

Kinetic and Potential Energy

Determine whether the objects in the following problems have kinetic or potential energy. Then choose the correct formula to use:

$$E_k = \frac{1}{2} mv^2$$

$$E_p = \text{mass} \times \text{gravitational acceleration} \left(-9.81 \frac{m}{s^2}\right) \times \text{height} \quad \text{OR} \quad E_p = \text{Weight} \times \text{Height}$$

$$\text{Energy} = J$$

$$\text{Weight} = N$$

$$\text{Mass} = kg$$

$$\text{Velocity} = \frac{m}{s}$$

$$\text{Gravitational acceleration} = \left(-9.81 \frac{m}{s^2}\right)$$

- 1.) You serve a volleyball with a mass of 2.1 kg . The ball leaves your hand with a speed of $30. \frac{m}{s}$. The ball has _____ energy. Calculate it.

- 2.) A baby carriage is sitting at the top of a hill that is 21 m high. The carriage with the baby weighs 12 N . The carriage has _____ energy. Calculate it.

- 3.) A car is traveling with a velocity of $40. \frac{m}{s}$ and has a mass of 1120 kg . The car has _____ energy. Calculate it.

- 4.) A cinder block is sitting on a platform $20. \text{ m}$ high. It weighs 79 N . The block has _____ energy. Calculate it.

- 5.) There is a bell at the top of a tower that is 45 m high. The bell weighs 190 N . The bell has _____ energy. Calculate it.

6.) A roller coaster is at the top of a 72 m hill and weighs 966 N . The coaster (at this moment) has _____ energy. Calculate it.

7.) What is the kinetic energy of a 3.0 kg ball that is rolling at $2.0\frac{\text{m}}{\text{s}}$?

8.) Two objects were lifted by a machine. One object had a mass of 2.0 kg , and was lifted at a speed of $2.0\frac{\text{m}}{\text{s}}$. The other had a mass of 4.0 kg and was lifted at a speed of $3.0\frac{\text{m}}{\text{s}}$.

a. Which object had more kinetic energy while it was being lifted?

b. Which object had more potential energy when it was lifted to a distance of $10.\text{ m}$? Show your calculation.

9.) A 3.0 kg briefcase is dropped. If this briefcase reaches the floor at a speed of $3.2\frac{\text{m}}{\text{s}}$, from what height was it dropped?

10.) A water balloon was dropped from the edge of a 8.0 m cliff. How fast was it moving as it hit the ground?