Answer #265

The answer is (b): The frequency must be reduced by a factor of the square root of two (multiplied by 0.707), as seen in an mpeg video by clicking your mouse on the photograph below.

Perhaps a short explanation of what you are seeing is in order, because this experiment is relatively complex. The original wave (first half of the video) has four wave generator vibrations per each metronome tick, with the metronome at 160 beats per minute, so its frequency is 640 vibrations per minute (as described in the question). For the second half of the video the weight has been decreased to 500 grams, resulting in a decrease of the wave speed of a factor of the square root of two. The wavelength of the wave must therefore be increased by that same factor in order to preserve the single loop standing wave. This can be done by *decreasing* the frequency by the same factor. This would be a metronome rate of 113 ticks per minute (160 x 0.707). On the video the metronome rate has been reduced to 108 ticks per minute to match the frequency of the wave generator with four wave generator oscillations per metronome tick. The experimental value of 108 x 4 = 432 vibrations per minute is close (about 5% low) to the theoretical value of 113 x 4 = 452 oscillations per minute.

Click your mouse here to view a slow-motion version of the video above.

Archive 14

Question of the Week

Outreach Index Page

Lecture-Demonstration Home Page

For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address

given on the Lecture-Demonstration Home Page.