

The Bodwad Sarvajanic Co-Op. Education Society Ltd., Bodwad.

Arts, Commerce and Science College, Bodwad.

Question Bank

Class:- TyBsc

Sem:-VI

Subject:-Organic Chemistry

Paper Name:- Spectroscopic Methods of Structure Determination.

1. What is advantage of spectroscopic methods?

- a) Amount of sample required is very small
- b) Time required for structure determination is much less.
- c) Detailed information is obtained
- d) All of these**

2. Which one of the following is not the parameter of a wave?

- a) Wavelength
- b) electromagnetic radiation**
- c) Amplitude
- d) frequency

3. Wavelength is defined as -----

- a) Distance between consecutive crests**
- b) Number of waves per unit length.
- c) Maximum displacement from X-axis.
- d) None of these.

4. Maximum displacement of a wave from x axis is known as

.....

- a) Amplitude**
- b) frequency
- c) Wave number

d) wavelength

5. Number of waves produced per unit time is called as

a) Wave number

b) Frequency

c) Amplitude

d) Oscillation

6. The least wavelength is ofregion.

a) IR

b) Visible

c) UV

d) Microwaves

7. Select the correct statement.

a) As wavelength increases, energy decreases.

b) Wave number is measured in reciprocal centimeters.

c) Frequency is number of cycles per second

d) All the above

8. UV spectroscopy provides information about presence of

a) Multiple bond

b) Aromatic rings

c) Extent of conjugation

d) All of these

9. UV spectroscopy is not useful for distinguishing between

.....

a) Conjugated dienes and isolated dienes.

b) Carbonyl compounds and enones

c) Functional isomers

d) Geometrical isomers

10. Select the wrong statement.

a) λ_{max} depends on structure of compound.

b) More is energy absorbed by molecule, more is value of λ_{max}

c) More is λ_{max} , more is conjugation

d) UV spectrum is a graph of absorbance versus wavelength

11. $n \longrightarrow \pi^*$ transition is observed incompound.

a) Ethylene

b) Acetone

c) Ethanol

d) Ethane

12. UV absorption band in alkenes around 170 to 190 nm is due to..... transition.

a) $\sigma \longrightarrow \sigma^*$

b) $n \longrightarrow \sigma^*$

c) $\pi \longrightarrow \pi^*$

d) $n \longrightarrow \pi^*$

13. $n \longrightarrow \sigma^*$ transition is observed in

a) Alcohols

b) Benzene

c) Alkanes

d) Alkenes

14. Which transition requires highest amount of energy?

a) $\pi \longrightarrow \pi^*$

b) $n \longrightarrow \pi^*$

c) $n \longrightarrow \sigma^*$

d) $\sigma \longrightarrow \sigma^*$

15. Which one of the following is not a chromophore?

a) C=C

b) -OH

c) C=O

d) -NO₂

16. Which functional group acts as auxochrome?

a) - OH

b) - NH₂

c) - Cl

d) All the above

17. Benzene absorbs at 255 nm while phenol absorbs at 270 nm

Therefore

a) Benzene is auxochrome

b) - OH is chromophore

c) - OH is auxochrome

d) both benzene and - OH are chromophores

18. Which one of the following has maximum value of λ_{\max} ?

a) Ethylene

b) 1,3 pentadiene

c) 1,4 pentadiene

d) 1,3,5 hexatriene

19. If two double bonds of a cyclic diene are present in the same ring, it is called diene.

a) Homoannular

b) Heteroannular

c) Homocyclic

d) Heterocyclic

20. An exocyclic double bond is a double bond

a) Present in a cyclic ring

b) Projected outside a cyclic ring

c) Having both substituents of an olefinic carbon as part of same ring.

d) Both b and c

21. If a double bond is exocyclic to two rings, λ_{\max} increases by nm .

- a) 5
- b) 10**
- c) 20
- d) 100

22. Which one of the following has maximum value of λ_{\max}

- a) Acetone
- b) Ethyl methyl ketone
- c) Methyl vinyl ketone**
- d) Acetaldehyde

