CHAPTER 5 Highlights

KEY IDEAS

Section 1 Work

- Work is done on an object only when a net force acts on the object to displace it in the direction of a component of the net force.
- The amount of work done on an object by a force is equal to the component of the force along the direction of motion times the distance the object moves.

Section 2 Energy

- Objects in motion have kinetic energy because of their mass and speed.
- The net work done on or by an object is equal to the change in the kinetic energy of the object.
- Potential energy is energy associated with an object's position. Two forms of potential energy discussed in this chapter are gravitational potential energy and elastic potential energy.

Section 3 Conservation of Energy

- Energy can change form but can never be created or destroyed.
- Mechanical energy is the total kinetic and potential energy present in a given situation.
- In the absence of friction, mechanical energy is conserved, so the amount of mechanical energy remains constant.

Section 4 Power

- Power is the rate at which work is done or the rate of energy transfer.
- Machines with different power ratings do the same amount of work in different time intervals.

Variable Symbols

Quantities		Units		Conversions
W	work	J	joule	$= \text{N} \cdot \text{m}$ $= \text{kg} \cdot \text{m}^2/\text{s}^2$
KE	kinetic energy	J	joule	
PE_g	gravitational potential energy	J	joule	
$PE_{elastic}$	elastic potential energy	J	joule	
P	power	W	watt	$= \text{J/s}$

KEY TERMS

work (p. 160)

kinetic energy (p. 164)

work–kinetic energy theorem (p. 166)

potential energy (p. 169)

gravitational potential energy (p. 169)

elastic potential energy (p. 170)

spring constant (p. 170)

mechanical energy (p. 174)

power (p. 179)

PROBLEM SOLVING

See **Appendix D: Equations** for a summary of the equations introduced in this chapter. If you need more problem-solving practice, see **Appendix I: Additional Problems.**