Ex/FCH/I/XII/34/2018

FINAL B. SC. EXAMINATION, 2018

(1st Semester)

CHEMISTRY (HONOURS)

PAPER - XII

ORGANIC CHEMISTRY

Time : Two hours Full Marks : 50

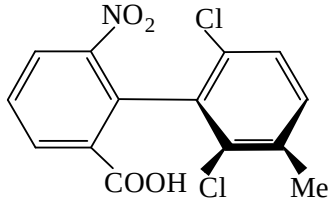
Use a separate answerscript for each group.

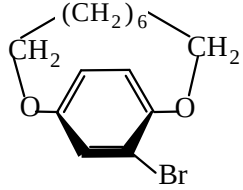
GROUP - A

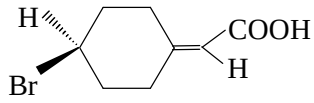
1. a) Draw the conformers of *cis*-1,3-dimethylcyclohexane and *trans*-1,3-dimethylcyclohexane. Comment on their relative stability, chirality and optical activity. 4

   b) *Cis*-4 *tert*-butylcyclohexyl tosylate undergoes solvolysis at a higher rate in 80% aqueous ethanol than the corresponding *trans*-isomer. Justify your answer with energy profile diagram. 2

   c) Designate the *R* / *S* configuration of the following compounds (***any two***) : 2

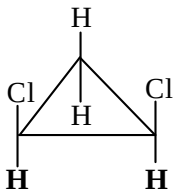
i) 

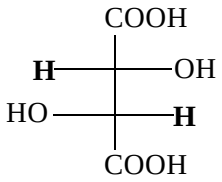
ii) 

iii) 

[Turn over

d) Comment on the topic relationship of the ligands indicated in bold in the given compounds below and justify your answer. 1+1





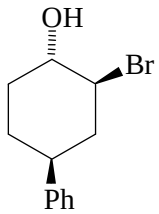
e) Predict the product(s) of the following reaction using Felkin-Anh model. 2

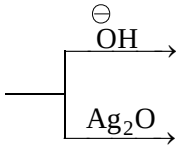
$$(R)-\text{PhCH(Me)COMe} \xrightarrow[\text{aqueous work up}]{\text{PhLi in THF}}$$

f) Draw the preferred conformation of the following molecule with appropriate reasoning. 1

cis - 4 - phenyl - 1- cyanocyclohexane

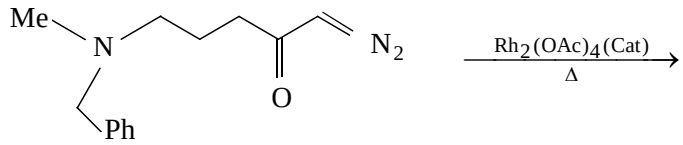
g) Predict the product(s) and explain your answer with mechanism. 2



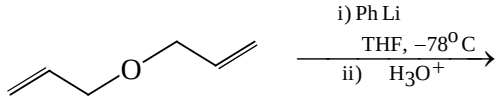


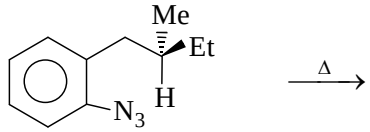
h) Suggest the reagent for asymmetric epoxidation of the following allylic alcohol to give the epoxide. Write down the structure of active reagent. 2

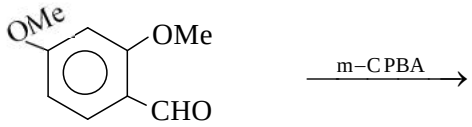
b) Mechanistically predict the product(s) of the following reaction. 3

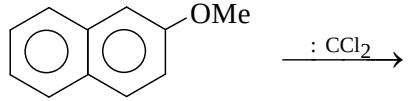


b) Predict the product(s) and propose the mechanism of formation of the following reactions. $2\frac{1}{2} \times 4$

i) 

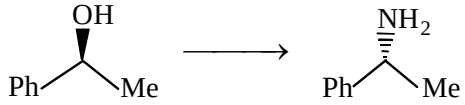
ii) 

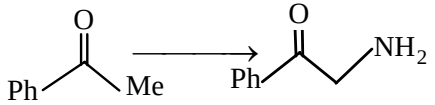
iii) 

