This question paper contains **5** printed pages]

NEPWT—21—2024

FACULTY OF SCIENCE

M.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

ORGANIC CHEMISTRY

SCHECT-1501

(Advanced Spectroscopic Methods)

(Tuesday, 10-12-2024) **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 *Hours* *Maximum Marks*—80

N.B. :— (1) *First* question is compulsory.

(2) Solve any *three* questions from remaining five.

1. Solve the following : 20

(*a*) Explain, why conjugated diene absorb at longer wavelength, whereas nonconjugated diene absorb at shorter wavelength in U.V. spectroscopy.

(*b*) Why TMS solvent is used as standard reference in NMR spectroscopy ?

(*c*) Explain the metastable ion peak and its application in the spectroscopy.

(*d*) Calculate the fundamental modes of vibrations in the following :

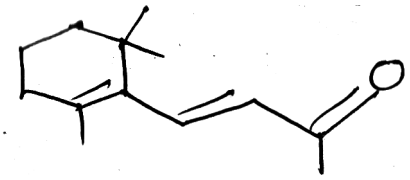
(*i*) H_2S

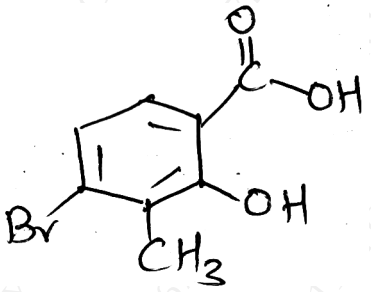
(*ii*) C_2H_2.

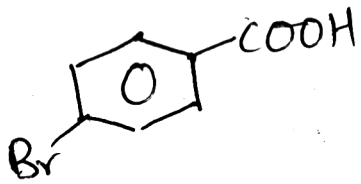
P.T.O.

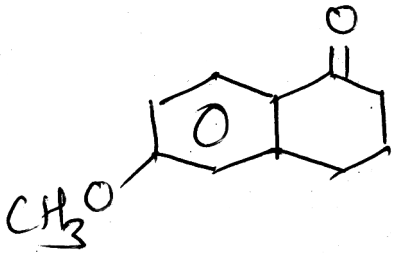
2. Answer the following : 20

(*a*) Calculate the λ_{max} of the following compounds :

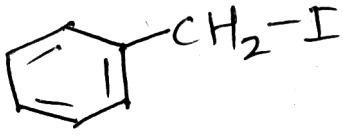
(*i*) 

(*ii*) 

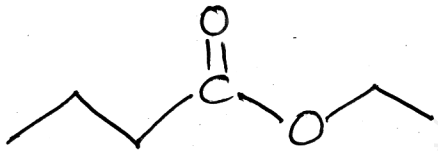
(*iii*) 

(*iv*) 

(*b*) Explain the genesis of the following compounds :

(*i*) 

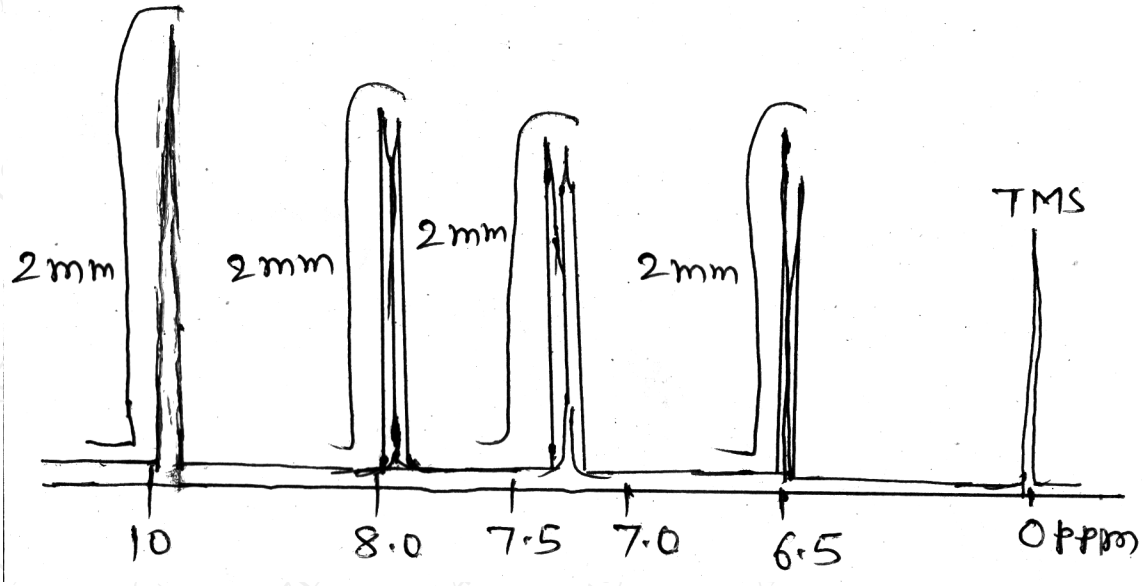
m/z = 218, 91, 65, 39.

