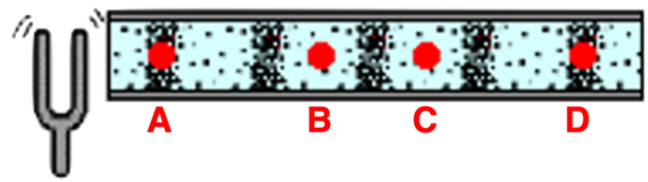
**Sound Waves**

Vibrating objects produce sound waves. The **frequency** at which the object vibrates is equal to the frequency of the sound waves. This frequency is related to the pitch. High frequency waves are heard as high-pitched waves.

A vibrating object, such as the tines of a tuning fork, forces surrounding air particles to vibrate. The vibration of air particles produces alternating regions of high and low pressure. The high pressure regions result from the crowding together of air particles; these are known as **compressions**. The low pressure regions are characterized by the spacing apart of air particles; these are known as **rarefactions**. **Figure 1** shows compressions and rarefactions arranged within a pipe. The distance between adjacent compressions is the **wavelength**.

**Figure 1**




Sound is often detected by the use of the flexible diaphragm of a microphone. As compressions reach the diaphragm, they push it *inward*. As rarefactions reach the diaphragm, it is drawn *outward*. The inward and outward vibrations of the diaphragm occur at the same frequency as the sound wave. These vibrations can be transformed into electrical signals and be displayed on an oscilloscope or a computer.

**Figure 2**

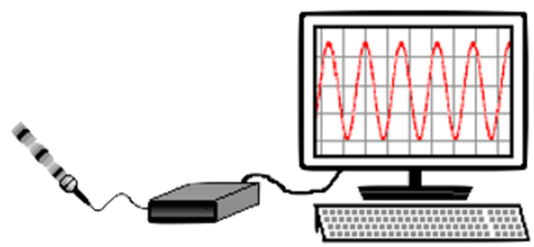


**Figure 3** and **Figure 4** were produced by two tuning forks with different vibrational frequencies. The pressure is measured relative to the normal room pressure. A *high positive pressure* indicates much higher than the normal room pressure. A negative pressure indicates lower than the normal room pressure. Because the sound waves are characterized by oscillations in pressure over the course of time, sound is often referred to as a **pressure wave**.

**Figure 3: Tuning Fork A**

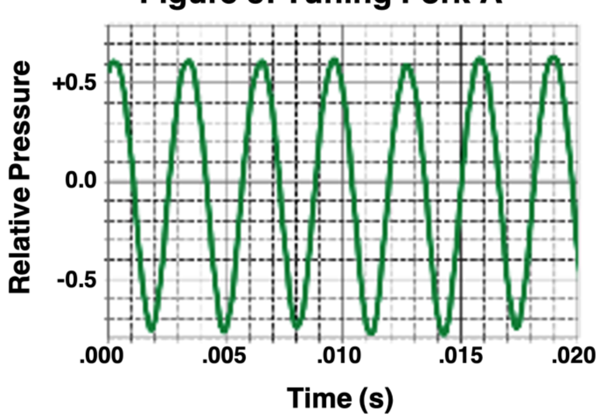



**Figure 4: Tuning Fork B**