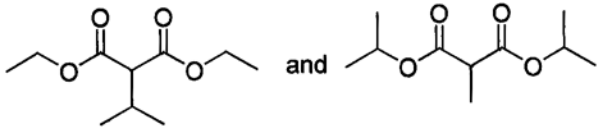
iv) Predict and explain the following changes in the auxochromic red/blue shifts: (a) when PhOH is basified and (b) when PhCOOH is basified.

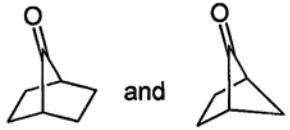
v) Calculate the concentration in μg/ml of the organic compound (Mol. Mass 211.2) in 0.11 M HCl giving an absorbance of 0.612 at λ_{max} 281 nm in a 4 cm cell. The molar absorptivity at 281 nm is 5372.

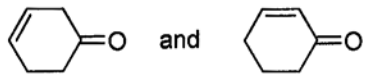
vi) "In NMR, all chemically equivalent protons may not be magnetically equivalent" – true or false? Justify with an example.

vii) How can you calculate the equilibrium constant of a keto-enol tautomerism by ^{1}H-NMR spectroscopy? Explain with an example.

6. How do you distinguish the pair of molecules given using spectroscopic methods [IR, UV-Vis and ^{1}H-NMR (use combination for better determination)]. (***any two***) 2×2

i) 

ii) 

iii) 

B. Sc. (Chemistry) Examination, 2022

(2nd Year, 2nd Semester)

CHEMISTRY (CORE)

Paper – Core/Chem/TH/09

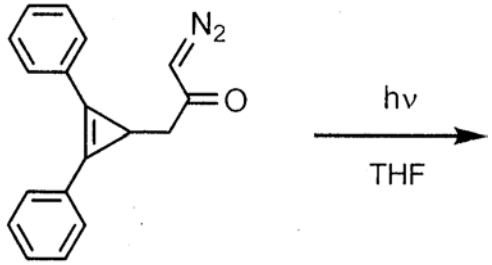
Time : Two hours Full Marks : 40

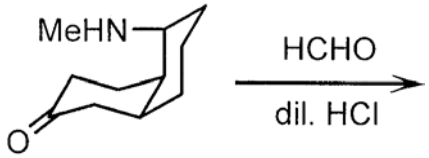
(20 marks for each unit)

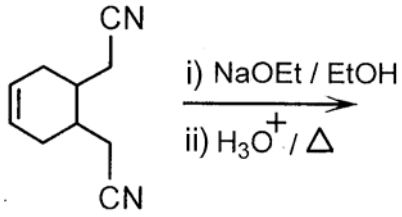
Use a separate answer script for each Unit.

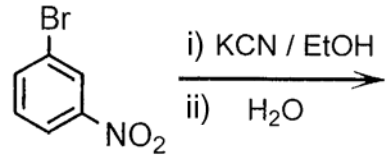
UNIT – 4091-O

1. Predict the product(s) formed in the following reaction with plausible mechanism. $1\frac{1}{2}\times 4$

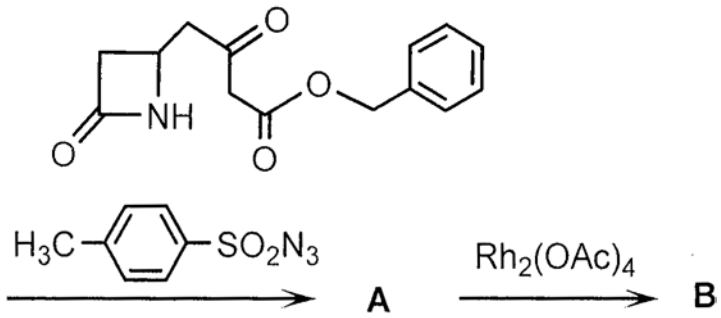
a) 

b) 

c) 

d) 

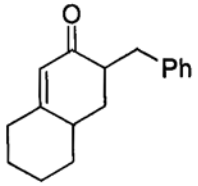
2. a) Write down the products **A** and **B** in the following reaction with suitable mechanism. 3