(*ii*) 

m/z = 116, 88, 60

3. Solve the following : 20

(*a*) Compound having M.F. $C_5H_4O_2$ shows the following NMR spectrum, deduce its structure :



(*b*) An organic compound with molecular mass 174, having M.F. $C_8H_{14}O_4$ exhibits following spectral data :

UV:213 nm $\in_{max}$: 60

P.T.O.

IR:(cm^{-1}) 2941 – 2857, 1745, 1458.

NMR :(δ ppm) :

(*i*) 4.14, q, 4H, J = 7.2 CPS.

(*ii*) 2.6, s, 4H

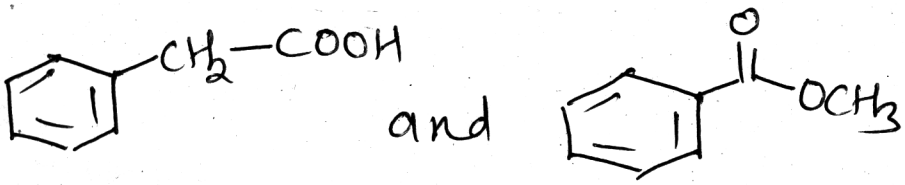
(*iii*) 1.27, t, 6H, J = 7.2 CPS

Deduce the structure of compound.

4. Answer the following : 20

(*a*) Solve the following :

(*i*) Differentiate the following by using IR :



(*ii*) Write a note on fingerprint region.

(*b*) An organic compound having M.F. $C_4H_8OBr_2$ exhibits the following spectral data, deduce the structure of compound :

IR (cm^{-1}) : 3000 – 2900, 1425, 1279, 1117.

PMR (δ, ppm) : 3.75, t, 4H, 3.40, t, 4H

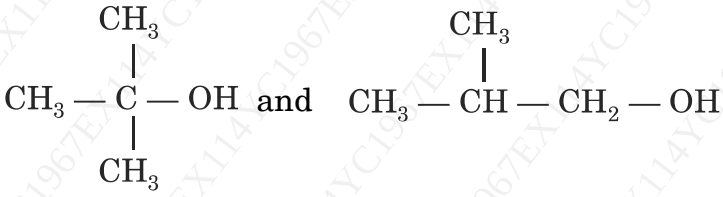
Mass : 234 (M + 4), 232 (M + 2), 230 (M+), 139, 137, 109, 107, 95, 93.

5. Answer the following : 20

(*a*) Solve the following :

(*i*) Explain deshielding of proton in benzene and shielding effect in acetylene.

(*ii*) How will you distinguish the following compounds by using off-resonance decoupled ^{13}C-NMR :



(*b*) A compound with M.F. $C_{10}H_{12}O_2$ displays the following spectral data :

IR IR (cm^{-1}) : 1690, 1600, 1580, 1490, 770, 690.

PMR (δ, PPM) : 1.3, d, 6H

5.3, septet, 1H

7.3 – 7.7, m, 5H

^{13}C-NMR : (δ) : 22 (q), 68 (d), 128 (d), 129 (d), 131 (s), 135 (d), 175 (s).

6. Write short notes on : 20

(*a*) McLafferty rearrangement

(*b*) Spin-spin coupling in PMR

(*c*) Chemical shift in PMR

(*d*) Electronic effect on absorption frequency of carbonyls.