Activity: Human Power

Purpose

Work and power are important concepts that deal with energy. Work is a force over a given distance and power is the amount of work done in an amount of time. The goal of this experiment is to get familiar with these concepts.

Equipment

1. scale
2. stopwatch
3. large bottle filled with water
4. meter stick
5. pole
6. rope

Procedure

Set up the experiment:

1. Split into groups of 3-4 students.
2. Collect all equipment and materials necessary to conduct the activity.
3. Attach one end of the rope to the bottle and the other end to the middle of the pole.
4. Measure the distance of the rope from the pole to the bottle and record it on the space given (meters, m).

Do work and collect data

5. Have each person stand on a chair and hold the pole horizontally so that the bottle is suspended. Twist the pole so the rope winds around it, lifting the bottle. Time how fast each person can wind the rope to bring the bottle all the way up to the pole. Record your data (in seconds).
6. Repeat so that each student has 3 tries, and record each time.
7. Using the given mass for your bottle, calculate Force by using:

   Force (N) = mass (kg) x acceleration (m/ s^2)

   Mass, m = given (kg)

   Acceleration due to gravity, a = 9.81 m/ s^2

   Record the force on the worksheet.

8. Use the worksheet to calculate average time for each person, work, power in watts and horsepower (remember that 1 hp = 746 watts).

Discussion Questions:

1. What is power?

2. What does it mean if one person has a higher value for power?

3. How many of you would it take to light a 60 Watt light bulb?

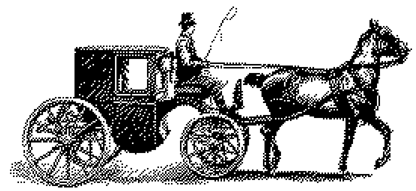
60 Watts ÷ Your Power (from the table) = _________ “your name”power

60 Watts ÷ ________Watts = _________ “________ “ power

4. How does your person power compare to the horsepower in a car (Use an estimated horsepower of 166)?

NAME : ____________________________ DATE: ___________

$W = F \times d$



$P = W / t$

PERSON	MASS, m (kg)	FORCE (N) (F=m x a) (a= 9.81m/s^2)	DISTANCE (m)	TIME (sec)	AVERAGE TIME (sec)	WORK (Joule, J) = force x distance	POWER (Watts, W) = work ÷ avg time	HORSEPOWER (hp) = Watts ÷ 746
				1.				
				2.				
				3.				
				1.				
				2.				
				3.				
				1.				
				2.				
				3.				