



Name: \_\_\_\_\_

# Work and Power Lab

*How Fast Can You Do Work?*

**Purpose:** In this activity, we will experience the concepts of Work and Power using simple classroom materials. Please complete the following activity in your group.

**Supplies needed include:**

- |                   |                        |
|-------------------|------------------------|
| 1) Spring Scale   | 2) Triple Beam Balance |
| 3) Object to lift | 4) Meter Stick         |
| 5) Stopwatch      | 6) Calculator          |

**Define** the following, **include the equation** used to calculate the term if it applies.

- 1) **Work:** \_\_\_\_\_
- 2) **Power:** \_\_\_\_\_
- 3) **Newton:** \_\_\_\_\_
- 4) **Joule:** \_\_\_\_\_
- 5) **Watts:** \_\_\_\_\_

## Part 1

**Let the FORCE Be With You...**



### Measure Force

- 1) Select an object (wood block, etc.) that has a mass that provides a readable measurement when you use the spring scale.
- 2) Determine the mass of the object using a triple beam balance: \_\_\_\_\_ g
- 3) Convert the mass of the object to kilograms. \_\_\_\_\_ kg
- 4) Use the Spring Scale to "lift" the object. Determine how many Newtons your object weighs.  N

### Calculate Force

- 5) Calculate the Force (weight) of the object using Newtons' 2<sup>nd</sup> Law:

**Force = mass x acceleration of gravity**

Force (weight) = \_\_\_\_\_ kg x \_\_\_\_\_ m/s<sup>2</sup> =  N

- 6) Compare your measured Force (see #4) with the calculated Force (#5). Analyze any similarities or differences you see. \_\_\_\_\_

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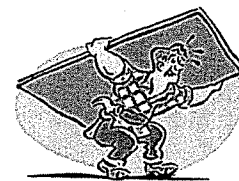
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## Part 2

### How Fast Can You Do Work?



**Procedure:** Calculate the work and power that you can do with your arms and legs.

#### ARMS

- 1) Attach a mass to the end of a string.
- 2) Measure the distance from the hanging mass to the top of the string.
- 3) Time how quickly you can raise the mass by rolling the string onto the dowel rod lifting the mass as you twist your hands.
- 4) Record the mass of the object that was lifted.
- 5) Calculate the work and power that was produced from this activity and record your data in the table below.

#### LEGS

- 1) Determine the vertical distance in meters from the first floor to the second floor. To do this, measure the height of each step and count the number of steps between the first and second floor.
- 2) With a stopwatch, see how quickly you can get from the first floor to the second floor.
- 3) Record your weight (kilograms) and time (seconds) the data table below.
- 4) Calculate the work and power that was produced from this activity and record your data in the table below.

Muscle Group	Mass of Obj.(kg)	Distance (m)	Force (N)	Time (s)	Work (J)	Power (W)	Horse-power
ARMS							
LEGS							

**ANALYSIS QUESTIONS:** On a separate sheet of paper, answer the following questions using complete sentences.

- 1) Which activity required the most work? Explain this using the two variables that affect work.
- 2) Which activity produced the most power? Explain why.
- 3) If you wanted to produce more power, what could you do to maximize power?
- 4) Would you be doing any more work by going up the stairs twice as fast? Explain.
- 5) This lab should have led you to a point of better understanding of work and power. It is now your chance to pull it all together by writing a **well written, thoughtful paragraph** . It should **make logical sense** and include all of the following terms.

Work	Power	Joule	Newton meter
Kgm/s <sup>2</sup>	Joule / second	kg m <sup>2</sup> /s <sup>2</sup>	Horsepower
Force	Distance	Time	Watts