

3. Resonance

Every material has what is called a natural frequency. An example of natural frequency that we have seen in our lives is the plucking of a guitar string. In this example, the natural frequency of the string can be heard in the sound it produces. When you tighten the string, you change the sound. This means that by changing the tension or length of the guitar string, you are changing its natural frequency. While it is helpful to think of examples that we see in our everyday lives, molecules do not contain guitar strings. Instead, they contain atoms that are bonded together.

1) Brainstorm: Based on the example of the guitar string, what do you think determines the natural frequency of a molecule?

Waves, such as light, also have frequencies. Because of this, light and matter can interact when the frequency of light matches the natural frequency of a molecule. This interaction is known as resonance.

2) What will happen when light of a resonant frequency interacts with a molecule?

3) Using your book and your notes from class, fill in the table below. Make sure to use appropriate units.

Infrared Light	
Range of Wavelengths	
Range of Frequencies	
Range of Wavenumbers	
Velocity	

4) Based on the table above, in what range of frequencies (in Hz) must a molecule's natural frequency be in order to be in resonance with infrared light? What is the range in wavenumbers?