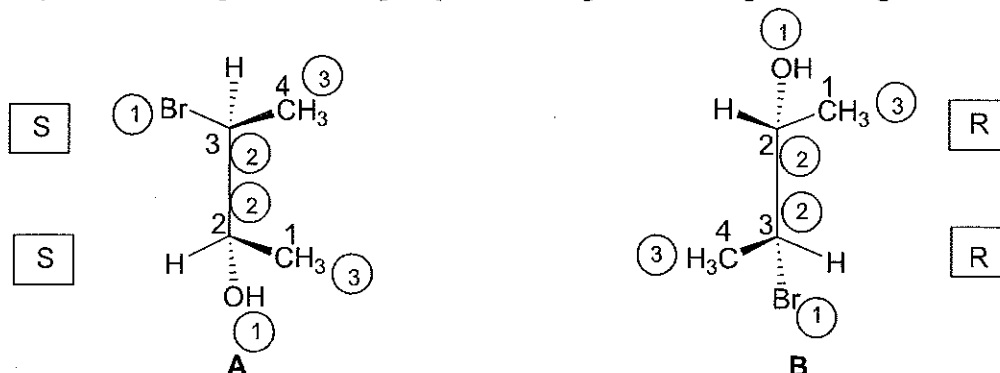


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1. Determine the stereochemical relationship between the two molecules **A** and **B** given below?
- Support your answer by giving R/S configurations of the chiral centres of them.
 - Clearly indicate the priorities of groups according to Cahn-Ingold-Prelog rules.

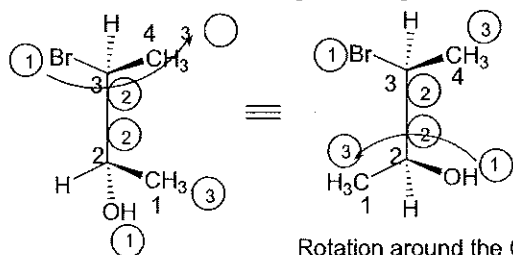


A and **B** are the same compound, 3-bromo-2-butanol. But different stereoisomers. Have two stereocentres. Configurations of the two stereocentres are, **A**: 2*S*, 3*S* **B**: 2*R*, 3*R*. Therefore, **A** and **B** are Enantiomers (mirror images).

Give here any drawings which you made use of, in determining R/S configurations.

Molecule **A**

After two interchanges of the groups on C-2 (to keep the lowest priority group away) Original configurations are not changed.

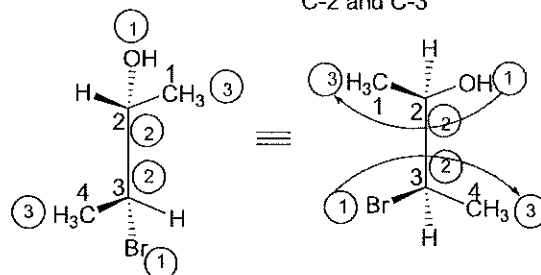


Rotation around the C-3 is anticlockwise. Therefore, configuration of C-3 is *S*.

Rotation around the C-2 is anticlockwise. Therefore, configuration of C-2 is *S*.

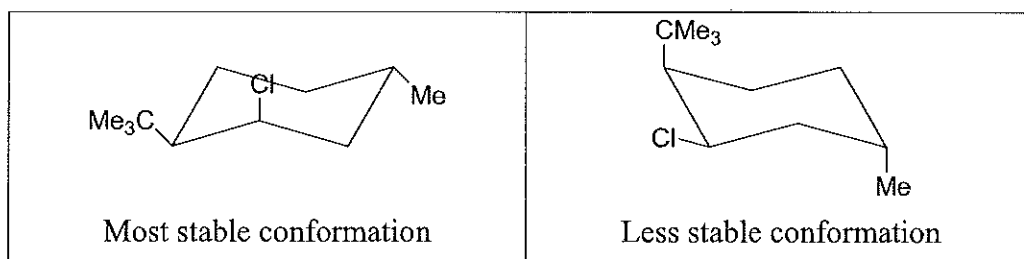
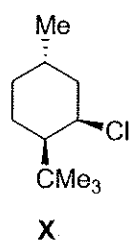
Molecule **B**

After two interchanges of the groups on both C-2 and C-3



Rotation of the groups at both C-2 and C-3 is clockwise. Therefore, configurations of C-2 and C-3 are *R*.

2. The following compound **X** undergoes E2 elimination with alcoholic KOH.
- Draw the two chair conformations of **X**.

