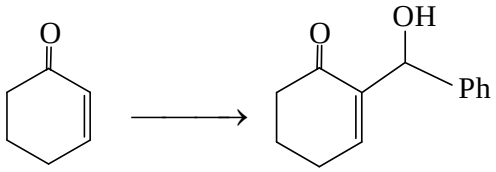
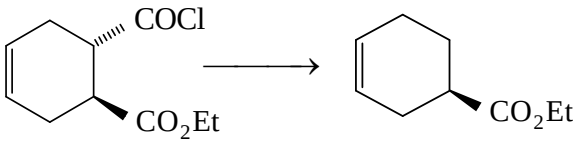
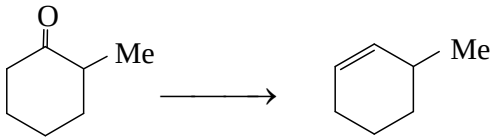
c) Mention the reagents for the following transformations :

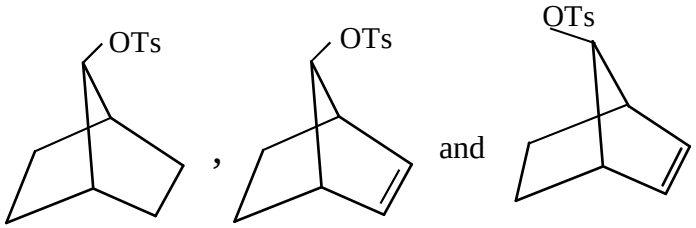
i) 


ii) 


iii) 


1+1+1

d) How will you explain the relative rate of acetolysis of the following bicyclic compounds using $CH_3CO_2K$ in acetone ? $2\frac{1}{2}$




$K_{rel}$ : 1 $10^4$ $10^{11}$

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# FINAL B. SC. EXAMINATION, 2017

( 1st Semester )

## CHEMISTRY (HONOURS)

## PAPER - XII

## ORGANIC CHEMISTRY

Time : Two hours Full Marks : 50

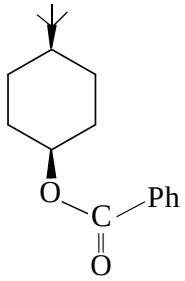
Use a separate answerscript for each group.

## GROUP - A

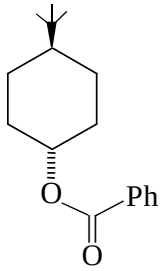
1. a) Comment on the relative stability, chirality and optical activity of *cis*-1,2-dimethylcyclohexane and *trans*-1,2-dimethylcyclohexane. $2\frac{1}{2}+1+1\frac{1}{2}$

b) Between *cis*-and *trans*-1,2-dibromocyclohexane, which one will have higher dipole moment and why ? $1\frac{1}{2}$

c) Which one of the following compounds **A** and **B** will undergo faster saponification and why ? 2

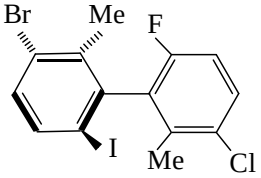


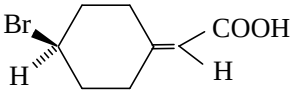

**A**




**B**

d) Assign *R*/*S* to the following molecules indicating relative priority of the ligands. $1\frac{1}{2}+1\frac{1}{2}$

i) 


ii) 


e) Assign topic descriptors to the diastereotopic hydrogens in *S*-2-butanol with a suitable diagram. $1\frac{1}{2}$

f) Suggest an experiment to prove that using Wilkinson's catalyst, the hydrogenation of an olefinic bond occurs with *syn*-facial selectivity. 2

g) Attempt ***any one*** of the following questions : 2

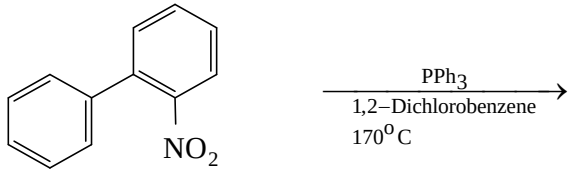
i) Predict the major product of the following reaction using Felkin-Anh model.

