Date ______________ Period ______________ Name ______________________

CHAPTER 11

Study Guide

Conservation of Energy

Vocabulary Review

Write the term that correctly completes the statement. Use each term once.

elastic collision	**law of conservation of energy**
elastic potential energy	**mechanical energy**
gravitational potential energy	**reference level**
inelastic collision	**rotational kinetic energy**
kinetic energy	**thermal energy**

1. ______________________ Within a closed, isolated system, energy can change form, but the total amount of energy is constant. This is a statement of the _____.

2. ______________________ The position at which the potential energy is defined to be zero is a(n) _____.

3. ______________________ The sum of the kinetic and gravitational potential energy of a system is the _____ of the system.

4. ______________________ _____ is the energy of motion, measured in joules.

5. ______________________ Energy stored in an Earth-object system as a result of gravitational attraction between the object and Earth is _____.

6. ______________________ A collision in which the kinetic energy decreases is a(n) _____.

7. ______________________ Energy that depends on an object's moment of inertia and its angular velocity is _____.

8. ______________________ Energy that usually makes the temperature of colliding objects rise slightly is _____.

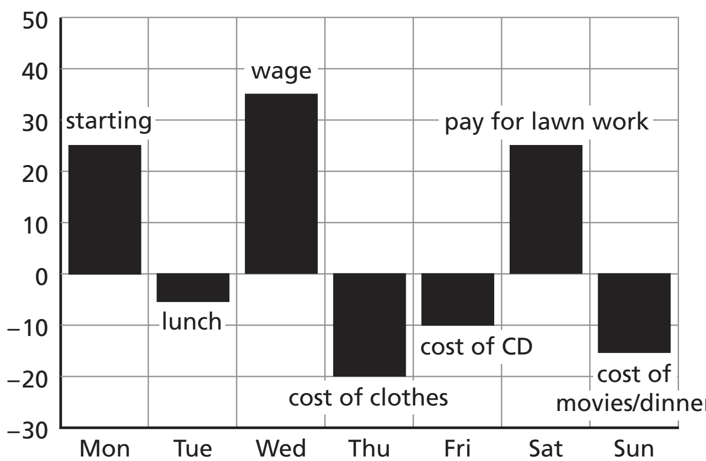
9. ______________________ A collision in which the kinetic energy doesn't change is a(n) _____.

10. ______________________ The energy in a compressed spring or a stretched rubber band is _____.

Section 11.1 The Many Forms of Energy

In your textbook, read about modeling the work-energy theorem on pages 286–287.

The diagram shows changes to your money during a week. Circle the choice that best completes the statement or answers the question.



1. How much money did you have on Monday?

a. $35 **c.** $20

b. $25 **d.** $0

2. How much money did you have by the end of the day on Wednesday?

a. $25 **c.** $55

b. $35 **d.** $60

3. How much money did you have by the end of the day on Friday?

a. $25 **c.** $45

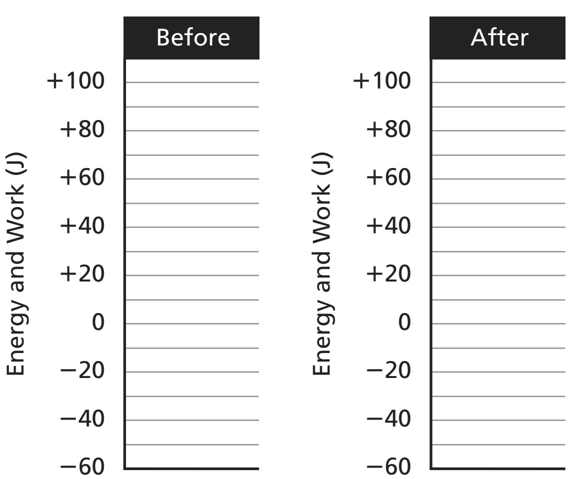
b. $35 **d.** $60

4. How does the amount of money you had at the end of the week compare with the amount you had at the beginning of the week?

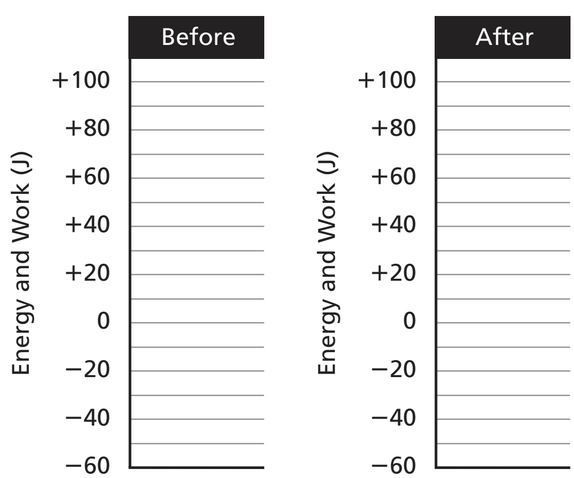
a. It increased. **b.** It decreased. **c.** It remained unchanged.

