

**Note-taking  
Worksheet****Work and Machines****Section 1 Work**

- A. \_\_\_\_\_—transfer of energy that occurs when a force makes an object move
1. For work to occur, an object must \_\_\_\_\_.
  2. The motion of the object must be in the \_\_\_\_\_ as the applied force on the object.
- B. Work and energy are related, since energy is always \_\_\_\_\_ from the object doing the work to the object on which the work is done.
- C. Work is done on an object only when a \_\_\_\_\_ is being applied to the object and the object moves.
- D. Calculating work—work equals force (in newtons) times \_\_\_\_\_
- E. \_\_\_\_\_—amount of work done in a certain amount of time; rate at which work is done
1. \_\_\_\_\_—power equals work divided by time.
  2. Power is measured in \_\_\_\_\_ (W).
  3. Since work and energy are \_\_\_\_\_, power also can be calculated—power equals energy divided by time.

**Section 2 Using Machines**

- A. Device that makes doing work easier is a \_\_\_\_\_.
- B. Machines \_\_\_\_\_ applied force and/or \_\_\_\_\_ direction of applied force to make work easier.
1. Same amount of work can be done by applying a small force over a long distance as can be done applying a large force over a short distance, since work equals \_\_\_\_\_ times \_\_\_\_\_.
  2. Increasing \_\_\_\_\_ reduces the amount of force needed to do the work.
  3. Some machines change the \_\_\_\_\_ of the applied force to do the work.
- C. Machines help move things that \_\_\_\_\_ being moved.
1. Force applied to machine is \_\_\_\_\_.
  2. \_\_\_\_\_—force applied by machine to overcome resistance

**Note-taking Worksheet** (continued)

3. Amount of energy the machine transfers to the object cannot be \_\_\_\_\_ than the amount of energy transferred to the machine.
- Some energy transferred is changed to \_\_\_\_\_ due to friction.
  - An ideal machine with no \_\_\_\_\_ would have the same input work and output work.
- D. \_\_\_\_\_ (MA) is the number of times a machine multiplies the effort force. It is calculated by MA equals resistance force divided by effort force.
- E. \_\_\_\_\_—measure of how much of the work put into a machine is changed into useful output work by the machine
- \_\_\_\_\_ efficiency—efficiency equals (output work divided by input work) times 100%.
  - Efficiency of a machine is always \_\_\_\_\_ than 100%.
  - \_\_\_\_\_ can make machines more efficient by reducing friction.

**Section 3 Simple Machines**

- A. A machine that does work with only one movement is a \_\_\_\_\_.
- B. \_\_\_\_\_—bar that is free to pivot about a fixed point called the fulcrum
- \_\_\_\_\_ arm is part of the lever on which effort force is applied.
  - \_\_\_\_\_ arm is part of the lever that exerts the resistance force.
  - Three classes of levers based on \_\_\_\_\_ of effort force, resistance force, and fulcrum
    - \_\_\_\_\_ lever—fulcrum is located between the effort and resistance forces; multiplies and changes direction of force
    - \_\_\_\_\_ lever—resistance force is located between the effort force and fulcrum; always multiplies force
    - \_\_\_\_\_ lever—effort force is between the resistance force and fulcrum; doesn't multiply force but does increase distance over which force is applied
  - Calculating ideal mechanical advantage (IMA) of a lever—IMA equals length of \_\_\_\_\_ arm divided by length of resistance arm

**Note-taking Worksheet (continued)**

- C. Grooved wheel with a rope, simple chain, or cable running along the groove is a \_\_\_\_\_, which is a modified first-class lever.
1. A \_\_\_\_\_ pulley is attached to something that doesn't move; force is not multiplied but direction is changed;  $IMA = 1$ .
  2. A \_\_\_\_\_ pulley has one end of the rope fixed and the wheel free to move; multiplies force;  $IMA = 2$ .
  3. \_\_\_\_\_—system of pulleys consisting of fixed and movable pulleys;  $IMA = \text{number of ropes supporting resistance weight}$
- D. \_\_\_\_\_—machine with two wheels of different sizes rotating together; modified lever form
1.  $IMA = \text{radius of wheel}$  \_\_\_\_\_ by the radius of axle
  2. \_\_\_\_\_ are a modified form of the wheel and axle.
- E. \_\_\_\_\_—sloping surface that reduces the amount of force required to do work
1.  $IMA = \text{length of slope (effort distance)}$  \_\_\_\_\_ by height of slope (resistance distance)
  2. Less force is required if a ramp is longer and less steep.
- F. \_\_\_\_\_—inclined plane wrapped in a spiral around a cylindrical post
- G. Inclined plane with one or two sloping sides is a \_\_\_\_\_.
- H. \_\_\_\_\_—uses a combination of two or more simple machines