Infrared Sepctroscopy

Quiz-15 marks(30mins)

(No late submission will be considered)

08/09/2020

Write down your roll number in a document along with the question numbers and the right options and upload the document.

1. Which type of energy transition is shown in IR-spectroscopy?

   a) Rotational
   b) Electronic
   c) Vibrational
   d) Bond-breaking

2. As wave number increases, wave energy

   a) Decreases
   b) Increases
   c) Remains constant
   d) Not related

3. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) O-H (alcohol), (3) C=O (ketone), and (4) C≡C (alkyne)?

   a) (4) < (3) < (2) < (1)
   b) (3) < (4) < (2) < (1)
   c) (3) < (4) < (1) < (2)
   d) (4) < (3) < (1) < (2)

4. Which of the following statements regarding IR spectroscopy is wrong?

   a) Infrared radiation is higher in energy than UV radiation.
   b) Infrared spectra record the transmission of IR radiation.
   c) Molecular vibrations are due to periodic motions of atoms in molecules, and include bond stretching, torsional changes, and bond angle changes.

d) Infrared spectra give information about bonding features and functional groups in molecules.

5. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) C-H (alkene), (3) C-H (alkyne), and (4) C-H (arene)?

a) (1) < (2) ≈ (3) < (4)
b) (4) < (3) ≈ (2) < (1)
c) (3) < (4) ≈ (2) < (1)
d) (1) < (4) ≈ (2) < (3)

6. Bending vibration includes

a) scissoring
b) twisting
c) wagging
d) all of the above

7. According to the Hooke's Law for a vibrating spring, the frequency of a stretching vibration is

a) proportional to the strength of the vibrating bond and masses of the atoms connected by the bond.
b) proportional to the strength of the vibrating bond and inversely proportional to the masses of the atoms connected by the bond.
c) inversely proportional to the strength of the vibrating bond and masses of the atoms connected by the bond.
d) inversely proportional to the strength of the vibrating bond and proportional to the masses of the atoms connected by the bond.

8. Absorption of IR radiation causes

a) change in vibrational energy without a change in electronic energy levels.
b) change in both vibrational energy and electronic energy levels.

c) change in electronic energy without a change in vibrational energy levels.
d) no change in vibrational energy and electronic energy levels.

9. A mandatory criteria for covalent bonds to be IR active is

a) symmetrical stretching/bending
b) asymmetrical stretching/bending
c) both a) and b)
d) none of the above

10. 2. Which of the following is the wave number of near infrared spectrometer?

a) 4000 – 200 cm^{-1}
b) 200 – 10 cm^{-1}
c) 12500 – 4000 cm^{-1}
d) 50 – 1000 cm^{-1}

11. What is the relation between restoring force, f to the displacement q in Hooke's law?

a) $f = -kq$
b) $f = kq$
c) $f = kq^2$
d) $f = -kq^2$

12. On which factors the vibrational stretching frequency of diatomic molecule depends?

a) Force constant
b) Atomic population
c) Temperature
d) Magnetic field

13. The frequency of vibration of a bond is a function of which factor?

a) Force constant of the bond
b) Masses of the atoms involved in bonding
c) Force constant of the bond and masses of the atoms

d) Bond order

14. What is the order of decreasing vibrational frequency for C — Cl, C — Br, C — C, C — O and C — H?

a) C-H, C-C, C-O, C- Cl, C-Br
b) C- Cl, C-Br, C-C, C -H, C-O
c) C-O, C-H, C-Br, C- Cl, C-C
d) C-Br, C- Cl, C-C, C-O, C-H

15. Which of the following is true?

a) Frequency of vibrations, symmetric stretching> Frequency of vibrations, asymmetric stretching
b) Frequency of vibrations, asymmetric stretching> Frequency of vibrations, symmetric stretching
c) Frequency of vibrations, symmetric stretching= Frequency of vibrations, asymmetric stretching