Read the following situations and draw before-and-after energy diagrams in the space provided.

5. A loaded wheelbarrow has a kinetic energy of 50 J. You do 30 J of work on the wheelbarrow.



6. A loaded wheelbarrow has a kinetic energy of 70 J. You do −60 J of energy on the wheelbarrow.



In your textbook, read about kinetic energy on page 287.

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

7. Which of the following would produce the greatest increase in the kinetic energy of a moving object?

a. doubling its mass **c.** halving its mass

b. doubling its velocity **d.** halving its velocity

8. A baseball and a ping pong ball are both shot from a slingshot with equal velocity. Which object has the greater kinetic energy?

a. the baseball **c.** The answer depends on the launch angle.

b. the ping pong ball **d.** The kinetic energies are equal.

9. A diver doing a somersault has a greater angular velocity in the _____.

a. tuck position **c.** The answer depends on the height of the diver.

b. fully extended position **d.** The velocities are equal.

10. How does the kinetic energy of a car traveling at 16 m/s compare with the kinetic energy of the same car traveling at 8 m/s?

a. It is 2 times greater. **c.** It is 8 times greater.

b. It is 4 times greater. **d.** It is 16 times greater.

11. How much work would have to be done on a truck with a kinetic energy of 2×10^4 J to reduce its kinetic energy by half?

a. 1×10^2 J **c.** 1×10^4 J

b. 4×10^4 J **d.** 2×10^2 J

12. A car has a kinetic energy of x J. 7.5 s later it moves in the opposite direction with the same speed. What kinetic energy does it have?

a. $-x$ J **c.** 0 J

b. x J **d.** $2x$ J

13. A car has a kinetic energy of x J. 7.5 s later it moves in the opposite direction with 3 times its initial speed. What kinetic energy does it have?

a. x J **c.** $9x$ J

b. $3x$ J **d.** $-x$ J

14. A 6 kg ball is traveling at 5 m/s. What is its kinetic energy?

a. 37.5 J **c.** 150 J

b. 75 J **d.** 300 J

15. If the velocity of the ball in question 16 doubles, its kinetic energy will be _____.

a. 37.5 J **c.** 150 J

b. 75 J **d.** 300 J

16. A ball of mass 0.5 kg has 100 J of kinetic energy. What is the velocity of the ball?

a. 20 m/s **c.** 100 m/s

b. 40 m/s **d.** 400 m/s

17. A ball traveling at 30 m/s has 900 J of kinetic energy. What is the mass of the ball?

a. 1 kg **c.** 9 kg

b. 2 kg **d.** 30 kg

In your textbook, read about stored energy and gravitational potential energy on pages 288–292.

For each statement below, write* true *or rewrite the italicized part to make the statement true.

18. ______________________ If a baseball is considered a system, work is done on it by *the pitcher's hand, gravity, and the bat*.

19. ______________________ After being hit by the bat, the work done by gravity on a ball that is rising is *mgh*.

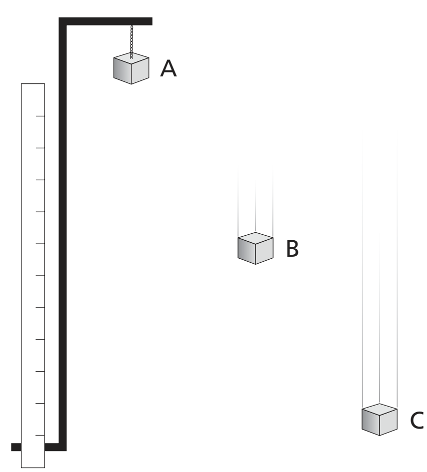
20. ______________________ On the way down, the work done by gravity on the ball *decreases* the ball's kinetic energy.

21. ______________________ If the height of the bat is considered the reference point, when the ball hits the ground, its gravitational potential energy is *less than* 0 J.

22. ______________________ If the Moon and Earth are considered a system, energy is stored in the system as *rotational energy*.

23. ______________________ The work that an archer does when pulling back on a bowstring is stored in the string as *gravitational* potential energy.

Use the diagram at right to answer questions 24–26.



