Chapter 8   Energy, Work, and Power

Example Problems

8.3 Power

E1. A monkey goes rock climbing. After 30 minutes the monkey has done 5900 J of work scaling up the side of a cliff, calculate the monkey's power output.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$W =$

$t =$

a) _____ ⟵ units

E2. A monkey lifts a bucket of water 30 meters out of a well at a constant velocity. If the bucket weighs 98 N and it takes 45 seconds to reach the top of the well, calculate the work done by the monkey and the power output.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
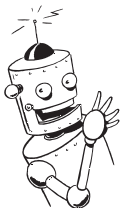
$P =$

$F =$

$d =$

$t =$

a) _____ ⟵ units   b) _____ ⟵ units

Chapter 8   Energy, Work, and Power

E3. A 51 kg monkey climbs a 6 meter tall tree in 10 seconds, calculate the work done by the monkey and his power output.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ⟵ units   b) _____ ⟵ units

E4. A monkey, while running, puts out 50 watts of power. Calculate how much work the monkey does after he has been running for 1.0 hour.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
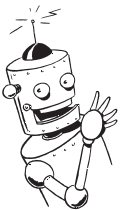
$P =$

$W =$

$t =$

a) _____ ⟵ units

Name _____ Period _____ Date _____

Chapter 8   Energy, Work, and Power

E5. An 8 kg mass is lifted from the floor to the ceiling in a science classroom using a small electric motor that puts out 25 watts of power. If it takes 7 seconds to lift the mass from the floor to the ceiling, calculate the work done on the mass and the height of the science room.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ◄——— units   b) _____ ◄——— units

E6. A monkey has bought a piano but he lives on the sixth-story of an apartment building. The monkey needs to get the piano from the street 15 meters up to his flat. The piano will not fit through the doors into the apartment but will fit through the outside window. The monkey attaches a rope to the piano and the other end to a 1,750 watts motor attached to the top of the building. Calculate how much energy will it take to lift the 285 kg piano from the ground to the monkey's flat and how long will it take.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
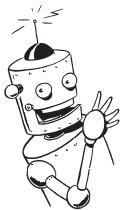
$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ◄——— units   b) _____ ◄——— units

Chapter 8   Energy, Work, and Power

E7. A monkey is taking his new Porsche fo a spin. The monkey wants to "feel" the vehicles acceleration so starting from rest the monkey pushes the gas pedal to the floor. The car goes from 0-60 mph (0-26.82 m/s) in 3.4 seconds. If the mass of the car is 1,361 kg, calculate the car's change in kinetic energy and the car's power output.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$m =$

$v =$

$t =$

a) _____ ⟵ units   b) _____ ⟵ units

E8. A car is traveling on a level road at 16.67 m/s as the engine generates 12 hp (8948.4 watt). Determine the average retarding force due to wind resistance and friction.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
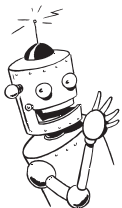
$P =$

$F =$

$v =$

a) _____ ⟵ units

Chapter 8   Energy, Work, and Power

Student Problems

8.3 Power

1. A monkey pushes a crate of bananas for 3.00 seconds applying constant horizontally force of 300.0 N. If the crate moves a total distance of 30.0 meters, calculate the work done on the crate and the power output by the monkey.

    Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

    $P =$

    $F =$

    $d =$

    $t =$

    a) _____ ⟵ units   b) _____ ⟵ units

2. A monkey pushes a wheelbarrow at a constant speed with a force of 145 N. The monkey moves the wheelbarrow 60.0 meters in 25.0 sec. Calculate the work done and the power output by the monkey.

    Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
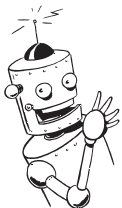
    $P =$

    $F =$

    $d =$

    $t =$

    a) _____ ⟵ units   b) _____ ⟵ units

Chapter 8   Energy, Work, and Power

3. A gorilla, a champion weight-lifting, raises 240 kg of mass a distance of 2.35 meters in 2.5 seconds. Calculate the work done lifting the weight and the power output.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

P =

m =

g =

h =

t =

a) _____ ⟵—— units   b) _____ ⟵—— units

4. A 420 kg load of bricks is lifted by a winch to a height of 120 meters in 5.0 minutes. Calculate the change in energy of the bricks and the power output of the winch.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
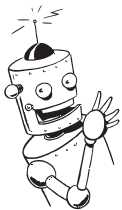
P =

m =

g =

h =

t =

a) _____ ⟵—— units   b) _____ ⟵—— units

Chapter 8   Energy, Work, and Power

5. A motor puts out 120 watts of power in 5.0 seconds to lift a 15 newton object. Calculate the vertical distance the object was raised.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ⟵ units

6. A monkey uses a small 1.5 watt electric motor to lift a 0.50 kilogram coconut at constant speed for 5.0 seconds. Calculate the vertical distance the banana was raised.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
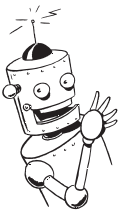
$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ⟵ units

Chapter 8   Energy, Work, and Power

7. A monkey pushes a crate 15 meters while applying a constant force of 100 N. If the power output by the monkey is 25 watts, calculate the work done by the monkey on the crate and the time it took to push the crate the 15 meters.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$F =$

$d =$

$t =$

a) _____ ⟵—— units   b) _____ ⟵—— units

8. A manually operated winch is used to lift a 200 kg mass to the roof of a 10 meters tall building. Assuming that you can work at a steady power output of 200 W, how long will it take you to lift the object to the roof?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
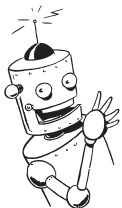
$P =$

$m =$

$g =$

$h =$

$t =$

a) _____ ⟵—— units

Chapter 8   Energy, Work, and Power

9. A car of mass 1550 kg can reach a speed of 60 mph (26.8 m/s) in 7.1 s. Calculate the change in kinetic energy of the car and the average power needed.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$P =$

$m =$

$v =$

$t =$

a) _____ ⟵ units   b) _____ ⟵ units

10. A shot-putter accelerates a 7.30 kg shot from rest to 14.0 m/s in 2.0 seconds. Calculate the change in energy of the shot and the average power output needed.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve
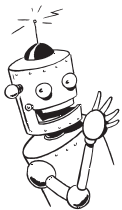
$P =$

$m =$

$v =$

$t =$

a) _____ ⟵ units

Name _____ Period _____ Date _____

Chapter 8   Energy, Work, and Power

11. If an electric motor develops 65,000 W of power as it lifts a loaded elevator 17.5 meters in 35 seconds, calculate the average force the motor exerts.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

P =

F =

d =

t =

a) _____ ◄——— units

12. It takes 10 seconds to lift a box 20.0 meters vertically using a cable attached to a motor. If the motor generates 1150 watts of power, calculate the weight of the box.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

P =

F =

d =

t =

a) _____ ◄——— units