

# Physics

## Very Little Work

### Purpose & Hypothesis

This lab examines how pulleys convert work done pulling in one direction into work done pulling in some other direction. First, investigate the apparatus **without touching any part of it**. Note the amount of mass hanging from each side of each pulley system. As you will see, although the masses on each side of a station may be different, each station is balanced by its pulley system. Use what you know about work to **predict** how far each mass will move as one is raised and the other is lowered, **WITHOUT TOUCHING ANY PART OF THE APPARATUS**. Fill in the following blanks with your predictions:

**Station 1:** The \_\_\_\_\_ g mass will move \_\_\_\_\_ times as far as the \_\_\_\_\_ g mass.

**Station 2:** The \_\_\_\_\_ g mass will move \_\_\_\_\_ times as far as the \_\_\_\_\_ g mass.

**Station 3:** The \_\_\_\_\_ g mass will move \_\_\_\_\_ times as far as the \_\_\_\_\_ g mass.

### Procedure

1. Choose **ONE** person, the **Mass Raiser**, who (with the hands of a surgeon) will be responsible for raising and lowering the masses. **This is the only person who is allowed to touch the apparatus**, which is **extremely delicate!** If anyone in your group messes up the apparatus (or if your group does not finish before your time is up), then the entire group will forfeit its lunch break to try again while I manipulate the pulleys for you.
2. Choose another person, the **Height Measurer**, who will be responsible for measuring (with the meter stick) how high each mass can be raised above the base.
3. Choose a third person, the **Data Recorder**, to record the data in the tables **on the back side of this sheet** while the first two conduct the experiment.
4. The Mass Raiser should **CAREFULLY** raise the left-hand mass of Station 1 until the right-hand mass reaches the base. The Height Measurer should measure the distance between the **bottom** of the left-hand mass and the base (to the nearest mm), and the Data Recorder should record the **Mass value (g)** and the **Max height (cm)** in the first two columns of the table.
5. The Mass Raiser should **CAREFULLY** raise the right-hand mass of Station 1 until the left-hand mass reaches the base. The Height Measurer should measure the distance between the **bottom** of the right-hand mass and the base (to the nearest mm), and the Data Recorder should record the **Mass value (g)** and the **Max height (cm)** in the first two columns of the table.
6. Repeat steps 4 and 5 for Station 2.
7. Repeat steps 4 and 5 for Station 3.
8. All group members should return to their assigned seats **immediately** before somebody messes up the apparatus.

## Analysis and conclusions

1. Each group member should copy the first two columns of data in the tables from the Data Recorder.
2. Complete the other columns in the table by converting grams to kilograms, centimeters to meters, and then using the formula from your notes to compute the gravitational potential energy (GPE).
3. Compare the two mass GPEs in each station. Explain how each pulley system trades force for distance, referring to the predictions you made at the beginning of the experiment.

## Data Tables

### Station 1

Mass value (g)	Max height (cm)	Mass (kg)	Max height (meters)	GPE (joules)

### Station 2

Mass value (g)	Max height (cm)	Mass (kg)	Max height (meters)	GPE (joules)

### Station 3

Mass value (g)	Max height (cm)	Mass (kg)	Max height (meters)	GPE (joules)