CHEM 4401 Molecular Spectroscopy: The Raman spectroscopy of molecules

1. What is the most important factor that determines the intensity of a Raman scattering signal?

A. The wavelength of the incident light
B. The wavelength of the scattered light
C. The Raman cross section of the molecule
D. The number of molecules in the sample

2. Which of the following is NOT a common application of Raman spectroscopy?

A. Identifying unknown compounds
B. Measuring the concentration of a compound in a sample
C. Determining the structure of a molecule
D. Measuring the purity of a compound

3. Which of the following is NOT a reason why Raman spectroscopy is useful?

A. It is a non-destructive technique
B. It is relatively easy to set up
C. It can be used to study both gases and solids
D. It is not affected by fluorescence

4. What is the most important factor that determines the wavelength of the scattered light in a Raman scattering event?

A. The wavelength of the incident light
B. The Raman cross section of the molecule
C. The polarizability of the molecule
D. The vibrational mode of the molecule

5. Which of the following is NOT a type of Raman scattering?

A. Stokes scattering
B. Rayleigh scattering
C. Anti-Stokes scattering
D. Fluorescence scattering

6. What is the difference between Stokes and anti-Stokes scattering?

A. Stokes scattering occurs at a longer wavelength than anti-Stokes scattering.
B. Stokes scattering occurs at a shorter wavelength than anti-Stokes scattering.
C. Stokes scattering is more intense than anti-Stokes scattering.
D. Anti-Stokes scattering is more intense than Stokes scattering.

7. What is the difference between Rayleigh and Raman scattering?

A. Rayleigh scattering is more intense than Raman scattering.
B. Rayleigh scattering is less intense than Raman scattering.
C. Rayleigh scattering occurs at a longer wavelength than Raman scattering.
D. Rayleigh scattering occurs at a shorter wavelength than Raman scattering.

8. What is the Raman shift?

A. The difference in wavelength between the incident light and the scattered light
B. The difference in wavelength between the scattered light and the Raman line
C. The difference in wavelength between the incident light and the Raman line
D. The difference in wavelength between the Stokes and anti-Stokes lines

9. How is the Raman shift related to the vibrational mode of the molecule?

A. The Raman shift is proportional to the vibrational mode.
B. The Raman shift is inversely proportional to the vibrational mode.
C. The Raman shift is equal to the vibrational mode.
D. The Raman shift is twice the vibrational mode.

10. What is the difference between a Raman spectrum and an infrared spectrum?

A. A Raman spectrum is more intense than an infrared spectrum.
B. A Raman spectrum is less intense than an infrared spectrum.
C. A Raman spectrum is a plot of intensity vs. wavelength while an infrared spectrum is a plot of intensity vs. frequency.
D. A Raman spectrum is a plot of intensity vs. frequency while an infrared spectrum is a plot of intensity vs. wavelength.

11. How is the Raman spectrum of a molecule related to its infrared spectrum?

A. The Raman spectrum is the same as the infrared spectrum.
B. The Raman spectrum is the inverse of the infrared spectrum.
C. The Raman spectrum is shifted to lower frequencies relative to the infrared spectrum.
D. The Raman spectrum is shifted to higher frequencies relative to the infrared spectrum.

12. What is the difference between a Raman active mode and a Raman inactive mode?

A. A Raman active mode is one that scatters light while a Raman inactive mode does not.
B. A Raman active mode is one that does not scatter light while a Raman inactive mode does.
C. A Raman active mode is one that is Raman shifted while a Raman inactive mode is not.
D. A Raman active mode is one that is not Raman shifted while a Raman inactive mode is.

13. Which of the following is NOT a factor that determines whether a mode is Raman active or inactive?

A. The polarizability of the molecule
B. The symmetry of the molecule
C. The mass of the molecule
D. The frequency of the mode

14. How many Raman active modes does a molecule need in order to be Raman active?

A. One
B. Two
C. Three
D. Four

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C. Three
D. Four

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26. How many Raman active modes does a molecule need in order to be Raman active?

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27. What is the difference between a Raman spectrum and an infrared spectrum?

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30. How many Raman active modes does a molecule need in order to be Raman active?

A. One
B. Two
C. Three
D. Four

1. C
2. D
3. D
4. D
5. D
6. B
7. B
8. A
9. B
10. C
11. D
12. A
13. C
14. A
15. C
16. D
17. A
18. A
19. C
20. D
21. A
22. A
23. C
24. D
25. A
26. A
27. C
28. D
29. A
30. A