

Work and Machines ▪ *Adapted Reading and Study***What Is Work?** (pages 108–113)**The Meaning of Work** (pages 108–109)

Key Concept: Work is done on an object when the object moves in the same direction in which the force is exerted.

- The word *work* has a different meaning in science than it does in everyday life. In science, **work** is when you exert a force that makes an object move in the same direction as the force.
- Work always makes an object move. If you push on a wall, the wall does not move. Even though you exert a force, there is no work done on the wall.
- The motion for work must be in the same direction as the force. If you carry books to school, the force you exert is upward. The motion of the books is toward school, so no work is done on the books.

Answer the following questions. Use your textbook and the ideas above.

1. Use the words *work* and *no work* to fill in the blanks in the table.

What Is Work?	
Example	Work or No Work?
You lift a box of newspapers.	a. _____
You hold a heavy piece of wood in one place.	b. _____
You pull your books out of your book bag.	c. _____

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2. Read each word in the box. In each sentence below, fill in one of the words.

move	force	work
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- a. Work always makes an object _____.
- b. For work to be done, the object's motion must be in the same direction as the _____.

Calculating Work (pages 110–111)

Key Concept: The amount of work done by an object can be determined by multiplying force times distance.

- The amount of work done on an object depends on two things: the amount of force and the distance the object moves due to the force.
- Work can be calculated using the formula:

$$\text{Work} = \text{Force} \times \text{Distance}$$

- It takes more work to move a heavy object than it does to move a light object. It takes more work to move an object a long distance than it does to move the object a short distance.
- The unit used to measure work is the **joule** (J).

Answer the following questions. Use your textbook and the ideas above.

3. What unit is used to measure work?

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4. Fill in the blanks in the table. Use this formula to find the amount of work: $\text{Work} = \text{Force} \times \text{Distance}$. Show your work in the space below.

Calculating Work		
Amount of Force	Distance the Object Moves	How Much Work Is Done?
2 N	3 m	6 joules
5 N	2 m	a. _____ joules
3 N	1 m	b. _____ joules

Power (pages 111–113)

Key Concept: Power equals the amount of work done on an object in a unit of time.

- **Power** is a rate that tells how much work is done in a certain amount of time.
- Power can be calculated using the formula:

$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

- It takes more power to do work quickly. It takes less power to do work slowly. For example, running up a flight of stairs takes more power than walking up the same stairs.
- The unit used to measure power is the watt (W).

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Answer the following questions. Use your textbook and the ideas on page 46.

5. Read the words in the box. Use the correct words to fill in the blanks in the formula.

Work	Time	Distance
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Power = $\frac{\text{a. _____}}{\text{_____}}$
b. _____

6. Circle the item in each pair that would take more power.

Which Takes More Power?		
Walking one block	OR	Biking one block
Raking leaves	OR	Using a leaf blower
Running up stairs	OR	Walking up stairs

7. Read each word in the box. In each sentence below, fill in one of the words.

watt	joule	work
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- a. The _____ is the unit used to measure power.
- b. Power equals work divided by _____.