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UNIT - 5
SPECTROSCOPIC TECHNIQUES

Q. 1 Lambert's law states that the rate of decrease in intensity of monochromatic light passing through transparent medium with thickness of medium is proportional to -----

-

- a. Wavelength of incident light.
- b. Intensity of incident light.
- c. Wavelength of transmitted light.
- d. Intensity of visible light

Ans:b

Q. 2 Beer's law states that the intensity of monochromatic light passing through transparent medium decreases as -----of the absorbing substance increases arithmetically

- a. Volume
- b. Concentration
- c. Cost
- d. Standard oxidation potential

Ans:b

Q. 3 Any isolated covalently bonded functional group that shows a characteristic absorption in uv-visible region is known as -----

- a. Auxochrome
- b. Chromophore
- c. Phosphoresce
- d. Chromatophore

Ans:b

Q. 4 Any group which does not itself act as a functional group but whose presence brings about a shift in absorption band towards longer wavelength is known as -----

- a. Auxochrome
- b. Chromophore
- c. Phosphoresce
- d. Chromatophore

Ans:a

Q. 5 The energy required for the transition is highest in case of ----- transition.

- a. $\pi-\sigma^*$
- b. $\sigma-\sigma^*$
- c. $\sigma-n$
- d. $n-\sigma$

Ans:b

Q. 6 Substitution of group if shifts absorption to the longer wavelength the shift is known as -----.

- a. chromophoric shift
- b. bathochromic shift
- c. blue shift
- d. yellow shift

Ans:b

Q. 7 Absorption shifted to shorter wavelength due to substitution of group is known as --

- a. chromophoric shift
- b. bathochromic shift
- c. blue shift
- d. yellow shift

Ans:c

Q. 8 A module which provides a beam of light of given single wavelength is known as -----

- a. window
- b. monochromator
- c. selector
- d. spectrometer

Ans:b

Q. 9 Operating range of uv-spectrophotometer is -----.

- a. 400nm-800nm
- b. 200nm-400nm
- c. 200nm-800nm
- d. 500nm-1500nm

Ans: b

Q. 10 Operating range of uv- visible spectrophotometer is -

- a. 400nm-800nm
- b. 200nm-400nm
- c. 200nm-800nm
- d. 500nm-1500nm

Ans: a

Q. 11 Detector used in uv- visible spectrophotometer is

- a. Photomultiplier tube
- b. Electric buzzer
- c. Null point detector
- d. None of the above

Ans: a

Q. 12 Benzene absorbs at 255nm while aniline absorbs at 280nm because -----

- a. Benzene is auxochrome
- b. $-NH_2$ is auxochrome
- c. $-NH_2$ is chromophore
- d. None of the above

Ans: b

Q. 13 ----- is known as colour enhancing group.

- a. Auxochrome
- b. Chromophore
- c. Chromatophore
- d. None of the above

Ans: a

Q. 14 Source used in uv-visible spectrophotometer is --.

- a. Incandescent lamp
- b. Hydrogen lamp
- c. Deuterium lamp
- d. Any of the above

Ans: d

Q. 15 Cuvettes used in uv-visible spectrophotometer are made up of -----.

- a. Glass
- b. Quartz
- c. Metal
- d. None of the above

Ans: b

Q. 16 The parts of spectrophotometer is used to obtain a light rays with single wavelength is known as -----.

- a. Monochromator
- b. Source of light
- c. Slit
- d. Detector

Ans: a

Q. 17 Transition which requires highest energy in uv-visible spectrophotometer is -----
----- transition.

- a. $\pi-\sigma^*$
- b. $\sigma-\sigma^*$
- c. $\sigma-n$
- d. $n-\sigma$

Ans: b

Q. 18 Transition which requires lowest energy in uv-visible spectrophotometer is -----
---- transition.

- a. π - σ^*
- b. σ - σ^*
- c. σ -n
- d. n- π *

Ans: d

Q. 19 Transition which requires radiation of shortest wavelength in uv-visible spectrophotometer is ----

- a. π - σ^* transition.
- b. σ - σ^* transition.
- c. σ -n transition.
- d. n- π * transition.

Ans:b

Q. 20 Transition which requires radiation of longest wavelength in uv-visible spectrophotometer is ----

- a. π - σ^* transition.
- b. σ - σ^* transition.
- c. σ -n transition.
- d. n- π * transition.