23. IR spectroscopy provides information about

- a) Presence of conjugation
- b) Functional group**
- c) Carbon skeleton
- d) All of these

24. Select the wrong statement.

- a) Atoms and groups of organic compounds are not still.
- b) They are vibrating constantly.
- c) When IR frequency matches with vibrational frequency, amplitude decreases.**
- d) IR region extends from 2.5 to 15 μm

25. In the plane bending vibrations are

- a) Rocking and scissoring**
- b) Rocking and wagging
- c) Scissoring and twisting
- d) Wagging and twisting

26. Select the correct statement

- a) Internuclear distance changes in stretching vibrations.
- b) Bond angle changes during bending vibrations.
- c) Wagging and twisting are vibrations in the same plane
- d) a and b both**

27. For linear molecule degree of vibrations is possible

- a) $3n - 4$
- b) $3n - 5$**
- c) $3n - 6$
- d) $3n + 3$

28. Functional group region extends from

- a) 4000 to 1200 cm^{-1}
- b) 3000 to 1300 cm^{-1}
- c) 4000 to 1300 cm^{-1}**
- d) 3000 to 1200 cm^{-1}

29. Finger print region extends from

- a) 4000 to 1300 cm^{-1}
- b) 1300 to 909 cm^{-1}**
- c) 909 to 667 cm^{-1}
- d) 1200 to 667 cm^{-1}

30. Lack of strong absorption band in the region 909 to 667 cm^{-1} indicates that

- a) Compound is non-aromatic**
- b) Compound does not contain functional group.
- c) Compound contains unsubstituted benzene ring.
- d) Compound is aromatic.

31. Alkyl groups are characterized by two IR bands in the region

- a) 3500 to 3300 cm^{-1}
- b) 2800 to 3000 cm^{-1}**
- c) 1500 to 1600 cm^{-1}

d) 3000 to 3300 cm^{-1}

32. Terminal and non-terminal alkenes can be distinguished byIR band/s.

a) **1640 cm^{-1}**

b) 3300 cm^{-1}

c) 990, 910 cm^{-1}

d) 1500, 1600 cm^{-1}

33. Terminal and non-terminal alkynes can be distinguished by IR band/s.

a) **3300 cm^{-1}**

b) 2200 cm^{-1}

c) 2260-2100 cm^{-1}

d) both a and b

34. IR band at 3600 cm^{-1} indicates that – OH group is

a) Hydrogen bonded

b) Intramolecular H- Bonded

c) Intermolecular H- bonded

d) **Free**

35. Aldehydes and ketones can be distinguished by IR band

a) 1715 cm^{-1}

b) 1725 cm^{-1}

c) **2700 cm^{-1}**

d) 1690 cm^{-1}

36. If a carboxylic acid shows C = O stretching frequency at 1715 cm^{-1} , it indicates...

a) Acid is in dilute solution

b) **Acid exist as a dimer**

c) Acid exist as a monomer

d) Acid is in gaseous state

37. Which factor affects carbonyl stretching frequency?

- a) Inductive effect
- b) Resonance effect
- c) Hydrogen bonding
- d) All of these**

38. Acetamide shows carbonyl stretching frequency at 1660 cm^{-1} due to effect.

- a) Inductive effect
- b) Resonance effect**
- c) Hydrogen bonding
- d) All of these

38. Due to presence of C = C or aromatic ring in conjugation with C = O, IR frequency

- a) Decreases by 20 to 30 cm^{-1}**
- b) Increases by 20 to 30 cm^{-1}
- c) Decreases by 5 to 10 cm^{-1}
- d) Increases by 5 to 10 cm^{-1}

39. Finger print region is useful for

- a) Determination of structure
- b) Determination of functional groups
- c) Sample comparison**
- d) all the above

40. During a reaction, IR band at 3600 cm^{-1} disappears and IR band at 1710 cm^{-1} appears, reaction taking place is

- a) Oxidation**
- b) Reduction
- c) Hydrolysis
- d) Hydrogenation

41. If broad band becomes sharp on dilution, the – OH group is

.....

