

1. A 0.4-kg mass hangs from a spring ( $k = 80 \text{ N/m}$ ), and is set into an up-and-down simple harmonic motion. What is the potential energy stored **in the spring alone** when the mass is displaced 0.1 m?
2. A runaway railroad car, with mass  $30 \times 10^4\text{-kg}$ , coasts across a level track at 1.5 m/s when it collides with a spring-loaded bumper at the end of the track. If the spring constant of the bumper is  $2 \times 10^6 \text{ N/M}$ , what is the maximum displacement of the spring after the collision? (Assume collision is elastic.)
3. A block rests on a frictionless level surface and is attached to a horizontally aligned spring with a spring constant of 80 N/m. The block is initially displaced 4 cm from the equilibrium point and then released to set up a simple harmonic motion. The frequency is 3.0 Hz. What is the mass of the block?
4. A radio wave has a speed of  $3 \times 10^8 \text{ m/s}$  and a frequency of 101 MHz. What is its wavelength?
5. A piano string of mass 0.005 kg/m is under a tension of 1350 N. Find the velocity with which a wave travels on this string.
6. A train consists of boxcars and flat cars. They are alternated every car. A daredevil is swinging perpendicular to the tracks on a 1metric ton wrecking ball hanging from a crane. If the train is moving 5 miles per hour and the cars are all 20 feet long, how high up must the top of the crane be for her to swing between every boxcar