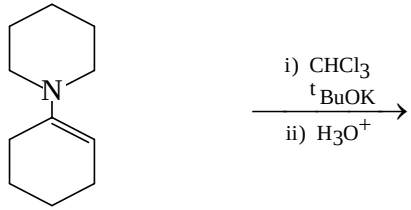

ii) Logically choose the correct enantiomer of 1-phenylethanol which can be used as a chiral auxiliary for the enantioselective synthesis of *S*-atrolactic acid (*S*-2-hydroxy-2-phenylpropanoic acid) through an appropriate pyruvate ester.

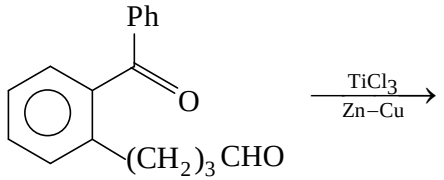


## GROUP - B

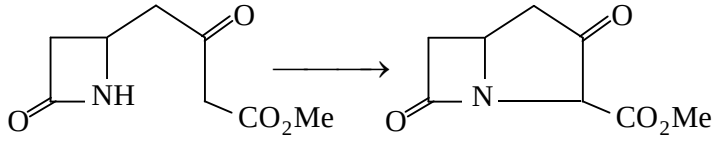
3. a) Predict the product(s) of the following reactions and explain with plausible mechanism. $2\frac{1}{2}\times3$

i) 


ii) 


iii) 


b) How can you carry out the following transformation ? Explain with mechanism. $1\frac{1}{2}+1\frac{1}{2}$



## GROUP - B

2. a) i) N-H bond vibrates at a frequency 3400 $cm^{-1}$. Calculate the force constant of the bond. $1\frac{1}{2}$

ii) How are the following compounds distinguished by IR ? Answer ***any two*** : $1\frac{1}{2} \times 2$

I. β-Aminobenzoic acid and 2-amino phenylacetic acid.

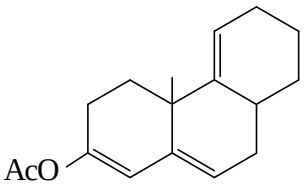
II. Diethyl ether and ethyl vinyl ether

III. Phenyl acetate and methyl benzoate

b) i) What is meant by hypsochromic shift in UV-vis spectroscopy ? 1

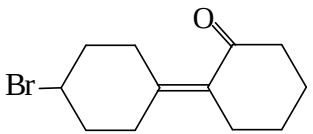
ii) Discuss with diagram on the effect of polar solvent on $n \rightarrow \pi^*$ and O transitions. 2

iii) With the help of Woodward-rule deduce the $\lambda_{max}$ of the following compounds : 2




(in $CHCl_3$)

and




(In EtOH)

c) i) Why does N-H appear as a broad peak in the corresponding $^1H$ – NMR Spectrum ? $1\frac{1}{2}$

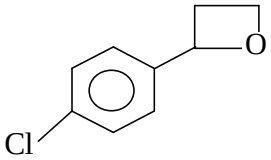




ii) What is meant by chemical shift in NMR ? Why is it preferably expressed as ppm instead of Hz ? 2

iii) Mention how many types of proton peaks are obtained in the $^1H$ – NMR of isopropylbenzene ? Discuss on the corresponding spin multiplicity and relative position of peaks in the $^1H$ – NMR spectrum ?

iv) Thermal decomposition at 560°C of compound **C** generates compounds **D** and **E**. $2\frac{1}{2}$




**C**

**E** ($C_8H_7Cl$)

[ **D** reduces Tollens' reagent. ]

Spectral properties of **D** and **E** are as follows :

**D** : IR : $\bar{\nu}$ at ~ 1700 $cm^{-1}$

$^1H$ – NMR (60 MHz, $CCl_4$ solvent) : δ 7.58 (4H) and 9.95 (1H) ppm.

**E** : IR : no $\bar{\nu}_{C=0}$

$^1H$ – NMR ($CCl_4$) : δ 5.10 (1H), 5.51 (1H), 6.50 (1H) and 7.10 (4H) ppm.

With the help of spectroscopic properties deduce the structures of **D** and **E** and show how these are formed from **C**.