- a) Free
- b) With intramolecular hydrogen bonding
- c) With intermolecular hydrogen bonding**
- d) b or c

42. The I.R. frequency of C=O group in acetone is less than that of acetaldehyde because-

- a) + I effect of CH₃- group decreases double bond character and absorption occurs at lower wave number.**
- b) –I effect of CH₃- group decreases double bond character and absorption occurs at lower work number.
- c) + I effect of CH₃- group increases double bond character and absorption occurs at lower wave number.
- d) None of these

43. The I.R. frequency of C = O group in acetyl chloride increases as compared to acetone, because-

- a) –I effect of Cl atom increases double bond character and absorption occurs at higher wave number.**
- b) +I effect of Cl atom increases double bond character and absorption occurs at higher wave number.
- c) –I effect of Cl atom decreases double bond character and absorption occurs at higher wave number.
- d) None of these

44. Methanol is a good solvent for U.V. and not for I.R. determination.

- a) Methanol is transparent liquid.
- b) -OH stretching frequency of methanol interferes with I.R. frequencies of hydroxy compounds**
- c) CH₃ group has +ve effect.
- d) None of these

45. Salicylaldehyde absorbs at lower frequency than benzaldehyde due to-

- a) Presence of intra molecular H-bonding in benzaldehyde.
- b) Presence of inter molecular H-bonding in Salicylaldehyde.
- c) Presence of intra molecular H-bonding in Salicylaldehyde.**
- d) None of these

46. ----- is used as internal standard in NMR spectroscopy.

- a) NBS
- b) DMSO
- c) TMS**
- d) THF

47. ----- radiations are used in NMR spectroscopy.

- a) Visible
- b) UV
- c) I R
- d) radio waves**

48 The resultant spin of is ^1_1H

- a) 0
- b) 1
- c) 1/2**
- d) 3/2

49. The chemical shift of a proton on the δ scale is 2. The value on τ scale is

- a) 3
- b) 8**
- c) 5
- d) 1

50. Benzene in PMR spectrum gives

- a) no signal
- b) only one signal**

- c) two signals
- d) six signals

51. is the ideal solvent used in PMR spectroscopy.

- a) water
- b) ethanol
- b) acetone
- d) carbon tetrachloride**

52.9. The coupling constant is denoted by the symbol

- a) C
- b) D
- c) J**
- d) N

53. A signal due to one neighbouring proton gives

- a) triplet
- b) singlet
- c) doublet**
- d) quartet

54. The hydrogens which are in the identical environments have

- a) Same coupling constant
- b) Same chemical shift**
- c) both a and b
- d) None of these

55. In a triplet, the relative peak areas are in the ratio

- a) 1 : 1 : 1
- b) 1 : 2 : 1**
- c) 1 : 3 : 1
- d) 1 : 5 : 1

56. Aromatic protons are

- a) **Deshielded than ethylene protons**
- b) Shielded than ethylene protons
- c) Appear upfield
- d) none of these

57. Which of the following hydrocarbons produces an nmr spectrum with more than one peak?

- a) methane
- b) ethane
- c) **butane**
- d) cyclobutane

58. Which of the following compounds has the most deshielded protons?

- a) **CH₃Cl**
- b) CH₃ I
- c) CH₃ Br
- d) CH₄

59. A compound of molecular formula C₅H₁₂ gives singlet in the PMR spectrum. The compound is-----

- a) pentane
- b) 2-methyl butane
- c) **2, 2-dimethyl propane**
- d) none of these

