LAB 12, POWER

Name _____ Period_____

A simple way to measure the power output of a person is to measure the time it takes the person to run up a flight of stairs of known height. In this experiment you will compare your power output with that of your classmates (and of your instructor). You will then convert these values into horsepower units.

When James Watt invented his steam engine, he was asked how many horses the engine could replace. To find out, Watt built a rope-and-pulley device with which he could measure the time it took a horse to lift various weights. Watt defined horsepower as the power a horse can produce steadily for a sustained period of time. The SI equivalent of one horsepower is 746 watts.

OBJECTIVE

After completing this experiment, you should have a better understanding of the watt as a unit of power and of the relationship between the watt and standard horsepower.

PROCEDURE

CAUTION: *Students who have medical conditions that exclude them from participation in sports or physical education classes should not be required to participate in the first part of this experiment.*

We shall attack *The Great Stairs* which are 5.0 meters high.

Use the bathroom scale to measure the mass of each student in kg.

Set the stopwatch at zero. Ask the first student to run up the stairs as fast as possible. The student should grasp the railing for safety as well as added power. Start the watch when both feet of the student have left the ground floor and stop the watch when both feet are on the top floor. Record the time.

Repeat the procedure for each participating student. Record all data.

CALCULATIONS

1. Using the equations of the notes or text, compute the power output in watts of each student listed in the data table. Record.

HINTS: w = fd, where w is work in joules, f is force in newtons, and d is distance in meters.
p = w/s, where p is power in watts, w is work in joules, and s is time in seconds.

2. Convert the wattage of each participant into horsepower equivalents.
HINT: hp = watts/746watts/hp.

QUESTIONS (answer on the back):

1. What is the relationship between the horsepower of the participants in this experiment and Watt's definition of horsepower?

2. List several possible sources of error in this experiment.

3. How does this experiment illustrate the relationship between force and distance in the power equation?

DATA AND CALCULATIONS TABLE... ***Lord Apple will select the order of students.***

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