Ans: d

Q. 21 Electron transition is allowed transition or forbidden depends upon-----

- a. The geometry of the molecular orbital in ground state
- b. The geometry of the molecular orbital in excited state
- c. The orientation of the electric dipole of the incident light responsible for including the transition
- d. On appropriate symmetry relationship between the above three factors

Ans:d

Q. 22 UV – Visible spectrophotometer has application in -----

- a. Detection of function group
- b. Determination of conjugation
- c. Identification of unknown compound
- d. All above

Ans:d

Q. 23 The magnitude of molar absorption coefficient is dependant of the wavelength of incident beam of radiation and-----

- a. Physical state of absorbing substance
- b. Chemical nature of absorbing substance
- c. Thermal energy of substance
- d. Electrical conductivity of absorbing substance

Ans:b

Q. 24 The relative energy changes involved in the transition has order-----

- a. $n-\pi^* < \sigma-\sigma^* < \pi-\pi^*$
- b. $n-\pi^* > \sigma-\sigma^* > \pi-\pi^*$
- c. $n-\pi^* < \pi-\pi^* < \sigma-\sigma^*$
- d. $n-\pi^* > \pi-\pi^* > \sigma-\sigma^*$

Ans:c

Q. 25 In Photomultiplier tube sensitivity of cell-----.

- a. Is considerably decreased
- b. Is kept constant
- c. Is considerably increased
- d. None of the above

Ans:c

Q. 26 The essential component of monochromator are entrance exit slit and-----.

- a. Dispersing element like prism
- b. Photovoltaic cell
- c. Galvanometer
- d. None of the above

Ans:a

Q. 27 If I_t is intensity of transmitted light I_0 is intensity of incident light, K is the constant for wavelength, l is thickness and c is concentration $I_t = I_0 \cdot e^{-kl}$ is-----.

- a. Beer's law
- b. Lambert's law
- c. Kohlrausch's law
- d. None of the above

Ans:b

Q. 28 Photomultiplier tube converts-----

- a. Electrons into photons
- b. Electrons into electric current
- c. Photons into electric current
- d. All above

Ans:c

Q. 29 The term $\log I_t / I_0$ is -----.

- a. Transmittance
- b. Resistance
- c. Conductance
- d. absorbance

Ans:a

Q. 30 Unsaturated compounds containing heteroatoms such as O, N and S shows ----- transition.

- a. π - σ^*
- b. n - π^*
- c. σ - σ^*
- d. σ - n

Ans:b

Q. 31 Visible spectrophotometer has operational range.....

- a. 400nm-800nm
- b. 200nm-400nm
- c. 200nm-800nm
- d. 500nm-1500nm

Ans:a

Q. 32 The solution of substance that appears colored to human eyes absorbs in the range.....

- a. 400nm-800nm
- b. 200nm-400nm
- c. 200nm-800nm
- d. 500nm-1500nm

Ans:a

Q. 33 The solution of substance that absorbs in UV region appears to human eyes.

- a. Colored
- b. Transparent
- c. Turbid
- d. None of the above

Ans:b

Q. 34 In UV visible spectrophotometer measurement of absorbance is preferred over % transmittance because----

- a. UV visible spectrophotometer is equipped to measure absorbance
- b. Absorbance is $\propto C$ while % transmittance is not
- c. % transmittance can't be measured with 100 % accuracy
- d. % transmittance is dependant on the power of incident radiations

Ans:b

Q. 35 According to Beer's Lambert's law $A = \epsilon cl$

Where ϵ is

- a. Absorbance
- b. Molar absorptivity

- c. Path length
- d. Transmittance

Ans:b

36. UV-visible spectroscopy measures -----.

- a. Molecular Rotation
- b. Electronic Excitation
- c. Nuclear excitation
- d. Molecular vibrations

Ans – b

37. UV region extends from ----- --.

- a. 100-400 nm
- b. 200-600 nm
- c. 800-1000 nm
- d. 400-700 nm

Ans-a

38. Visible region extends from ----- --.

- a. 100-400 nm
- b. 200-600 nm
- c. 800-1000 nm
- d. 400-800 nm

Ans- d

39. According to the statement of Lambert's law, the rate of decrease in intensity of light with thickness of the medium is proportional to the-----.