60. In a quartet relative peak areas are in the ratio-----

- a) 1 : 1 : 1 : 1
- b) 1 : 2 : 2 : 1
- c) **1 : 3 : 3 : 1**
- d) 1 : 5 : 5 : 1

61. A compound with molecular formula C₃H₆O gives one single peak in PMR spectrum, the compound is -----

- a) Acetaldehyde
- b) n-butane
- c) Acetone**
- d) none of these

62. How many sets of equivalent protons are there in $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Cl}$?

- a) One
- b) two
- c) three**
- d) four

63. Signal splitting in NMR arises due to -----

- a) Shielding effect
- b) Deshielding effect
- c) spin-spin coupling**
- d) none of these

64. The IR Band for -OH group is observed in range of ----

- a) $3530\text{-}3300\text{ cm}^{-1}$
- b) $3200\text{-}3600\text{ cm}^{-1}$**
- c) $1060\text{-}1275\text{ cm}^{-1}$
- d) $2200\text{-}2500\text{ cm}^{-1}$

65. How many types of coupling are present?

- a) 2
- b) 6
- c) 3**
- d) 4

66. Find out the site of unsaturation of following compound $\text{C}_3\text{H}_8\text{O}$?

- a) 1**
- b) 5
- c) 2

d) 4

67. Which NMR Signal show vicinal coupling?

a) **J= 8-10 Hz**

b) J= 1-2 Hz

c) J= 0-5 Hz

d) J= 1-3 Hz

68. The Base value for acyclic enone is

a) 202nm

b) 210nm

c) **215nm**

d) 212 nm

69. The splitting for -NH₂ group in proton CH₃-CH₂-NH₂ will be observed as

a) Doublet

b) **Singlet**

c) Quarted

d) Triplet

70. Find the structure of the given NMR data (a) 1.1 δ (t , 3H)

a) CH₃O

b) CH₃-CH₃

c) **CH₃-CH₂-**

d) CH₃OH

71. Long range coupling show how many bonds ?

a) **4**

b) 3

c) 2

d) 1

72. Spin spin splitting can be explained empirically by which rule ?

- a) n-1
- b) n-2
- c) n+1**
- d) n+2

73. How many sets of protons are present in $\text{CH}_3\text{-O-CH}_3$ molecule ?

- a) 3 Sets
- b) 1 Sets**
- c) 2 Sets
- d) 5 Sets

74. The molecular ion peak of toluene will be observed at M/Z value of ?

- a) 90
- b) 92**
- c) 93
- d) 95

75. The molecular ion peak of ethanol will be observed at M/Z value of ?

- a) 46**
- b) 45
- c) 43
- d) 42

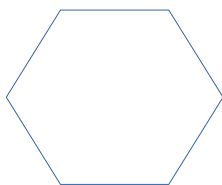
76. The molecular ion peak of $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ will be observed at M/Z value of ?

- a) 31**
- b) 33
- c) 32
- d) 30

77. The molecular ion peak of $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_2\text{-CH}_3$ will be observed at M/Z value of ?

- a)89
- b)87
- c)86
- d)88**

78. The molecular ion peak of



+ will be observed at

- a) 78
- b) 77**
- c) 79
- d) 76

79. What do you expect to observe in the ^1H NMR spectrum of chloroethane $\text{CH}_3\text{CH}_2\text{Cl}$?

- a) A Doublet and a Quartet
- b) Two Double
- c) A Triplet and a Quartet**
- d) A Doublet and a Triplet

80. What do you expect to observe in the ^1H NMR spectrum of 1,1-dichloroethane CH_3CHCl_2 ?

- a) A Singlet and a Doublet
- b) A Singlet and a Quartet
- c) A Doublet and a Triplet
- d) A Doublet and a Quartet**

81. Vicinal Coupling is

- a) Coupling Between ^1H Nuclei attached to the same C atom
- b) Coupling Between ^1H Nuclei attached to the adjacent C atom**
- c) Coupling Between ^1H Nuclei in an alkene
- d) Coupling Between ^1H Nuclei in an alkane

82. A ^1H NMR spectrum of CH_3CHBr_2 shows two signals. What are multiplicities and assignments of these signals?

- a) A Quartet assigned to the CH_3 group and doublet assigned to the CH group.
- b) A Doublet assigned to the CH_3 group and Quartet assigned to the CH group.**
- c) A Triplet assigned to the CH_3 group and Singlet assigned to the CH group.
- d) Two Singlets, one assigned to each of the CH_3 and CH group

83. The IR Spectrum of methanol (CH_3OH) shows strong absorptions at 3340 (Broad), 2945, 2833 and 1030 cm^{-1} . Which band is assigned to the OH stretch?

