
PHYS 1210 Worksheet 6. Hooke's Law, Potential Energy

1. When a diver stands still at the end of a diving board, the end of the board flexes downward a distance of 10.0 centimeters. When the diver jumps and lands back down on the board, the board flexes downward a distance of 25.0 centimeters. What is the diver's acceleration when the board is flexed downward 25.0 centimeters?
2. A projectile launcher used in a physics teaching lab contains a spring. To fire a projectile, the spring is compressed with the projectile pressed against it. The spring is then released, extending and pushing on the projectile. The work done by the spring on the projectile is equal to the decrease in the spring's potential energy.*

In a particular launcher, the spring has a length of 10.0 centimeters when it is under zero tension. Inside the launcher, the spring can be compressed by one, two, or three "clicks:" at one click, the spring is 6.00 centimeters long; at two clicks, it is 4.00 centimeters long, and at three clicks, the spring is 2.00 centimeters long. The spring is 8.00 centimeters long when the projectile is released, so it is always under some compression, and it does not extend fully.

When a 70-gram projectile is fired horizontally from two "clicks," its exit speed is 4.00 meters per second.

- A. What is the spring constant of the spring?
- B. What is the projectile's exit speed when it is launched horizontally from one click?
- C. What is the projectile's exit speed when it is launched horizontally from three clicks?
- D. If the projectile is launched vertically upward from two clicks, the spring must lift the projectile 4.00 centimeters before releasing it. What is the projectile's exit speed in this situation?

* If the mass of the projectile is much greater than the mass of the spring.