- a. Concentration of the medium
- b. Temperature of the system
- c. Intensity of light
- d. Pressure of the medium

Ans - c

40. According to the statement of Beer's law, the rate of decrease in intensity of light with thickness of the medium is directly proportional to the----- --.

- a. Concentration of the medium
- b. Temperature of the system
- c. Intensity of light
- d. Pressure of the medium

Ans – a

41. The unshared electrons present in the compound are known as----- --.

- a. π electron

- b. 6 electrons
- c. unsaturated electrons
- d. n electrons

Ans- d

42. Identify the correct order of energies required for the electronic transitions. a. $\sigma \rightarrow \sigma^*$

b. $n \rightarrow \sigma^* > \sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^*$

c. $\sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > n \rightarrow \pi^* > \pi \rightarrow \pi^*$

d. $\sigma \rightarrow \sigma^* > n \rightarrow \pi^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^*$

Ans – a

43. Which of the following transition required less amount of energy?

- a. $\sigma \rightarrow \sigma^*$
- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. d

44. Which of the following transition required large amount of energy?

- a. $\sigma \rightarrow \sigma^*$
- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. a

45. Saturated hydrocarbons shows ----- transition.

- a. $\sigma \rightarrow \sigma^*$
- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. a

46. Unsaturated hydrocarbon shows ----- transition.

- a. $\sigma \rightarrow \sigma^*$
- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. c

47. Compound containing nonbonding or unshared electrons present on hetero atoms such as O, N, S shows -----.

- a. $\sigma \rightarrow \sigma^*$

- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. b

48. Compound containing double bonds involving hetero atoms bearing unshared electron pairs of electrons shows-----.

- a. $\sigma \rightarrow \sigma^*$
- b. $n \rightarrow \sigma^*$
- c. $\pi \rightarrow \pi^*$
- d. $n \rightarrow \pi^*$

Ans. d

49. Covalently unsaturated group responsible for electronic transitions is called as-----.

- a. Auxochrome
- b. Active molecule
- c. Chromophore
- d. Hyperchrome

Ans. c

50. Auxochrome is -----.

- a. Saturated functional group attached to the chromophore
- b. Unsaturated functional group attached to the Chromophore
- c. Unsaturated group responsible for electronic transition
- d. Saturated group responsible for electronic transition

Ans- a

51. The shift of absorption to longer wavelength is -----.

- a. Hypsochromic shift
- b. Hyperchromic shift
- c. Bathochromic shift
- d. Hypochromic shift

Ans – c

52. Hypsochromic shift is -----.

- a. Shift of absorption to the longer wavelength
- b. Shift of absorption to the shorter wavelength
- c. Increase in intensity of absorption
- d. Decrease in intensity of absorption

Ans.-b

53. Increase in the intensity of absorption is called as-----.

- a. Hypsochromic shift
- b. Hyperchromic shift
- c. Bathochromic shift

- d. Hypochromic shift

Ans – b

54. Hypochromic effect is when----- --.

- a. Intensity of absorption increases
- b. Intensity of absorption decreases
- c. Shift of absorption to the longer wavelength
- d. Shift of absorption to the shorter wavelength

Ans. b

55. In block diagram of UV-Visible spectroscopy, correct sequence will be.....

- a. Source → Monochromator → Sample holder → Photodetector → Amplifier → Recorder
- b. Source → Sample holder → Monochromator → Photodetector → Amplifier → Recorder
- c. Source → Photodetector → Sample holder → Monochromator → Amplifier → Recorder
- d. Source → Monochromator → Photodetector → Sample holder → Amplifier → Recorder

Ans. a

(Part B- Infra Red Spectroscopy)

56. IR spectroscopy measures ----- --.

- a. Molecular Rotation
- b. Electronic Excitation
- c. Nuclear excitation
- d. Molecular vibrations

Ans: d

57. IR region is -----.

- a. 0.78 to 200 μ
- b. 200 to 300 μ
- c. 1.5 -100 μ
- d. 1-2 μ

Ans: a

58. Stretching vibrations in molecules involves -----.

- a. Movement of the atoms w.r.t. particular atom in same direction
- b. Movement of the atoms w.r.t. particular atom in opposite direction
- c. Movement of the atoms w.r.t. particular atom in parallel direction
- d. Movement of the atoms w.r.t. particular atom in perpendicular direction