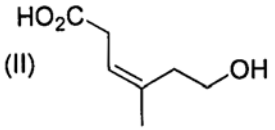


b) Compound **C** decomposes faster than compound **D**- explain. 1

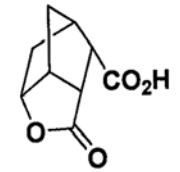
C **D**

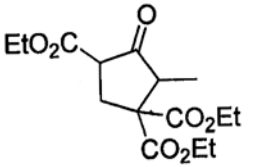
3. a) Write down the structure of the product(s) **E** and **F** in the following reaction and explain with suitable mechanism. 3

(I) 

(II) 

ii) After depicting the **retrosynthetic analysis** outline an **actual synthetic pathway** of the following compound starting from easily/ commercially available suitable organic molecules. (***any one***). 3

(I) 

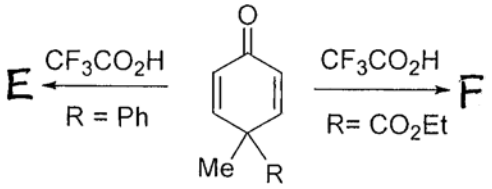
(II) 

5. Answer ***any four*** of the following questions. $1\frac{1}{2}\times 4$

i) Calculate the wave number of stretching vibration of a carbon-carbon double bond. [Force constant $k = 10\times10^5$ dynes.cm^{-1}]

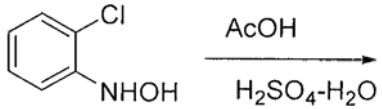
ii) *cis*-1,2-Dichloroethylene is IR active with respect to C=C stretching mode of vibration, whereas *trans*-1,2-dichloroethylene is not. Explain.

iii) Increase the polarity of the solvent shift $\pi \rightarrow \pi^*$ band to longer wave length but $n \rightarrow \pi^*$ band to shorter wave length – comment on this statement.

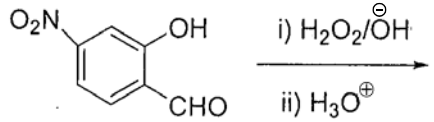


b) Predict the product(s) in the following reaction with plausible mechanism (Attempt ***any two***) 2×2

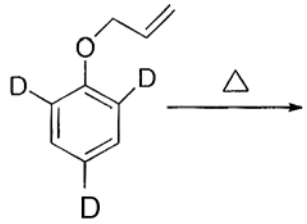
i)



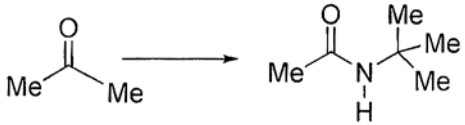
ii)



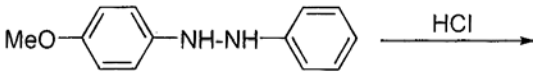
iii)



c) How would you carry out following transformation? (Mechanism is not required) 2



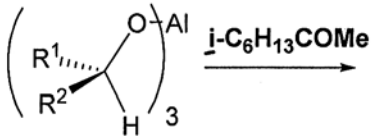
d) Write down the products formed in the following reaction. 1



[Turn over

UNIT – 4092-O

4. a) Predict the **major enantiomer** formed in the following reaction, and **account mechanistically** for its formation as the major one. $1\frac{1}{2}$



[steric bulk : $R^1 > R^2$]

b) With the help of a **suitable model** predict the structure of the **major product** with proper **stereochemical outcome**, formed in the reaction of *S*-3-methoxy-2-pentanone with MeMgl. 2

c) Which of compounds **G** and **H** shows a greater rate of anhydride formation and why? $1\frac{1}{2}$

G

H

d) Exemplify the formation of a 12-membered macro-lactone from a lactonization reaction of a ω-hydroxyacid bearing unsaturations in suitable positions. 1

e) i) Outline a logical **retro-synthetic analysis** of the following compounds (***any one***): 1