

Module 10

Oscillatory Motion

QUESTIONS

Question 1 (LV1): The position of a 0.50-kg object attached to a spring is described by $x = (0.25 \text{ m}) \cos(0.4\pi t)$. Find (a) the position of the object at $t = 0.30 \text{ s}$ and (d) the objects speed at $t = 0.30 \text{ s}$.

Question 2 (LV2): Two mass-spring systems have the same mass and the same total energy. The amplitude of system A is twice that of system B. How do their frequencies compare?

Question 3 (LV3): A mass on a string of unknown length oscillates as a pendulum with a period of 2.0 s. What is the period if the length of the string is halved?

PROBLEMS

Problem 1 (LV2): When four people with a combined mass of 320 kg sit down in a 2000-kg car, they find that their weight compresses the springs an additional 0.90 cm. (a) What is the force constant of the springs? (b) The four people get out of the car and bounce it up and down. What is the frequency of the car's vibration?

Problem 2 (LV2): A mass-spring system undergoing simple harmonic motion has a velocity to the right of 2.5 m/s when it is displaced 0.500 m to the right of its equilibrium position, and an acceleration of 7.5 m/s^2 to the left. How much farther from this point will the mass move before it stops momentarily and then starts to move back to the left?