Ans: a

59. Match the following

- | | |
|---------------|--|
| i) Scissoring | a) movement of atoms in same direction in same plane |
| ii) Rocking | b) movement of two atoms in opposite direction in same plane |
| iii) Wagging | c) movement of one atom up and other atom down the plane |
| iv) Twisting | d) movement of atoms up the plane or below the plane |

a. i=d, ii=c, iii=b, iv=a

b. i=b, ii=a, iii=d, iv=c

c. i= c, ii=d, iii= b, iv=a

d. i=d, ii=a, iii=d, iv=b

Ans. =b

60. Bending vibrations are characterised by-----.

- a. Change in bond angle between two covalent bonds
- b. Change in bond length between two covalent bonds
- c. Change in geometry of molecule
- d. Change in internuclear distance

Ans: a

61. Fundamental modes of vibrations in benzene are-----.

- a. 9
- b. 6
- c. 3
- d. 30

Ans =d

62. Fundamental modes of vibrations in CO₂ are -----.

- a. 9
- b. 6
- c. 4
- d. 30

Ans = c

63. Fundamental modes of vibrations in water are -----.

- a. 3
- b. 9
- c. 4
- d. 18

Ans = a

64. Fundamental modes of vibrations in C₂H₆ are-----.

- a. 6
- b. 9
- c. 4
- d. 18

Ans= d

65. Molecule absorbs IR radiation only when-----.

- a. Frequency of vibration of bond and frequency of IR radiation match
- b. Frequency of rotation of bond and frequency of IR radiation match
- c. Frequency of excitation of bond and frequency of IR radiation match
- d. Frequency of transition of bond and frequency of IR radiation match

Ans: a

66. Molecule absorb IR radiation in following condition?

- i) Frequency of vibration of bond and frequency of IR radiation match
- ii) When absorption causes change in electric dipole
- a. Only i
- b. Only ii
- c. Both i and ii
- d. None of above

Ans: c

67. Out of following which is not used as an IR source?

- a. Nernst filament
- b. Globar
- c. Mercury arc
- d. Quartz hydrogen lamp

Ans: d

68. Monochromator i.e. prism in IR spectroscopy is made up of

- a. NaCl, KOH
- b. NaCl, KBr
- c. NaOH, KBr
- d. NaOH, KOH

Ans: b

69. Sampling of substances in IR spectroscopy can be done as following; match it

- | | |
|-----------------------------|---|
| a. Solid run in solution | i) amorphous sample deposit on NaCl or KBr cell |
| b. Solid film technique | ii) solid dissolve in aq. Solvent and drop it on alkali halide, evaporate |
| c. Pressed pallet technique | iii) sample mixed in Nujol and make paste |
| d. Mull technique | iv) sample grind with KBr and pressed to pallet |
- a. a=iii, b=iv, c=i, d=ii
 - b. a=ii, b=i, c=iv, d=iii
 - c. a=iv, b=iii, c=i, d=ii
 - d. a=ii, b=i, c=iii, d=iv

Ans: b

70. Out of following which is not used as detector in IR spectroscopy?

- a. Thermocouple
- b. Bolometer
- c. Golay detector
- d. Globar

Ans; =d

71. IR Spectrum is graph between-----.

- a. Wavelength vs absorbance
- b. Wavelength vs transmittance
- c. Wavelength vs % transmittance
- d. Wave number vs absorbance

Ans: c

72. Finger print region is ----- .

- a. 4000-1500 cm^{-1}
- b. 1500-909 cm^{-1}
- c. 909-667 cm^{-1}
- d. 667-50 cm^{-1}

Ans: b

73. Match the following.

- | | |
|-------------------|---------------------------------|
| a. Alkanes | i) 1725 cm^{-1} |
| b. Alcohols | ii) 2800-3000 cm^{-1} |
| c. Ketones | iii) 3000-3100 cm^{-1} |
| d. Aromatic rings | iv) 3200-3600 cm^{-1} |

- a. a=ii, b=iv, c=i, d=iii
- b. a=iii, b=i, c= iv, d=ii
- c. a=ii, b=iv, c=iii, d=i
- d. a=iv, b=iii, c=ii, d=i

