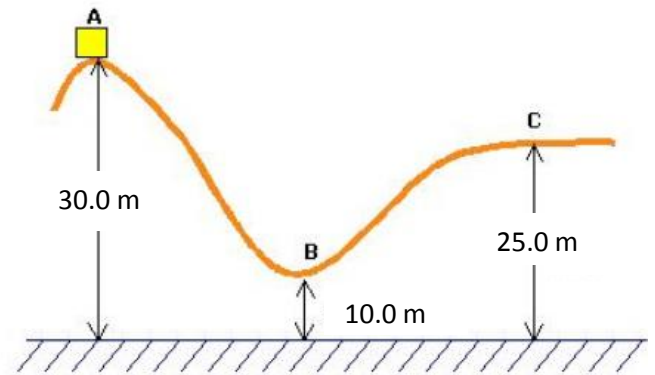


Worksheet: Types of Energy and Work-Energy Theorems (D2017)

1. A 1.00 kg toy roller coaster car moves from point A to B then C. Use 3SDs.

- What is the potential energy at B and C relative to A? (-196 J, -49.0 J)
- What is the change in potential energy as it goes from B to C? (147 J)
- What is the potential energy at B and C relative to point C? (-147 J, 0 J)
- What is the change in potential energy as it goes from B to C? Use C as the reference. (147 J)



- A trampoline has a spring constant of 3430 N/m. How far will the trampoline sink when a 70 kg person steps on it? (0.20 m)
- A 60 kg runner has 1500 J of kinetic energy. How fast is he moving? (7.1 m/s)
- A 5.0 kg rock is raised 28 m above the ground level. What is the change in its potential energy? (1.4×10^3 J)
- A shopper in a supermarket takes a box of sugar from a shelf that is 1.5 m high and places it into the bottom of his cart which is 0.48 m from the floor. The sugar has a weight of 5.0 N.
 - What potential energy, relative to the floor, did the sugar have before it was taken from the shelf? (7.5 J)
 - How much work was done to move the box of sugar from the shelf to the cart? (-5.1 J)
- A spring is stretched 2.0 cm when a mass of 40 grams is hung from it. What is the spring constant of the spring? (20 N/m)
- The tops of the towers of the Golden Gate Bridge, in San Francisco, are 227 m above the water. Suppose a worker drops a 655 g wrench initially at rest from the top of a tower. What will the velocity of the wrench be when it hits the water? (Use the work energy theorem.) (66.7 m/s, down)
- On Planet X a 0.50 kg space rock falls a distance of 2.5 meters and loses 20 J of energy. What is the magnitude of the acceleration due to gravity on Planet X? (16 m/s^2)
- If a child does 2.0 J of work in raising a 180 g red apple from the ground to his mouth to take a bite of the apple, how far is the apple lifted? (1.1 m)
 - If another 1.0 J of work is done on the apple, what will be the apple's potential energy relative to the ground? (3.0 J)

10. A stone is thrown vertically up with a speed of 14 m/s. At that moment, it had 37 kJ of kinetic energy. What was the mass of the stone? (3.8×10^{-4} kg)
11. A 500 kg car is moving at 28 m/s. The driver sees a barrier ahead. If the car takes 95 m to come to rest, what is the magnitude of the average force necessary to stop? (2.1×10^3 N)
12. A 50 kg skydiver loses 2400 kJ of energy during a jump. What was her change in height? (-4.9×10^3 m)
13. A baby carriage that is carrying twins is sitting at the top of a hill that is 21 m high. The mass of the carriage and the babies is 48 kg. What is the potential energy of the twins and the carriage relative to the ground when the carriage has moved 9.0 m down the hill? (5.6×10^3 J)
14. A force of 200 N stretches a spring 30 cm. What is the spring constant of the spring? How far would this spring stretch with a force of 100 N applied to it? (0.15 m)
15. A snowball that will be used to build a snowman is at the top of the only hill in town and weighs 22 N. If the potential energy of the snowball is 520 J, what is the height of the snowy hill? (24 m)
16. The world record for pole vaulting is 6.15 m. If the pole vaulter's gravitational potential is 4942 J, what is his mass? (82.0 m)
17. What is the potential energy of stretched spring, if the spring constant is 40 N/m and the elongation is 5.0 cm? (0.050 J)
18. Paul and George are running with the same velocity but Paul has 3 times the mass as George. If Paul has a kinetic energy of 411 J, what is George's kinetic energy? (137 J)
19. In 1990, Roger Hickey of California reached a speed 35.0 m/s on his skateboard. Suppose it took 21 kJ of work for Roger to reach this speed from a speed of 25.0 m/s. Calculate Hickey's mass. (70 kg)
20. A 75 kg bobsled is pushed along a horizontal surface by two athletes. After the bobsled is pushed a distance of 4.5 m starting from rest, its speed is 6.0 m/s. Find the magnitude of the net force on the bobsled. (3.0×10^2 N)