# Elastic Potential Energy Questions

These questions use real-world situations involving springs, bungee cords, trampolines, vehicle suspension systems and safety equipment. Some questions require you to rearrange the equation and think carefully about the units given.

1. A toy foam dart blaster uses a spring with a spring constant of 120 N/m. Before firing, the spring is compressed by 0.15 m. Calculate the elastic potential energy stored in the spring.
2. A pogo stick spring has a spring constant of 350 N/m. A child compresses the spring by 0.25 m before jumping. Calculate the elastic potential energy stored.
3. A trampoline spring stretches by 0.20 m when a gymnast lands on it. The spring constant is 500 N/m. Calculate the elastic potential energy stored in the spring.
4. A mountain bike suspension spring has a spring constant of 800 N/m. When the bike lands after a jump, the spring compresses by 0.18 m. Calculate the elastic potential energy stored.
5. A bungee cord stores 180 J of elastic potential energy before a jump. The cord stretches by 0.60 m. Calculate the spring constant of the cord.
6. A warehouse loading bay uses a large spring buffer to stop delivery lorries. The buffer stores 2 500 J of elastic potential energy when compressed by 0.50 m. Calculate the spring constant of the buffer.
7. A railway station buffer has a spring constant of 25 000 N/m. During a low-speed collision, it stores 4 500 J of elastic potential energy. Calculate how far the spring compresses.
8. A stunt performer is attached to a safety cord with a spring constant of 1 500 N/m. At maximum stretch, the cord stores 1 080 J of elastic potential energy. Calculate the extension of the cord.
9. Engineers are testing a new crash barrier. During a test, a spring system with a spring constant of 40 000 N/m compresses by 35 cm.

Calculate:

a) the elastic potential energy stored

b) the energy stored in kJ.

10. A theme park is testing a launch system powered by a giant spring.

The spring has a spring constant of 60 000 N/m.

During Test A, the spring is compressed by 0.40 m.

During Test B, the spring is compressed by 0.80 m.

Calculate:

a) the elastic potential energy stored during Test A

b) the elastic potential energy stored during Test B

c) the increase in elastic potential energy between the two tests

d) explain, using your calculations, why doubling the compression does not simply double the stored energy.