

Chapter 4 Work and Machines

I. What is Work?

- A. Work is done on an object when the object moves in the same direction in which the force is exerted.
- B. The amount of work done on an object can be determined by multiplying force times distance.
 - a. $\text{Work} = \text{Force} \times \text{Distance}$
- C. Power equals the amount of work done on an object in a unit of time.
 - a. $\text{Power} = \text{Work} / \text{Time}$
- D. Work
- E. Joule
- F. Power

II. How Machines Do Work

- A. A machine makes work easier by changing at least one of three factors. A machine may change the amount of force you exert, the distance over which you exert your force, or the direction in which you exert your force.
- B. A machine's mechanical advantage is the number of times a machine increases a force exerted on it.
- C. $\text{Mechanical advantage} = \text{Output force} / \text{Input force}$
- D. To calculate the efficiency of a machine, divide the output work by the input work and multiply the result by 100 percent.
- E. $\text{Efficiency} = \text{Output work} / \text{Input work} \times 100\%$
- F. Machine
- G. Input force
- H. Output force
- I. Input work
- J. Output work
- K. Mechanical advantage
- L. Efficiency

III. Simple Machines

- A. There are six basic kinds of simple machines: the inclined plane, the wedge, the screw, the lever, the wheel and axle, and the pulley
- B. You can determine the ideal mechanical advantage of an inclined plane by dividing the length of the incline by its height.
- C. The ideal mechanical advantage of a wedge is determined by dividing the length of the wedge by its width.

- D. The ideal mechanical advantage of a screw is the length around the threads divided by the length of the screw.
- E. The ideal mechanical advantage of a lever is determined by dividing the distance from the fulcrum to the input force by the distance from the fulcrum to the output force.
- F. You can find the ideal mechanical advantage of a wheel and axle by dividing the radius of the wheel by the radius of the axle.
- G. The ideal mechanical advantage of a pulley is equal to the number of sections of rope that support the object.
- H. Most of the machines in your body are levers that consist of bones and muscles.
- I. The ideal mechanical advantage of a compound machine is the product of the individual ideal mechanical advantages of the simple machines that make it up.
- J. Inclined plane
- K. Wedge
- L. Screw
- M. Lever
- N. Fulcrum
- O. Wheel and axle
- P. Pulley
- Q. Compound machine