24. The point at which the block has both kinetic and potential energy is _____.

a. A **b.** B **c.** C

25. The block has the maximum amount of kinetic energy at point _____.

a. A **b.** B **c.** C

26. At point A, the block has _____.

a. no energy

b. both kinetic and potential energy

c. only kinetic energy

d. only potential energy

Section 11.2 Conservation of Energy

In your textbook, read about conservation of mechanical energy on pages 293–295.

1. You are designing a skateboard park. The starting ramp is supposed to be 0.61 m high.

a. What would be the potential energy of a 63.5-kg skateboarder at the top of the starting ramp?

b. How could you change the ramp design so that a 63.5-kg skateboarder moves twice as fast at the bottom? For now, ignore air resistance and friction between the skateboard and ramp. Explain why this design change would work in terms of the conservation of mechanical Energy.

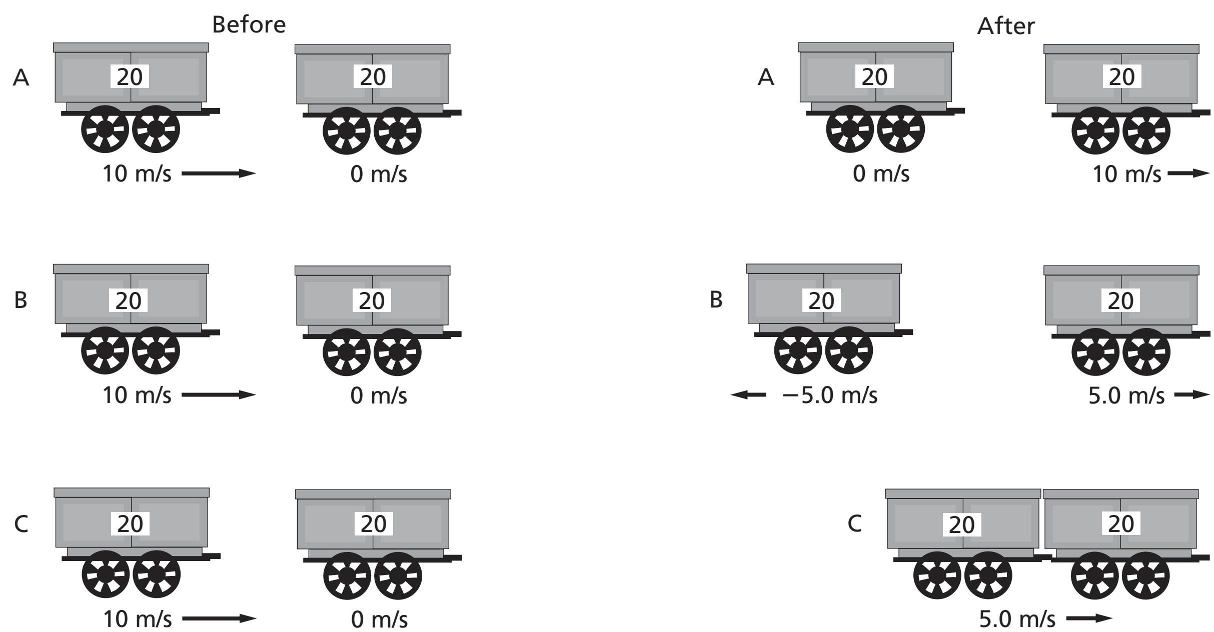
c. Assume that the same 63.5-kg skateboarder in part **b** falls off the side of the ramp. What is the kinetic energy of the skateboarder on the ground, at the bottom of the ramp.

2. Consider the ramp in problem 1. Explain why the skateboarder has the same final kinetic energy whether she falls off the side of the ramp, plummeting downward, or whether she rolls down the ramp. Draw a diagram.

3. What are some losses of mechanical energy? Give several examples.

In your textbook, read about analyzing collisions on pages 297–301.

The diagrams show the motion of two identical 20-kg carts before and after they collide. Use the diagrams to answer questions 4–7. Circle the letter of the choice that best answers the question.



4. In which collision(s) was momentum conserved?

a. only A

b. only B

c. A and C

d. A and B

5. In which collision(s) was energy conserved?

a. only A

b. only B

c. only C

d. A, B, and C

6. An inelastic collision occurs in which collision(s)?

a. A and B

b. B and C

c. only B

d. only C

7. In the inelastic collision(s), what happened that reduced the total mechanical energy of the system?

a. Some kinetic energy changed to elastic potential energy.

b. Some kinetic energy changed to gravitational potential energy.

c. Some kinetic energy changed to sound energy and thermal energy.

d. Some kinetic energy changed to chemcial energy.