Reg. No. | | | | | | | | | |

CHS/ACS/OCS/CAS 454

II Semester M.Sc. Degree Examination, Sept./Oct. 2022
(Freshers and Repeaters) (CBCS – 2016-17 Syllabus)
CHEMISTRY/APPLIED CHEMISTRY/ORGANIC CHEMISTRY/
ANALYTICAL CHEMISTRY
Organic Spectroscopic Techniques

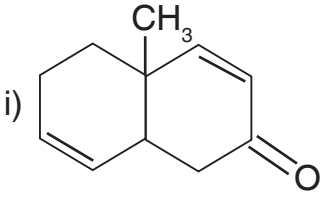
Time : 3 Hours Max. Marks : 70

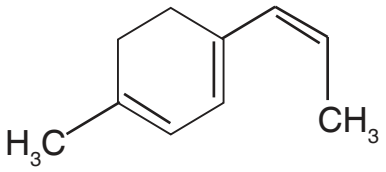
Instructions *: 1) Answer Part – **A** and **any four full** questions from Part – **B**.*
*2) Figures to the **right** indicate marks.*

PART – A

1. Answer **all** the following sub-divisions : **(9×2=18)**

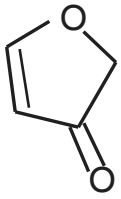
a) Calculate the λ_{max} for the following compounds :

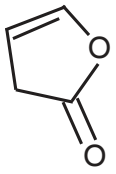
i) 

ii) 

b) Benzene is colourless while nitrobenzene is pale yellow and p-nitroaniline is dark yellow. Justify.

c) How will you distinguish between the following compounds using IR spectra ?

i) 

ii) 

d) What is multiplet skewing ? Give its importance.

e) "Even when $CDCl_3$ is used as a solvent, there appears a peak at 7.26 ppm in NMR spectra."Comment on this.

f) What are the advantages of FT-NMR over CW NMR Instrument.

g) What are the factors affecting the fragmentation in Mass spectra ?

h) What is McLefferty rearrangement ? Give an example.

i) Distinguish between 'molecular ion peak' and 'base peak' with a suitable example.

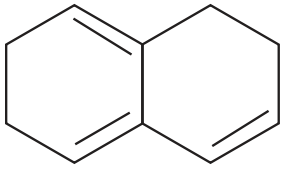
P.T.O.

PART – B

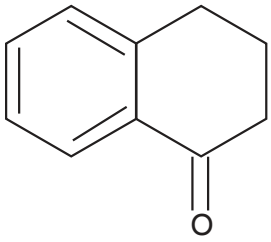
Answer **any four full** questions : **(4×13=52)**

2. a) Discuss the factors which affect the positions of UV bands.
   b) What is finger print region in IR spectra ? Explain its use in structural elucidation of organic compounds.
   c) Explain Woodward-Fieser rules for predicting λ_{max} of α, β-unsaturated systems and predict the λ_{max} for the following :

i)



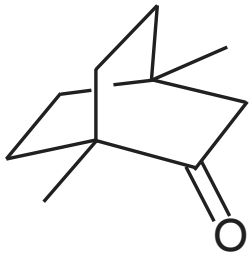
ii)



(4+3+6=13)

3. a) Discuss the effect of hydrogen bonding and solvents on IR frequencies.
   b) How do you confirm the following conversion using FTIR :
   1 – (4-hydroxyphenyl) ethanone $\rightarrow$ 4-hydroxylphenyl acetate.
   c) With suitable examples, discuss the effect of various substitutions on the vibrational frequencies of carbonyl group. **(4+4+5=13)**

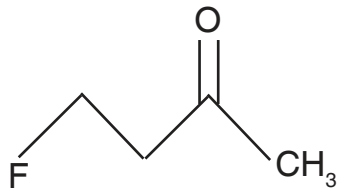
4. a) Discuss the applications of NOE with suitable examples.
   b) Draw the ^{1}H-NMR (spin multiplicities) and ^{13}C-NMR spectra of :



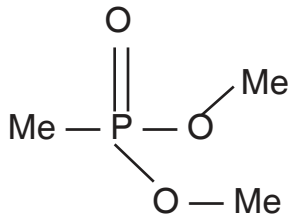
   c) Discuss the magnetic anisotropic effect in molecules containing π-bonds.
   (4+5+4=13)

5. a) Sketch and explain the ^{1}H-NMR and ^{13}C-NMR spectra for the following molecules :

i)



ii)



b) Write a note on the following :

i) Karplus curve.

ii) Spin decoupling technique. **(7+6=13)**

6. a) Discuss the fragmentation modes for the following with suitable examples :

i) Esters

ii) Phenols.

b) How will you distinguish 1°, 2° and 3° alcohols on the basis of mass spectrometry ?

c) Write a note on HRMS analysis. **(6+3+4=13)**

7. a) Discuss the following ionization methods :

i) Fast atom bombardment ionization.

ii) Chemical ionization.

b) What is meta stable ion ? Discuss its formation in toluene.

c) Elucidate the possible structure of the compound based on following data :

Mol. Formula : C_5H_9BrO

^{1}H-NMR : δ1.17(d, 6H), 3.02(m, 1H), 4.10 (s,2H)

^{13}C-NMR : δ17, 37, 39, 210

Mass : m/z 166 (M+2) **(6+3+4=13)**