

Measuring Power

Overview: Today you'll measure power and have some handy tools to be able to record and interpret data. We use the same materials as last lesson, but introduce an important concept: that of power. **Power** is work done over time and is measured in watts, which is a Joule per second.

What to Learn: You'll be able to have hands-on experience and understand a working definition of energy, work, and power.

Materials

- Meter or yard stick
- A stopwatch or timer
- Object

Lab Time

1. Grab your 100-gram object and put it on a table.
2. Now lift it off the table straight up until you lift it one meter (one yard).
3. Start the timer and at the same time start lifting the object up and down 20 times.
4. Stop the timer when you're done with the 20 lifts.
5. So, do you have the power of the Dodge Viper? Hmmm, probably not, but let's take a look.
6. First of all, figure out how much work you did. Work = force x distance, so take the force you used and multiply that by the distance you moved it. In this case, you can multiply 1 Newton x 20 meters and get 20 Joules of work.
7. Now figure out how much power you used. Power is work divided by time so take your work (20 Joules) and divide it by how much time it took you to do that work. For example, if you lifted the block 20 times (doing 20 Joules of work) in 5 seconds, you did 20 Joules/5 seconds = 4 Watts of power. To convert Watts to horsepower we multiply by .001 so in this example, you did $4 \times .001 = .004$ horsepower.
8. Show your calculations in the worksheet below.

Measuring Power Calculations

1. How much work did you do? Show your work. (No pun intended!)

2. How much power did you use? Show your work.

Exercises Answer the questions below:

1. What is work?
 - a. Force divided by distance
 - b. Force times distance
 - c. Energy required for power
 - d. Kinetic and potential energy
2. What is power?
 - a. Work divided by time
 - b. Work multiplied by time
 - c. Energy used in an exercise
 - d. Calories over time
3. How do we measure work? Name one unit.

4. How do we measure power? Name one unit.

Answers to Exercises: Measuring Power

1. What is work? (force times distance)
2. What is power? (work over time)
3. How do we measure work? Name one unit. (Joule, calorie)
4. How do we measure power? Name one unit. (Watt, horsepower)