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Harmonics account for sound quality, or timbre

Table 4 shows the harmonics present in a tuning fork, a clarinet, and a viola when each sounds the musical note A-natural. Each instrument has its own characteristic mixture of harmonics at varying intensities.

The harmonics shown in the second column of **Table 4** add together according to the principle of superposition to give the resultant waveform shown in the third column. Since a tuning fork vibrates at only its fundamental frequency, its waveform is simply a sine wave. (Some tuning forks also vibrate at higher frequencies when they are struck hard enough.) The waveforms of the other instruments are more complex because they consist of many harmonics, each at different intensities. Each individual harmonic waveform is a sine wave, but the resultant wave is more complex than a sine wave because each individual waveform has a different frequency.

In music, the mixture of harmonics that produces the characteristic sound of an instrument is referred to as the *spectrum of the sound.* From the perspective of the listener, this spectrum results in *sound quality,* or **timbre.** A clarinet sounds different from a viola because of differences in timbre, even when both instruments are sounding the same note at the same volume. The rich harmonics of most instruments provide a much fuller sound than that of a tuning fork.

timbre

the musical quality of a tone resulting from the combination of harmonics present at different intensities

Table 4 Harmonics of a Tuning Fork, a Clarinet, and a Viola at the Same Pitch