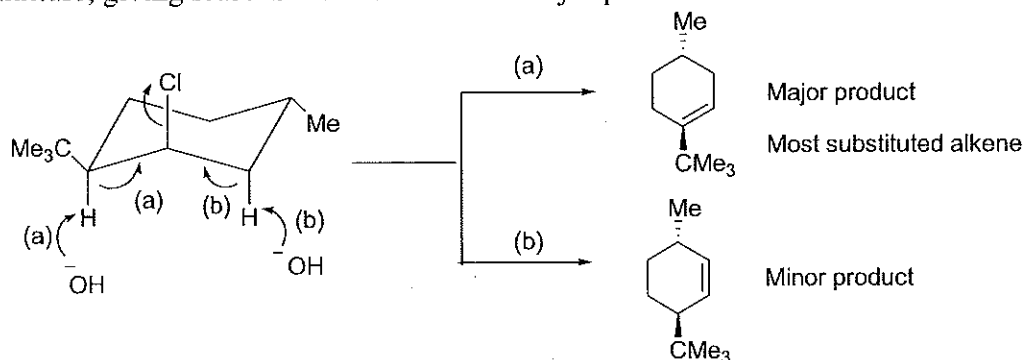


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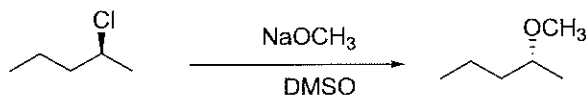
- ii. Which chair conformation undergoes the E2 elimination? Explain why.

Most stable conformation. Anti-periplanar arrangement of the Cl and β -H required for E2 elimination is found in most stable conformer.

- iii. Write the product/s of this reaction giving its mechanism. If you get a product mixture, giving reasons indicate what the major product is.



3. Giving reasons predict the mechanistic pathway of the following reaction



Substrate: Secondary alkyl halide

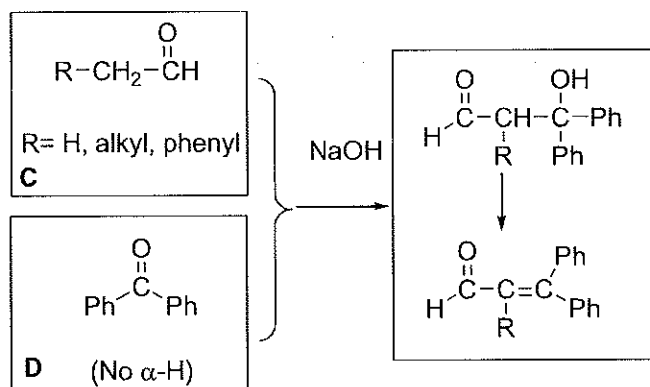
Nucleophile: CH_3O^- is a negatively charged strong/good nucleophile.

Solvent: DMSO is a polar aprotic solvent. Nucleophile is not solvated, available for reaction.

Mechanism: $\text{S}_{\text{N}}2$ pathway. $\text{S}_{\text{N}}2$ mechanism leads to inversion of configuration.

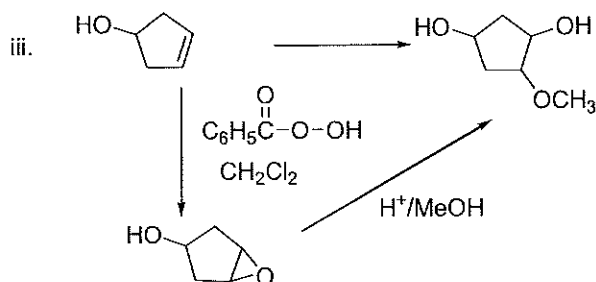
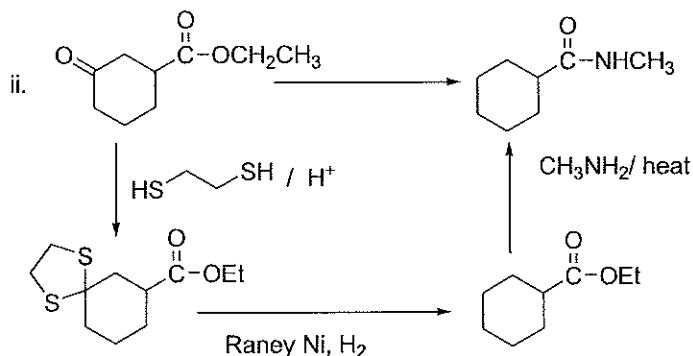
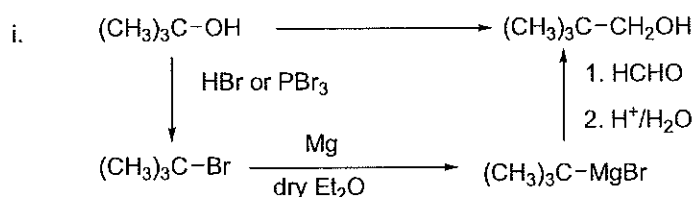
4. Compound **C** is an aldehyde which can undergo self-condensation with base and compound **D** is a ketone which cannot undergo base catalyzed condensation itself.

- Give suitable structures for **C** and **D**.
- Draw the structure of the crossed aldol product of **C** and **D**.



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5. Show how you can carry out each of the following transformations in **less than four** steps.

