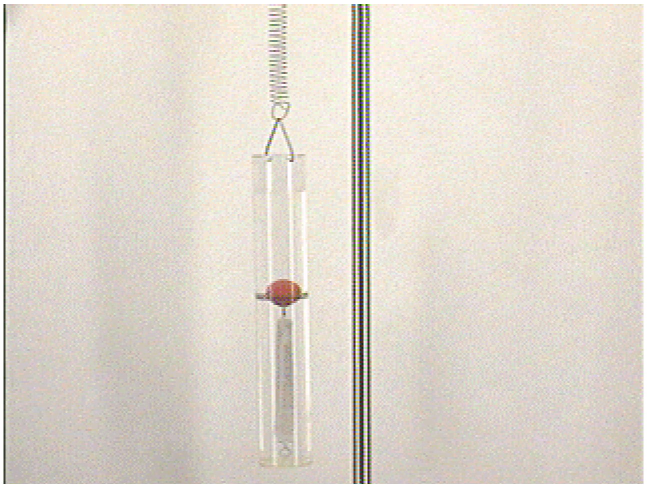
Answer #95

The answer is (b) the motion of the pingpong ball will be *out of phase* with the motion of the oscillating container, as seen in an mpeg video by clicking your mouse on the photograph below.



This device is a type of accelerometer, in which the pingpong ball moves in the direction of the acceleration at each point in the motion of the container. Thus, when the container is above its equilibrium position the acceleration is downward, but when the container is below its equilibrium position the acceleration is upward.

There is a slight effect due to the viscosity of the water bath that delays the response of the pingpong ball. If you display the video by single frames, you may be able to see a very slight delay of the motion of the pingpong ball with respect to the motion of the container. Because of the blurriness of the video, this is very difficult to see.

One way to see why is as follows. When the container is above its equilibrium position its acceleration is downward so the apparent weight density of the water is less than when the container is at rest. Therefore the pingpong ball will have less buoyant force and the spring will pull it down below its equilibrium position. Conversely, when the container is below its equilibrium position its acceleration is upward, so the apparent weight density of the water is greater than when the container is at rest. Therefore the pingpong ball will have more buoyant force and will extend the spring further than when it is at equilibrium. Note that because the pingpong ball is much less dense than the water (it floats) the apparent weight change of the water is much greater than that of the pingpong ball, contrasting it with the situation in *Questions #69 and #70*.

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For questions and comments regarding the *Question of the Week* contact
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