- a) 1030 cm^{-1}
- b) 2833 cm^{-1}
- c) 2945 cm^{-1}
- d) 3340 cm^{-1}**

84. The height of crest or depth of trough is called.....

- a) Wavelength
- b) Amplitude**
- c) Distance
- d) Displacement

85. Aromatic region extends from

- a) 4000 to 1300 cm^{-1}
- b) 1300 to 909 cm^{-1}
- c) 909 to 667 cm^{-1}**
- d) 1200 to 667 cm^{-1}

86. The proton NMR of 1-Bromopropane will consist of

- a) Two doublet and Sextet
- b) A Doublet and septet
- c) A Singlet , a doublet , and a triplet
- d) Two Triplets and Sextet**

87. The proton NMR of 2-Bromopropane will consist of

- a) Two doublet and Sextet
- b) A Doublet and septet**
- c) A Singlet , a doublet , and a triplet
- d) Two Triplets and Sextet.

88. The proton NMR of 2-Bromo-2-Methylpropane will consist of

- a) Three Quartet and a singlet
- b) Two Doublet and a singlet
- c) Two Singlets
- d) one Singlets**

89. Which compound has a molecular ion at $M/Z = 58$, and infrared absorption at 1650 cm^{-1} and just one singlet in its NMR spectrum?

- a) Butane
- b) CH_3COCH_3**
- c) $\text{CH}_3\text{CH}_2\text{CHO}$
- d) 2-Methylpropane

90. Which one of the following hydrocarbons produces an NMR spectrum with more than one peak ?

- a) Methane
- b) Ethane
- c) Butane**
- d) Cyclobutane

91. The isomer of C₄H₈ which produces an NMR spectrum with four different signals is

- a) **CH₂=CHCH₂CH₃**
- b) CH₃CH=CHCH₃
- c) (CH₃)₂C=CH₂
- d) Cyclobutane

92. To work out the molecular mass of an organic molecule you would look at its.....

- a) Infra red spectrum
- b) Mass Spectrum**
- c) Proton NMR spectrum
- d) Boiling point

93. Which one of the following statements about the mass spectrum of CH₃Br is correct?

- a) The last two peaks are of equal size and occur at m/z values of 94 and 96**
- b) The last two peaks have abundances in the ratio 3:1 and occur at m/z values of 94 and 96
- c) There is just one peak for the molecular ion with an m/z value of 95
- d) There is just one peak for the molecular ion with an m/z value of 44.

94. Infrared Spectroscopy provides valuable information about?

- a) Molecular weight
- b) Melting point
- c) Conjugation
- d) functional group**

95. Which of the following bond would be expected to have the lowest frequency stretch?

- a) **C-I**
- b) C-Br
- c) C-CL
- d) C-F

96. Which of the following bond would be expected to have the highest frequency stretch?

- a) C-C
- b) C=C
- c) **carbon carbon triple bond**
- d) C-Br

97. A strong signal at 1720cm^{-1} in an IR Spectrum indicate the presence of an

- a) Alcohol
- b) ether
- c) **Carbonyl**
- d) Amine

98. A strong signal at 3400cm^{-1} in an IR Spectrum indicate the presence of an

- a) **Alcohol**
- b) ether
- c) Carbonyl
- d) Amine

99. The molecular ion peak of O-Cresol will be observed at M/Z value of

- a) 107
- b) 108**
- c) 109
- d) 106

100. The molecular ion peak of Cyclohexanone will be observed at M/Z value of

- a) 99
- b) 100
- c) 98**
- d) 97