Name _____ Class _____ Period _____

Muscle Up

Lab 8.1

Purpose

To determine the power that can be produced by various muscles of the human body.

Required Equipment

- Meter stick
- Stop watch

Discussion

Power is usually associated with mechanical engines or electrical motors. Many other devices also consume power to make light or heat. A lighted incandescent bulb may dissipate 100 watts of power. The human body also dissipates power as it converts the energy of food to heat. The human body is subject to the same laws of physics that govern mechanical and electrical devices.

The different muscle groups of the body are capable of producing forces that can act through distances. Work is the product of the force and the distance, but only if they both act in the same direction. When a person runs up stairs, the force lifted is the person's weight, and the distance is the vertical distance moved—not the distance along the stairs. If the time it takes to do work is measured, the power output of the body, which is the work divided by the time, can be determined in watts.

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Getting Started

You will need your metric mass and weight in this activity so start by finding calculating your mass and weight in kilograms and newtons.

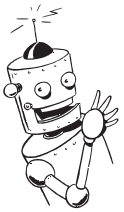
1. A metric kilogram is equal to 2.2 pounds. Using the formula bellow, convert your mass from pounds to kilograms.

$$\text{Your Mass (kg)} = \frac{\text{Your Weight (lbs)}}{2.2\ \text{lbs/kg}}$$

Your Mass: _____ kg

2. Using your mass and the formula for weight, calculate your weight in newtons.

$$w = mg$$



Your Weight: _____ N

Data Table A (stair climb)

Name	Force (N)	Distance (m)	Work (J)	Time (s)				Power (watt)
				trial #1	trial #2	trial #3	Ave Time	

Stair Climb

In this part of the activity you will be timing yourself as you run up a flight of stairs. The work you do will be to change your potential energy. The rate at which you do that work is your power output.

3. In data table A, record you weight in newtons in the *force* box.
4. Measure the height of the stairs from top to bottom and record in the *Distance* box of data table A .
5. Calculate the amount of work you do going from the bottom of the stairs to the top using the work formula bellow.

$$Work = Fd$$

Show your work:

6. Have another group member time you as you go up the flight of stairs. Repeat three times and record the results in data table A.
7. Calculate your power output and record in data table A.

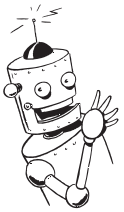
$$P = \frac{Work}{t_{ave}}$$

Show your work:

8. Convert your power into the English version called horse power (hp). One hp is equal to 746 watt.

$$P_{hp} = \frac{P_{watt}}{746}$$

Show your work:



Horse power: _____ hp

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Data Table B (curling)

Name	Force (N)	Distance (m)	Work (J)	Time (s)			Power (watt)
				total	one rep	up only	

Curling

In this part of the activity you will be curling a mass 10 times. The work you do to the mass will be changing it's potential energy by lifting it up. The rate at which you do the work is your power output.

9. Calculate the weight of the mass you will be curling in newtons and record in data table B in the force box. One pound equals 4.448 newtons.

$$w_{newtons} = w_{pounds} \times (4.448)$$

10. Holding the mass by your side and have someone measure it's displacement as you curl it one time. Record the displacement as the *Distance* in data table B.

11. Calculate the amount of work done by lifting the mass one time using the work formula and record in the *Work* box of data table B.

$$Work = Fd$$

Show your work:

12. Time how long it takes to curl the mass 10 time and record as the *Total Time* in the table B.

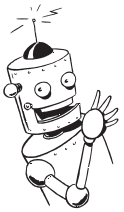
13. Divide the *Total Time* by 10 in order to calculate how long it takes to perform one complete repetition (up and down) and record in table B as *Time of One Rep*.

14. Divide the *Time of One Rep* by 2 in order to calculate the *Time Up Only* and recorder in table B.

15. Calculate your power output and record in data table B.

$$P = \frac{Work}{t_{up\ only}}$$

Show your work:



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