Ans=a

74. Match the following

- | | |
|-------------------|----------------------------|
| a. Cyclopropanone | i) 1710 cm^{-1} |
| b. Cyclobutanone | ii) 1740 cm^{-1} |
| c. Cyclopentanone | iii) 1775 cm^{-1} |
| d. Cyclohexanone | iv) 1818 cm^{-1} |

- a. a=ii, b=iii, c=iv, d=i
- b. a=iii, b=iv, c=i, d=ii
- c. a=iv, b=iii, c=ii, d=i
- d. a=iv, b=i, c=ii, d=i

Ans: = c

75. Out of following is not detector in IR spectroscopy.

- a. Global
- b. Bolometer
- c. Golay
- d. thermocouple

Ans. = a

76. Aromatic region in IR spectroscopy is in between.....

- A. 1500-909 cm^{-1}
- b. 909-667 cm^{-1}

- c. 667-50 cm^{-1}
- d. 4000-1500 cm^{-1}

Ans= b

77. In block diagram of IR spectroscopy, correct sequence will be.....

- a. Source--sample--monochromator--detector—amplifier—recorder
- b. Source--sample--monochromator--amplifier-- detector --recorder
- c. Source--monochromator---Sample—detector—amplifier--recorder
- d. Source--sample--monochromator--detector—amplifier—reference—recorder

Ans= a

78. Molecules like H_2 , Cl_2 , O_2 are IR inactive because.....

- a. They are diatomic
- b. They are linear
- c. They does not have electrical dipole
- d. All of above

Ans=C

79. Vibrational transitions requireenergy than electronic transitions.

- a. More
- b. less
- c. same
- d. none of above

Ans= b

80. Calculate possible number of fundamental vibration in CHCl_3 ?

- a. 19
- b. 15.
- c. 36
- d. 9

Ans= d

81. Streching frequency of cyclic ketone in IR.....with increase in ring size.

- a. Increases
- b. decreases
- c. remain same
- d. no effect

Ans= b

82. Which one of following is out of plane vibration?

- a. Scissoring
- b. Rocking
- c. symmetric stretching
- d. Wagging

Ans=d

83. Keto form of acetyl acetone show characteristic absorption stretching frequency for

carbonyl group while Enol form of same will give absorption for.....

- a. -OH & -C=C stretch
- b. -C=O & -C=C stretch
- c. -C=O & -OH stretch
- d. None of above

Ans= a

84. Out of following which is not a bending vibration?

- a. Rocking vibration
- b. wagging vibration
- c. twisting vibration
- d. symmetric stretching

Ans= d

85. Which of following is correct about application of IR spectroscopy?

- i) Identifying atmospheric pollution
 - ii) Measuring ethanol in breath
 - iii) Determination of molecular weight
- a. Only i
 - b. Only ii
 - c. Only i & ii
 - d. All i, ii, iii

Ans= C

86. In IR exact position of absorption depends upon.....

- a. Force constant
- b. Masses of atoms
- c. Environment of bond
- d. All of above

Ans=d

87. For calculating fundamental modes of vibration in non-linear polyatomic molecule (3N-6) formula is used where N is.....

- a. Number of electron in bond
- b. Number of atoms in molecule
- c. Number of degree of freedom
- d. None of above

Ans= b

88. For calculating fundamental modes of vibration in non-linear polyatomic molecule (3N-6) formula is used where "3" in 3N indicates for.....

- a. Sum of rotational, vibrational and translational degree of freedom
- b. Sum of rotational and translational degree of freedom
- c. Sum of vibrational and rotational degree of freedom
- d. Sum of vibrational and translational degree of freedom

Ans= a

89. KBr is used in IR spectroscopy because.....

- a. It has dipole moment
- b. It is diatomic salt
- c. It is transparent to IR
- d. All of above

Ans= c

90. CCl₄ does not give prominent bands in IR because....

- a. It has dipole moment zero
- b. It is solvent
- c. It is polyatomic molecule
- d. All of above

Ans= a

91. IR spectroscopy measures

- a. Molecular Rotation
- b. Electronic Excitation
- c. Nuclear excitation
- d. Molecular vibrations

Correct ans: d

92. IR region is

- a. 0.78 to 200 μ
- b. 200 to 300 μ
- c. 1.5 -100 μ
- d. 1-2 μ

Correct ans: a.

