Answer on Question #72024-Physics-Other

An ore car of mass 41000 kg starts from rest and rolls downhill on tracks from a mine. At the end of the tracks, 20 m lower vertically, is a horizontally situated spring with constant 4.2 × 105 N/m. The acceleration of gravity is 9.8 m/s2. Ignore friction. How much is the spring compressed in stopping the ore car?

Solution

From the conservation of energy:

$$mgh = \frac{kx^2}{2}$$

$$x = \sqrt{\frac{2mgh}{k}}$$

$$x = \sqrt{\frac{2(41000)(9.8)(20)}{4.2 \cdot 10^5}} = 6.2\ m.$$

Answer: $\mathbf{6.2\ m}$.