

wk.5.elast_pot_e_rot

1. A force of 20 newtons causes a spring to compress 6.2 cm. What is the spring constant k of the spring?

2. A 10 kg mass is hung from a spring causing it to extend 12 cm.

(a) In what direction does the restoring force point?

(b) What is the weight of the mass that is hung?

(c) What is the spring constant of the spring?

3. A dart gun has a spring constant k of 35 N/m. The spring is compressed 8.0 cm. If the gun is pointed straight up in the air and fires a dart of mass 30 g,

(a) To what maximum height will the dart go?

Show the formula that equates elastic potential energy to gravitational potential energy

(b) How fast will the dart be traveling just as it leaves the gun?

Show the formula that equates elastic potential energy to kinetic energy

4. A traffic engineer designs a barrier at a dangerous off ramp that will bring a 1000 kg car to a full stop with a negative acceleration that can be withstood without serious injury to the occupants of the car. If a human can withstand 5 “g’s”

(a) What is this acceleration equal to in m/s^2

(b) If the car is traveling at 60 miles per hour, what is this equal to in m/s ?

(c) Using $v_{final}^2 = v_{initial}^2 + 2ad$, determine the distance through which the car needs to be stopped in order that the occupants do not feel more than 5 g’s acceleration.

(d) The engineer uses a dense foam as a barrier. What does the spring constant of this foam need to be in order to perform as the engineer designs the barrier?

5. How many radians are there in 352° ? **show conversion factor**

6. How many degrees are there in 2.45 radians? **show conversion factor**

7. Convert 150 rpm to rads/s **show conversion factor**

8. Convert 35 rads/s to rpms. **show conversion factor**

9. The wheels of the mousetrap car are 12 inches in diameter. Through how many rotations do they turn if the car travels 35 feet?

10. How many radians is this?

Answers:

1) $323 \text{ N} \text{ or } 3.2 \times 10^2 \text{ N}$

2) 4 s

3) 8 N

4) $32 \text{ N} \text{ or } 3.2 \times 10^1 \text{ N}$

5) $h = 83.0 \text{ m}$

6) $v = 7.2 \text{ m/s}$

7) 4 m/s

8) 2 m/s

9) 4.7 m

10) 4 N

11) 1.0 radians

12) 140°

13) 12.7 radians

14) 334 rpm

15) 11 rotations

16) 9 radians