93. Stretching vibrations in molecules involves

- a. Movement of the atoms w.r.t. particular atom in same direction
 - b. Movement of the atoms w.r.t. particular atom in opposite direction
 - c. Movement of the atoms w.r.t. particular atom in parallel direction
 - d. Movement of the atoms w.r.t. particular atom in perpendicular direction
- Correct ans: a.

94. Match the following

- | | |
|---------------|--|
| i) Scissoring | a) movement of atoms in same direction in same plane |
| ii) Rocking | b) movement of two atoms in opposite direction in same plane |
| iii) Wagging | c) movement of one atom up and other atom down the plane |
| iv) Twisting | d) movement of atoms up the plane or below the plane |
- a. i=d, ii=c, iii=b, iv=a
 - b. i=b, ii=a, iii=d, iv=c
 - c. i= c, ii=d, iii= b, iv=a
 - d. i=d, ii=a, iii=d, iv=b

Correct ans. =b

95. Bending vibrations are characterised by

- a. Change in bond angle between two covalent bonds
 - b. Change in bond length between two covalent bonds
 - c. Change in geometry of molecule
 - d. Change in internuclear distance
- Correct ans: a

96. Fundamental modes of vibrations in benzene are a. 9

b. 6 c. 3 d. 30

Correct ans=d

97. Fundamental modes of vibrations in CO₂ are a. 9

b. 6 c. 4 d. 30

Correct ans = c

98. Fundamental modes of vibrations in water are a. 3

b. 9 c. 4 d. 18

Correct ans = a

99. Fundamental modes of vibrations in C₂H₆ are a. 6

b. 9 c. 4 d. 18

Correct ans= d

100. Molecule absorbs IR radiation only when

- a. Frequency of vibration of bond and frequency of IR radiation match
 - b. Frequency of rotation of bond and frequency of IR radiation match
 - c. Frequency of excitation of bond and frequency of IR radiation match
 - d. Frequency of transition of bond and frequency of IR radiation match
- Correct ans: a

101. Molecule absorb IR radiation in following condition?

- i) Frequency of vibration of bond and frequency of IR radiation match
 - ii) When absorption causes change in electric dipole
- a. Only i
 - b. Only ii
 - c. Both i and ii
 - d. None of above

Correct ans: c

102. Out of following which is not used as an IR source?

- a. Nernst filament
- b. Globar
- c. Mercury arc
- d. Quartz hydrogen lamp

Correct ans:

d

103. Monochromator i.e. prism in IR spectroscopy is made up of

- a. NaCl, KOH
- b. NaCl, KBr

- c. NaOH, KBr
- d. NaOH,
KOH

Correct

ans: b

104. Sampling of substances in IR spectroscopy can be done as following; match it

- a. Solid run in solution i) amorphous sample deposit on NaCl or KBr cell
 - b. Solid film technique ii) solid dissolve in aq. Solvent and drop it on alkali halide, evaporate
 - c. Pressed pallet technique iii) sample mixed in Nujol and make paste
 - d. Mull technique iv) sample grind with KBr and pressed to pallet
- i. a=iii, b=iv, c=i, d=ii
 - ii. a=ii, b=i, c=iv, d=iii
 - iii. a=iv, b=iii, c=i, d=ii
 - iv. a=ii, b=i, c=iii, d=iv

correct ans:

b

105. Out of following which is not used as detector in IR spectroscopy

- a. Thermocouple
- b. Bolometer
- c. Golay detector
- d. Globalar

Correct ans; =d

106. IR Spectrum is graph between

- a. Wavelength vs absorbance
- b. Wavelength vs transmittance
- c. Wavelength vs % transmittance
- d. Wave number vs absorbance

Correct ans: c

107. Finger print region is a.

- a. 4000-1500 cm^{-1}
- b. 1500-909 cm^{-1}
- c. 909-667 cm^{-1}
- d. 667-50 cm^{-1}

