

**B.Sc. 1st Semester (Honours) Examination, 2020-2021**

**CHEMISTRY**

**Course ID: 11411**

**Course Code: SH/CHEM/101/C1**

**Course Title: Organic Chemistry I**

**Time: 1 Hour 15 Minutes**

**Full Marks: 25**

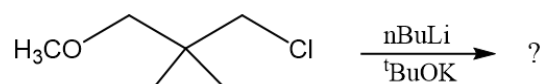
*The figures in the margin indicate full marks.*

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

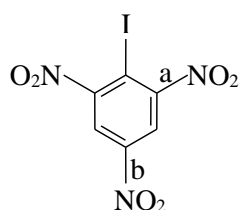
1. Answer *any five* questions:

1×5 = 5

(a) Draw the structure of intermediate



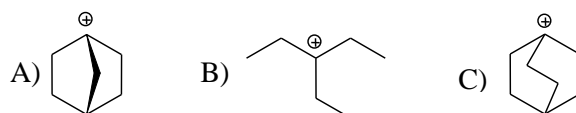
(b) Which of the C—N bond (a or b) has a higher bond length and why?



(c) Draw the orbital picture of  $\text{CH}_3\text{CH}=\text{C}=\text{O}$ .

(d) 'Dipole moments of  $\text{Me}-\text{F}$  (1.56D) and  $\text{Me}-\text{Cl}$  (1.51D) are similar even though the fluorine is considerably more electronegative than chlorine'. Give reason(s).

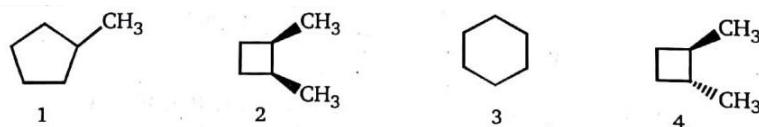
(e) Give the correct order of stability of the following carbocations:



(f) What is the difference between torsion angle and dihedral angle?

(g) Draw the elements of symmetry present in *E*-1,2-dichloroethene.

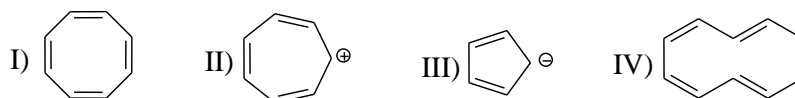
(h) Rank the following substances in order of decreasing heat of combustion.



2. Answer *any two* questions:

5×2 = 10

(a) (i) Which of the following compounds are aromatic, antiaromatic and non-aromatic? Justify your answer.

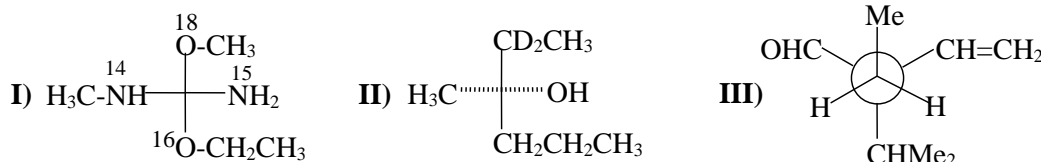


(ii) Draw the  $\pi$ -MOs of allyl radical and mention the orbitals, which act as HOMO and LUMO.

3+2 = 5

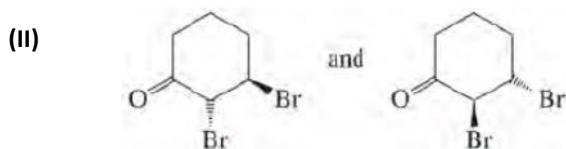
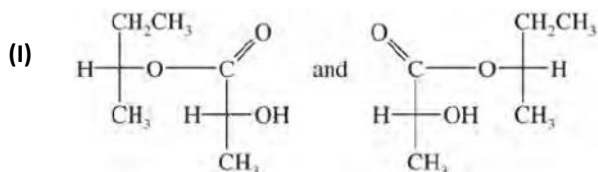
(b) (i) Draw the orbital picture of a dissymmetric allene. Why it is dissymmetric? Explain.

(ii) Assign R/S-descriptors for the chiral centers in the following compounds.

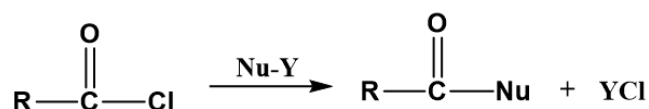


2+3 = 5

(c) (i) Which of the following pair of compounds could be separated by distillation?



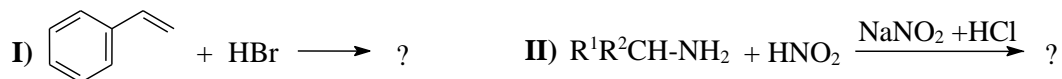
(ii) Indicate the type of the following reaction: Addition/ Elimination/Substitution



(iii) Justify with an example that formal charges on atoms of a molecule and oxidation state of the same atoms in the same molecules are different aspects. 2+1+2 = 5

(d) (i) Compare the nucleophilicity of  $\text{NH}_2\text{NH}_2$  and  $\text{NH}_3$ ?

(ii) Give the structures of products in each case with the structures of intermediate(s), if any.



2+3 = 5

3. Answer *any one* question:

10×1 = 10

(a) (i) Explain the fact that the cyclopentadienone has shorter  $\text{C}=\text{O}$  bond length than cycloheptatrienone (tropone).

(ii) Predict the products (A) and (B) with suitable explanation.



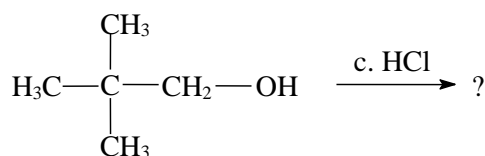
(iii) Calculate the *e.e.* and the specific rotation of a mixture containing 6.0 g of (+)-2-butanol and 4.0 g of (-)-2-butanol, the specific rotation of enantiomerically pure (+)-2-butanol is +13.5°.

(iv) Outline the chemical method of resolution of ( $\pm$ )-2-methylpentanoic acid. 2+3+2+3 = 10

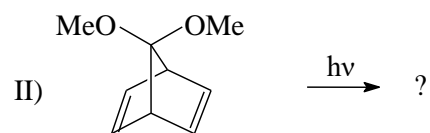
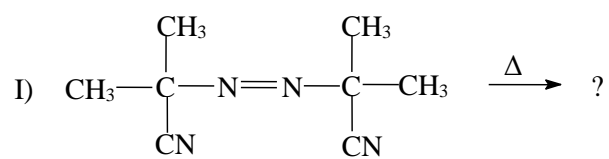
(b) (i) Draw the orbital pictures of singlet and triplet carbene.

(ii) Explain addition of singlet carbene to  $\text{C}=\text{C}$  bond is stereospecific but addition of triplet carbene to  $\text{C}=\text{C}$  is not. Explain with reaction mechanism.

(iii) Predict the product(s) in the following reaction:



(iv) Give the product(s) of the following reactions:



2+3+2+3 = 10