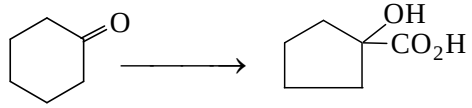
iv) 

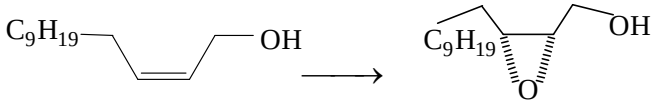
7. Attempt ***any one*** of the following questions :

a) How can you perform following transformations?

i) 

ii) 

iii) 



GROUP - B

2. Answer ***any one*** of the following questions.

a) What is meant by molar absorptivity? Comment on the λ_{max} and molar absorptivity of $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transition of $>C = O$ unit with proper reason. 1+2

b) What is vacuum UV region? Which kind of electronic transition is expected in this region ? Comment on the selection rules for IR-Spectroscopy with example.

$\frac{1}{2} + \frac{1}{2} + 2$

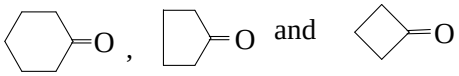
3. Answer ***any two*** of the following questions :

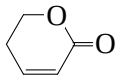
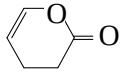
a) What is auxochrome? Explain the effect of solvent polarity on the K and R-band of UV-VIS spectroscopy. 1+2

b) i) Explain the coupled vibration in IR-Spectroscopy with an example. $1\frac{1}{2}$

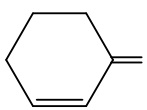
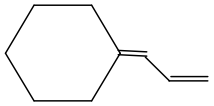
ii) Calculate C−H stretching frequency ($\bar{\nu}$ in cm^{-1}) applying Hook's Law. $1\frac{1}{2}$

c) i) Distinguish the structural differences among the molecules of each Set +(A) & (B) based on IR-Spectral data. 1+1

A)  and

B)  and 

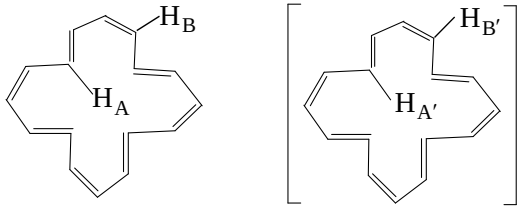
ii) Using Woodward-Fischer rule distinguish the following compounds on the basis of their UV-VIS absorption profile. 1

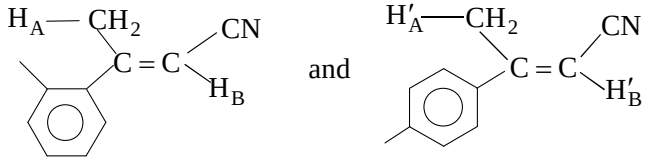
 and 

4. Answer ***any two*** of the following questions.

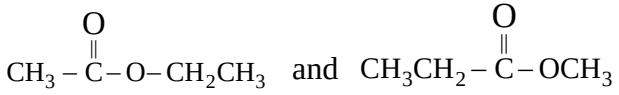
a) What is shielding constant ? Explain neighbouring group anisotropy with proper examples. 1+2

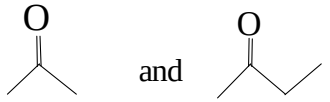
b) Compare (with reasons) the chemical shifts (H_A vs $H_{A'}$ and H_B vs $H_{B'}$) in the following chemical species. $1\frac{1}{2}+1\frac{1}{2}$

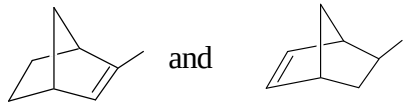
i) 

ii) 

c) How do you distinguish the following pairs by ^1H – NMR Spectroscopy? 1+1+1

i) 

ii) 

iii) 

5. i) Write down the limitation of Beer-Lambert's Law.

ii) Calculate the energy of a mole of photon of an electromagnetic radiation of wavelength $\lambda = 400\,nm$. 1+1

GROUP - C

6. a) Both $PhCH_2COCH_2Cl$ and $PhCH(Cl)COCH_3$ produce same product when reacted separately with aqueous NaOH – Explain. 3