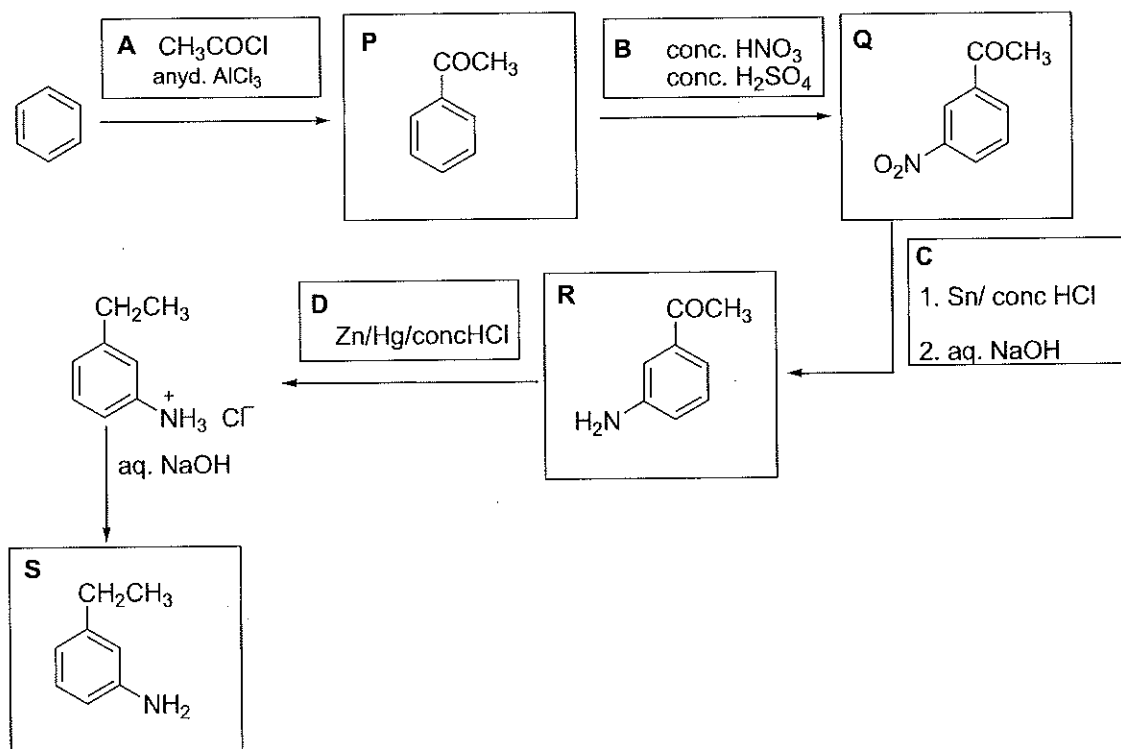


6. State whether each of the following compounds are aromatic, anti-aromatic or non-aromatic. Give reasons for your answer.

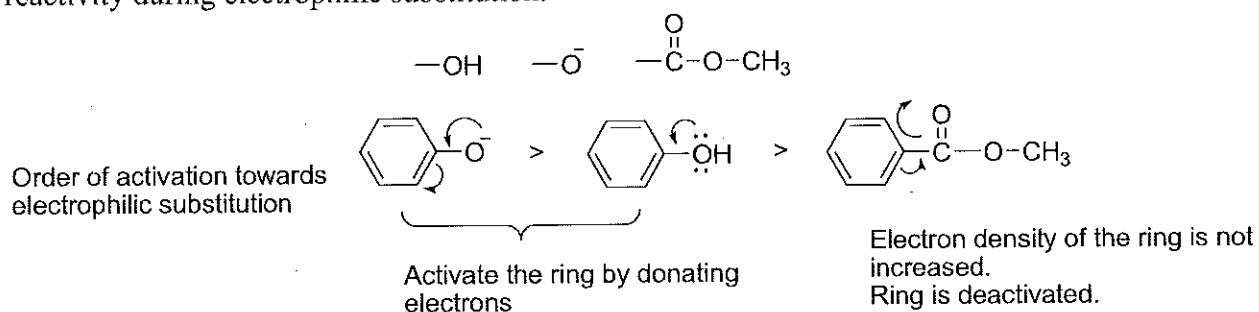
	Cyclic, planar, no $(4n+2)\pi$ electrons in the ring. Does not obey Huckle rule. But has $4n\pi$ electrons in a closed shell. Therefore, Anti-aromatic
	Cyclic. Non-planar due to the presence of sp^3 hybridized C atom ($-\text{CH}_2-$ group). Therefore, non-aromatic
	Cyclic, planar, 4π electrons + lone pair of electrons on N atom = 6π electrons in a closed shell [Huckle no. which is $(4n+2)\pi$ electrons], Obeys Huckle rule, Aromatic.
	Cyclic, planar, 6π electrons + a pair of electrons due to negatively charged C atom = 8π electrons = $4n\pi$ electrons in a closed shell (not the Huckle no.). Anti-aromatic

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7. Complete the following reaction scheme giving the structures of the intermediates and appropriate reagents and reaction conditions.



8. Giving reasons, compare the influence of the following substituents of benzene on the reactivity during electrophilic substitution.



phenoxide ion has a greater ability to donate electrons to the ring than phenol.

Therefore phenoxide ion is more reactive than phenol towards electrophilic substitution

Intermediates of substitution



stability of this intermediate is less due to + charge on electronegative O atom.