C4; Work, Power, Machines Conceptual Study Guide

The SI Unit for work and energy is Joules.

Work output is the work done by a machine on an object.

Work input is the work you do on a machine.

Mechanical efficiency compares the work output to the work input. Note in the real world this M.E. can never be equal to or greater than 100%, primarily due to friction.

The mathematical equation for mechanical efficiency is: M.E. = (W.O./W.I.) x 100

Mechanical advantage is essentially the number of times a machine multiplies force, also known as the ratio of force output to force input. M.A. = F.O./F.I.

Most machines, such ramps, make lifting heavy objects easier by allowing us to use a smaller force, but over a larger distance. Machines can also change the direction the force is applied.

Work = Force x distance

Power = Work/time

The SI unit of power is Watts

A lever is a machine with a bar that pivots on a fixed point. The fixed point is known as the fulcrum.

A wheel and axle is a machine with two circular devices of different size.

A compound machine is made of two or more simple machines.

Know how to identify the three types of levers: first-class, second-class, and third-class.

Name: _____   Section: _____

C4 KFS Study Guide

Please show all work: <u>fill in spaces</u> as indicated, show <u>equation</u> then <u>substitute</u> values, use correct <u>units</u>, and <u>label all variables</u>.

Useful information: **W = F x d; P = W/t; MA = F.O./F.I.; ME = (W.O./W.I.) x 100**

#1) Shrek lifts a <u>2000 N</u> donkey vertically a distance of <u>4 m</u>. Realize the force Shrek applies is equal to the weight of the donkey. Determine the <u>work</u> done by Shrek on the donkey.

K: _____   F: _____

_____

S:

Answer gets boxed here:

_____

#2) Thor does <u>1200 J</u> of work in a time of <u>3 seconds while throwing his hammer</u>. Determine the <u>power</u> exerted by Thor.

K: _____   F: _____

_____

S:

Answer gets boxed here:

_____

#3) The ancient Egyptians use a ramp (inclined plane) system with a mechanical advantage of 4 to lift a 2400 N capstone to the top of the pyramid. What force is needed by the Egyptians to push the stone up the incline? (Assume ideal frictionless ramp). If the stone is raised a vertical distance of 30 meters from ground level, how many meters must the Egyptians push the stone along the inclined plane?

Must show work, but KFS not needed:

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