

<b>Answers to Potential and Kinetic Energy skill sheet</b>		
$E_p = m \times g \times h$ [ $g = 10\text{N/kg}$ ];	$E_p = \text{weight} \times \text{height}$	$E_k = 1/2 \times m \times v^2$

1. Determine the amount of potential energy of a 5.0-N book that is moved to three different shelves on a bookcase. The height of each shelf is 1.0 m, 1.5 m, and 2.0 m.

$$E_p = \text{weight} \times \text{height} = 5 \times 1 = 5\text{N}; 5 \times 1.5 = 7.5\text{N}; 5 \times 2 = 10\text{N}$$

2. You are on in-line skates at the top of a small hill. Your potential energy is equal to 1,000. J. The last time you checked, your mass was 60.0 kg.

a. What is your weight in newtons?

$$\text{Weight} = \text{mass} \times \text{gravity} = 60.0 \times 10 = 600\text{N}$$

b. What is the height of the hill?

$$\text{height} = E_p \div \text{Weight} = 1000 \div 600 = 1.67\text{m}$$

c. If you start rolling down this hill, your potential energy will be converted to kinetic energy. At the bottom of the hill, your kinetic energy will be equal to your potential energy at the top. Calculate your speed at the bottom of the hill.

$$\text{If all the } E_p \text{ has become } E_k \text{ then } E_k = 1000\text{J}$$

$$1/2 \times 60 \times v^2 = 1000$$

$$30 \times v^2 = 1000$$

$$V = \sqrt{(1000 \div 30)} = 5.8 \text{ m/s}$$

3. A 1.0-kg ball is thrown into the air with an initial velocity of 30 m/s.

a. How much kinetic energy does the ball have?

$$E_k = 1/2 \times m \times v^2 = 0.5 \times 1 \times 30^2 = 0.5 \times 900 = 450 \text{ Joules}$$

b. How much potential energy does the ball have when it reaches the top of its ascent?

$$\text{If all the } E_k \text{ has become } E_p \text{ then } E_p = 450\text{J}$$

c. How high into the air did the ball travel?

$$m \times g \times h = 450$$

$$1 \times 10 \times h = 450$$

$$h = 45\text{m}$$

4. What is the kinetic energy of a 2,000.-kg boat moving at 5.0 m/s?

$$E_k = 1/2 \times m \times v^2 = 2000 \times 1 \times 5^2 = 1000 \times 25 = 25,000 \text{ Joules}$$

5. What is the velocity of an 500-kg elevator that has 4000 J of energy?

$$1/2 \times 500 \times v^2 = 4000$$

$$V = \sqrt{(4000 \div 250)} = 4 \text{ m/s}$$

6. What is the mass of an object traveling at 30 m/s if it has 33,750 J of energy?

$$\frac{1}{2} \times m \times 30^2 = 33,750$$

$$450 \times m = 33,750$$

$$m = 33,750 / 450 = 75\text{kg}$$