8 Energy

TRUE OR FALSE QUESTIONS

Circle the correct answer.

T F 1. The rate at which work is done is called power.

T F 2. The energy an object has by virtue of its location is called its potential energy.

T F 3. The energy an object has by virtue of its motion is called its kinetic energy.

T F 4. The ratio of output force to input force for a simple machine is called its efficiency.

T F 5. More power is needed to carry a heavy suitcase slowly up a flight of stairs than to carry the suitcase quickly up the same flight of stairs.

MULTIPLE CHOICE QUESTIONS

Choose the best answer to each question and write the appropriate letter in the space provided.

B 6. If you lift one load up two stories, how much work do you do compared to lifting one load up only one story?

A) Four times as much
B) Twice as much
C) The same amount
D) One half as much

C 7. If Nellie Newton pushes an object with twice the force for twice the distance, she does

A) the same work.
B) twice the work.
C) four times the work.
D) eight times the work.

A 8. How much work is done on a 50-N rock that you lift 10 m straight up?

A) 500 J
B) 50 J
C) 10 J
D) 1 J

A 9. How much power is expended if you lift a 50-N rock 10 meters in 1 second?

A) 500 W
B) 50 W
C) 10 W
D) 5 W

A

10. An object that has kinetic energy must be

A) moving.
B) falling.
C) elevated.
D) at rest.

B

11. An arrow in a bow has 70 J of potential energy. Assuming no energy loss, how much kinetic energy will it have after it has been shot?

A) 140 J
B) 70 J
C) 50 J
D) 35 J

B

12. If Skelly the skater's speed is increased so he has twice the momentum, then his kinetic energy is increased by

A) two.
B) four.
C) eight.
D) zero.

B

13. A car that travels twice as fast as another when braking to a stop will skid

A) twice as far.
B) four times as far.
C) depends on the mass of the cars.

MATH PROBLEMS

Solve the following problems in the space provided. Show all work.

14. How much work is done in lifting 30 kg of bricks to a height of 20 m?

$W = F \cdot d$ $F = m \cdot a$

$W = 300N(20m)$ $F = 30kg\ (10 m/s^2) = 300N$

$W = 6000\ J$

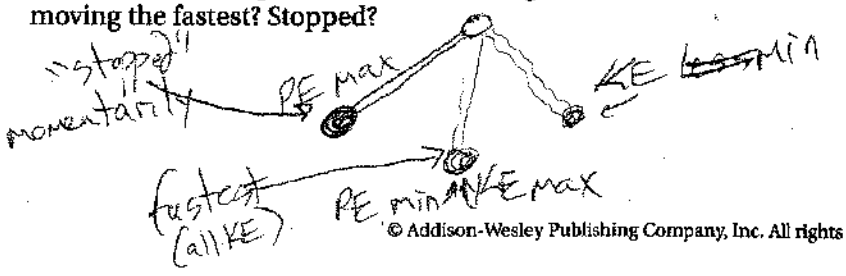
15. A toy cart moves with a kinetic energy of 40 J. What will its kinetic energy be if its speed is doubled?

$KE = \frac{1}{2} m v^2$, so if the velocity is doubled (x2) and then squared (2^2) the result is four times as much KE: $40J \times 4 = 160\ J$

ESSAY QUESTION

On a separate sheet of paper, answer the following question.

16. Discuss how energy conservation applies to a pendulum. Where is potential energy the most? The least? Where is kinetic energy the most? The least? Where is the pendulum accelerating the most? The least? Where is it moving the fastest? Stopped?



Date _____ Period _____ Name _____

10 Chapter Assessment

Use with Chapter 10.

Energy, Work, and Simple Machines

Understanding Concepts Part A

Write the letter of the choice that best completes the statement or answers the question.

B 1. Any object that has energy has the ability to _____.

a. burn **b.** produce a change **c.** fall

B 2. If the environment does work on a system, _____.

a. the environment warms

b. the energy of the system increases

c. the energy of the system decreases

d. the quantity of work done on the system has a negative value

C 3. When a force is exerted on an object, work is done only if the object _____.

a. is heavy **c.** moves

b. remains stationary **d.** has no momentum

B 4. In which of the following situations is no work done on a football?

a. picking up the football **c.** dropping the football

b. carrying the football down the field

A 5. In which of the following situations is work done on the football by a person?

a. picking up the football **c.** dropping the football

b. carrying the football down the field

C 6. In which of the following situations is work done on the football by gravity?

a. picking up the football **c.** dropping the football

b. carrying the football down the field

Write the term that correctly completes each statement.

