# Work and Energy Study Guide

Name _____

Period _____

**I. Work:** Force acting through a _____.

a. Equation: Unit:

b. No movement - _____ work! Movement must be in the _____ direction of applied force.

c. Calculate the amount of work to slide a 30 N box 5 m.

**II. Power:** Rate at which _____ is done or the amount of work done per unit of _____.

a. Equation: Unit:

b. A 850 N man vs. a 450 N man runs up a flight of stairs 3 m high in 5.0 seconds. How does the work and power compare between the two men?

**III. Mechanical Energy** is the total amount of _____ and _____ in a system.

a. The energy of an object enables it to do _____.

b. Energy is measured in _____.

c. The two most common forms of mechanical energy:

1. **Kinetic energy** – Energy in the form of _____.

   a. The amount of kinetic energy an object has depends on its _____ and its _____.

   b. Kinetic energy = ½ _____ x velocity$^2$

   c. If you double the mass, the kinetic energy _____. If you double the velocity, the kinetic energy would _____.

   d. Calculate the kinetic energy of a 55 kg person running with a speed of 9.0 m/s.

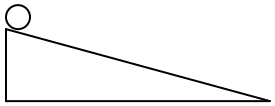
2. **Potential energy** – Energy due to _____.

   a. Potential energy – energy stored by things that are _____ the ground.

   b. The amount of PE an object has depends on its _____, the acceleration due to _____ and its _____. GPE = _____.

   c. A 50 kg woman climbs a flight of stairs 6.0 m high. How much gravitational potential energy does she possess when she gets to the top? How much work did she do?

d. Find the velocity of the object at the bottom.

10 m 

**IV. Conservation of Energy:** Energy cannot be _____ or _____.

a. Energy can be _____ from one form into another.

b. The _____ energy never changes in a system. Sketch a pendulum in various positions to represent the idea.

c. Equation:

**V. Machines:** A machine is a device used to _____forces or simply to change the _____ of forces.

a. The concept that underlies every machine is the _____ of energy.

b. 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 _____.

c. Increasing _____ reduces the amount of force needed to do the work.

d. Some machines change the _____ of the applied force to do the work.

e. 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** and _____ **output**.

f. **Mechanical Adavantage** (MA). The ratio of output _____ to input _____ for a machine. MA = _____. It's basically a measure of much it multiplies _____ force.

g. **Efficiency** (E). The ratio of useful work _____ to total work _____. Efficiency = _____.

h. A lever is used to lift a heavy load. When a 50 N force pushes one end of the lever down 1.2 m, the load rises 0.2 m. Draw it out and show your work!
   1. Calculate the weight of the load.
   2. What is IMA of the lever?

i. In raising a 5000 N piano 0.4 m with a pulley system, the workers exert 2000 N of force for every 2 m of rope pulled down.
   1. What is the actual mechanical advantage of the pulley system?
   2. What is the efficiency of the pulley system?