

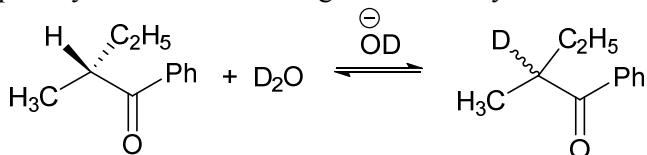
6. Identify the incorrect representation of canonical structures from the following pairs. Give proper argument for your choice.



Distinguish between bond energy and bond dissociation energy? Which is more general and why?

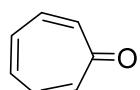
7. Draw the molecular orbitals of allyl anion and mark them as bonding, non-bonding or anti-bonding. Which one will act as HOMO and which one will be LUMO in a pericyclic reaction? Define homoaromaticity with a suitable example.

8. The following optically active ketone undergoes base catalysed racemization in D₂O as follows.

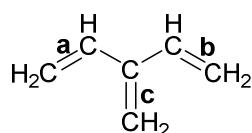


What relation between the rate of deuterium exchange and the rate of racemization is expected and why? Supposing it is a two-step process of different kinetics identify the slowest step. Explain your answer in light of the plausible mechanism of the reaction.

9. Tropone, shown below has unusually high dipole moment of 4.07 D — explain.

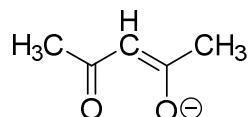


The following hydrocarbon has three double bonds having bond lengths **a**, **b** and **c** respectively. Comment on the bond lengths **a**, **b** and **c** with proper justification.



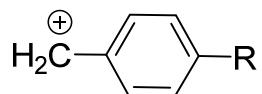
10. Indicate the nucleophilic and electrophilic centres by putting arrows in following structure (C).

Draw appropriate resonance forms to substantiate your answer.



(C)

Arrange and explain the following benzyl cations in the increasing order of stability.



R= *t*Bu, *i*Pr, Et, Me