7. One definition of POWER is "work done per unit time."
8. A machine with a mechanical advantage greater than 1 increases EFFORT FORCE.
9. For an ideal machine, efficiency is always 100 percent.
10. If the mechanical advantage of a machine is less than 1, effort force is GREATER than resistance force.
11. A wedge used to split wood is a SIMPLE machine.
12. A pair of gears make up a COMPOUND machine.

Name _____

10 Chapter Assessment

Understanding Concepts Part B

Answer the following questions, showing your calculations.

1. How much work is done if you raise a 6.0-N weight 1.5 m above the ground?

$W = F \cdot d = (6\,N)(1.5\,m) = 9\,N \cdot m = 9\,J$

2. Using an ideal machine, a worker exerts an effort force of 5.0 N to lift a 12.0-N weight a distance of 3.0 m. How far does the effort force move?

SKIP

3. An effort force of 200.0 N is applied to an ideal machine to move a 750.0-N resistance a distance of 300.0 cm. What is the mechanical advantage of the machine?

SKIP

4. How much power is developed by an electric motor that moves a 500-N load a distance of 20 m in 10 s?

$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{(500\,N)(20\,m)}{10\,s} = 1000\,\frac{N \cdot m}{s} = 1000\,W$

5. What is the efficiency of a machine that requires a work input of 190 J to achieve a work output of 160 J?

$\text{efficiency} = \frac{160\,J\ (\text{output})}{190\,J\ (\text{input})} \times 100\% = 84\%$

6. How much power is generated by a machine in lifting 250 kg a distance of 150 m in 30.0 s?

$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{m \cdot a_G \cdot d}{t} = \frac{250\,kg\,(9.8\,\frac{m}{s^2})(150\,m)}{30\,s} = 1.2 \times 10^4\,J$

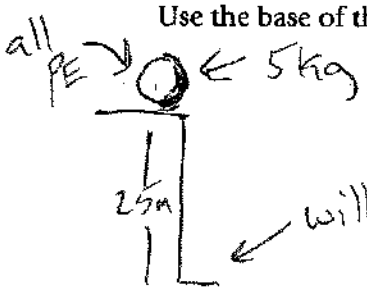
Name _____

11 Chapter Assessment

Understanding Concepts Part B

Answer the following questions, showing your calculations.

1. Determine the mechanical energy of a 5.0-kg stone perched near the edge of a cliff 25.0 m high. Use the base of the cliff as the reference level.



$PE = M \cdot a_g \cdot h = 5kg(9.8\frac{m}{s^2})(25m)$

$= 1.2 \times 10^3 J$ of PE turns into $1.2 \times 10^3 J$ of KE @ bottom

2. Compare the kinetic energies of a biker and bike (with a combined mass of 80 kg) traveling at 3.00 m/s and the same biker and bike traveling twice as fast.

$KE = \frac{1}{2}mv^2$ - so if we double velocity and square it then KE increases by a factor of 4 so KE in second case is four times the KE. Or....

$KE = \frac{1}{2}(80kg)(3\frac{m}{s})^2$: $KE = \frac{1}{2}(80kg)(6\ m/s)^2$

3. Which has the greater gravitational potential energy—a 550-g flower pot sitting on a 1.2-m high shelf or a 350-g flower pot sitting on a 1.8-m high shelf?

$PE = M \cdot a_g \cdot h$

$0.55kg(10\frac{m}{s^2})(1.2m) = 6.5J$ — more PE

$PE = M \cdot a_g \cdot h$

$= 0.35kg(10\ m/s)(1.8m) = 6.2J$

4. A weight trainer lifts a 90.0-kg barbell from a stand 0.90 m high and raises it to a height of 1.75 m. What is the increase in the potential energy of the barbell?

$PE = M \cdot a_g \cdot h$ ← $h = 1.75m - .9m = .85m$

$= 90kg(10\ m/s^2)(.85m) = 765J$

5. A child having a mass of 35.0 kg is on a sled having a mass of 5.0 kg. If the child and sled traveling together have a kinetic energy of 260 J, how fast are they moving?

$KE = \frac{1}{2}mv^2 = \frac{1}{2}(35kg + 5kg)v^2$

$KE = 20kg \cdot v^2$

$\frac{260J}{20kg} = v^2$

$\sqrt{13\frac{m^2}{s^2}} = \sqrt{v^2}$

$v = 3.6\ m/s$