Correct ans: b

108. Match the following

- a. Alkanes i) 1725 cm^{-1}
 - b. Alcohols ii) 2800-3000 cm^{-1}
 - c. Ketones iii) 3000-3100 cm^{-1}
 - d. Aromatic rings iv) 3200-3600 cm^{-1}
- i. a=ii, b=iv, c=i, d=iii
 - ii. a=iii, b=i, c= iv, d=ii
 - iii. a=ii, b=iv, c=iii, d=i

- iv. a=iv, b=iii,
c=ii, d=i
correct
ans=a

109. Match the following

- a. Cyclopropanone i) 1710 cm^{-1}
b. Cyclobutanone ii) 1740 cm^{-1}
c. Cyclopentanone iii) 1775 cm^{-1}
d. Cyclohexanone iv) 1818 cm^{-1}
- i. a=ii, b=iii, c=iv, d=i
ii. a=iii, b=iv, c=i, d=ii
iii. a=iv, b=iii, c=ii, d=i
iv. a=iv, b=i,
c=ii, d=i
Correct
ans: = c

110. Out of following is not detector in IR spectroscopy.

- a. Golbar b. Bolometer c. Golay d.
thermocouple Correct Ans.= a

111. Aromatic region in IR spectroscopy is in between.....

- a. $1500-909\text{ cm}^{-1}$ b. $909-667\text{ cm}^{-1}$ c. $667-50\text{ cm}^{-1}$ d. $4000-1500\text{ cm}^{-1}$

Correct Ans= b

112. In block diagram of IR spectroscopy, correct sequence will be.....

- a. Source--sample--monochromator--detector—amplifier—recorder
b. Source--sample--monochromator--amplifier-- detector --recorder
c. Source--monochromator---Sample—detector—amplifier--recorder
d. Source--sample--monochromator--detector—amplifier—reference—recorder

Correct Ans= a

113. Molecules like H_2 , Cl_2 , O_2 are IR inactive because.....

- a. They are diatomic
b. They are linear
c. They does not have electrical dipole
d. All of
above

Correct

Ans=C

114. Vibrational transitions require energy than electronic transitions.

- a. More b. less c. same d. none of
above Correct Ans= b

115. Calculate possible number of fundamental vibration in CHCl_3 ? a. 19

- b. 15. c. 36 d. 9

Correct Ans= d

116. Stretching frequency of cyclic ketone in IR with increase in ring size.

- a. Increases b. decreases c. remain same d. no effect
Correct Ans= b

117. Which one of following is out of plane vibration?

- a. Scissoring b. Rocking c. symmetric stretching d. Wagging
Correct Ans=d

118. **Keto** form of acetyl acetone show characteristic absorption stretching frequency for carbonyl group while **Enol** form of same will give absorption for.....

- a. -OH & -C=C stretch
b. -C=O & -C=C stretch
c. -C=O & -OH stretch
d. None of above
e. Correct Ans= a

119. Out of following which is not a bending vibration?

- a. Rocking vibration b. wagging vibration c. twisting vibration d. symmetric stretching

Correct ans= d

120. Which of following is correct about application of IR spectroscopy

- i) Identifying atmospheric pollution
ii) Measuring ethanol in breath
iii) Determination of molecular weight
a. Only i
b. Only ii
c. Only i & ii
d. All i, ii, iii Correct
Ans= C

121. In IR, exact position of absorption depends upon.....

- a. Force constant
b. Masses of atoms
c. Environment of bond
d. All of above
Correct
Ans=d

122. For calculating fundamental modes of vibration in non linear polyatomic molecule ($3N-6$) formula is used where N is.....

- a. Number of electron in bond
b. Number of atoms in molecule
c. Number of degree of freedom
d. None of above
Correct
Ans= b

123. For calculating fundamental modes of vibration in non linear polyatomic molecule ($3N-6$)

formula is used where "3" in 3N indicates for.....

- a. Sum of rotational, vibrational and translational degree of freedom
- b. Sum of rotational and translational degree of freedom
- c. Sum of vibrational and rotational degree of freedom
- d. Sum of vibrational and translational degree of freedom

Correct Ans= a

124. KBr is used in IR spectroscopy because.....

- a. It has dipole moment
- b. It is diatomic salt
- c. It is transparent to IR
- d. All of above

Correct Ans= c

125. CCl₄ does not give prominent bands in IR because....

- a. It has dipole moment zero
- b. It is solvent
- c. It is polyatomic molecule
- d. All of above

Correct Ans= a

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