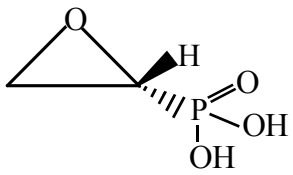
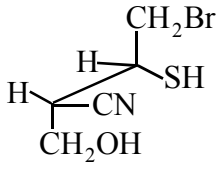
d) Assign the configurational descriptor (*R* / *S*) to the Stereocentres of the following molecules with assignment of priority sequence of the ligands.

i) $1\frac{1}{2}+\left(1\frac{1}{2}+1\frac{1}{2}\right)$




ii)




e) The optical rotation of enantiopure *R*-PhCOCH(Me)Ph gradually changes to zero in the presence of catalytic amount of NaOMe in MeOH – Why? 3

f) Predict the most stable conformer of 3*R*, 4*S*-hexane-3, 4-diol and suggest the appropriate reason. 2

g) Draw the conformational stereoisomers of 4-methylpent-3-en-2-one and comment on their relative stability. $1\frac{1}{2}$



# B. Sc. Chemistry Examination, 2023

( 1st Year, 1st Semester )

## CHEMISTRY (CORE)

### Paper: Core/Chem/Th/02

Time : Two Hours Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each unit.

### UNIT - 1021 - O

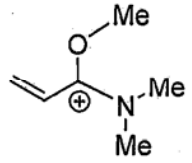
Attempt ***all*** the questions.

1. a) Calculate the double bond equivalent (DBE) of the compound of molecular formula $C_7H_4N_2O_2$. 1

b) Draw the orbital diagram of $CH_3$-CH=C=O and mention the state of hybridization of all the carbon atoms. $1\frac{1}{2}$

c) Between *n*-hexane and cyclohexane, which one will have higher boiling point and why? 2

d) Draw all the resonating structures of the following cation and indicate the most contributory resonating structure with the explanation. 2

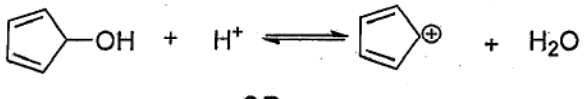


e) Explain the following observations: $1\frac{1}{2}+2\frac{1}{2}$

i) $CH_3$ radical is planar while $CF_3$ radical is pyramidal.

ii) $PhN_2Cl$ easily couples with N, N-dimethyl aniline, but does not couple with N, N, 2, 6-tetramethyl aniline.

f) Which of the following reactions will have large equilibrium constant? Give reason. 2

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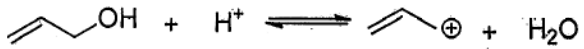
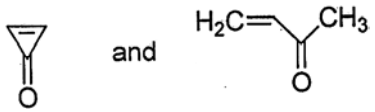
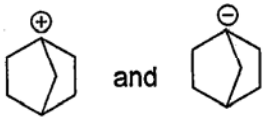



g) Using Frost diagram comment on the aromaticity of cyclobutadiene. $1\frac{1}{2}$

h) i) Between the following two carbonyl compounds which one will have higher dipole moment? Explain. 2




ii) Which of the following ions is more stable? Explain with suitable reason. 2






iii) Draw the π-MO's diagram of allyl radical and identify the SOMO energy level in the ground state. 2

**UNIT - 1022 - O**

Attempt ***all*** the questions.

2. a) **A** and **B** are two achiral diastereomers having molecular formula $C_5H_8O$. **A**, on reduction, yields **C** and **D** in equimolecular proportion which are enantiomeric to each other. Similarly, **B**, on reduction, yields **E** and **F** which are enantiomeric to each other and obtained in equimolecular proportion. **C**, **D**, **E** and **F** have the molecular formula $C_5H_{10}O$. Deduce the structures of **A** and **B** and find out the realtionship between **C** and **F**. 3

b) Logically comment whether the following statement is correct or not. 1

"A molecule is achiral because it possesses an $S_3$ axis."

c) Find out the symmetry element(s) present in the following molecules. $1\frac{1}{2}+1\frac{1}{2}+2$

i) E-1, 2-dibromoethene

ii) 1, 3-dinitrobenzene

iii) most stable conformer of 1, 2-dichloroethane