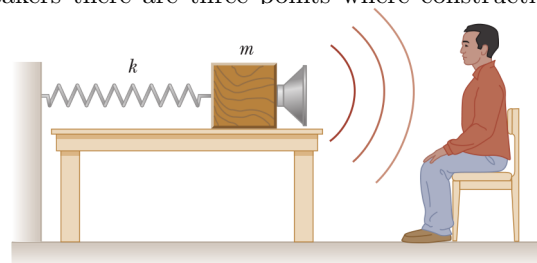


Physics 9B Fall 2013 - Discussion #3

1. A research ship emits a SONAR ping straight down into a saltwater bay, where the bulk modulus and density of saltwater are $B = 2.2 \times 10^9$ Pa and $\rho = 1020$ kg/m³. Assume that the frequency of the sound is $f = 2$ kHz, that the intensity is $I = 1$ kW/m², and that the amplitude remains constant as the wave propagates. If the time required to hear an echo from the seafloor is $\Delta t = 0.07$ s, what are (a) the speed of sound in the water, (b) the depth of the bay, (c) the pressure exerted by the sound at the bottom of the bay? (d) Is the bottom of the bay a pressure node or antinode? (e) Is the bottom of the bay a displacement node or antinode?
2. Speakers A and B are vibrating in phase. They are directly facing each other, 7.80 m apart, and are each playing a 73.0 Hz tone. The speed of sound is 343 m/s. On the line between the speakers there are three points where constructive interference occurs. What are the distances of these points from A?

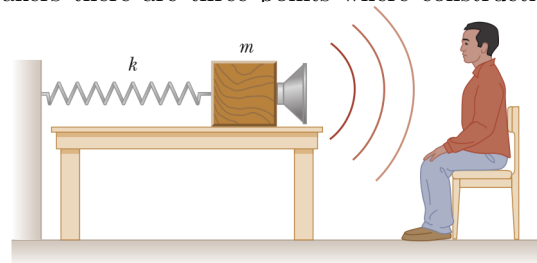
A block with a speaker bolted to it is connected to a spring with spring constant k and oscillates with amplitude A . The total mass of the speaker and block is m , and the speaker emits sound waves of frequency f . Determine (a) the highest and (b) the lowest frequencies heard by the person to the right of the speaker.



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