Name: ______________________________ Period:____________________________

Investigation 8b: Efficiency and Power (50 pts)

Simple machines such as ropes and pulleys and levers can create large output forces from small input forces. In this investigation, you will explore the nature of work.

FOLLOW THESE DIRECTIONS CAREFULLY AND IN ORDER!

1. I have already set-up the pulley for you with four weights attached. Take the spring scale to measure the weight of the block in Newtons. This is the “Output Force” that you can record in Table 1, column 5.
2. Clip the end of the yellow string to the bottom block. Pass the string over the middle pulley if the top block.
3. Use the plastic black cord to mark where the string leaves the top pulley.
4. Lift the bottom block to the colored tape by pulling the string. This height is .2 meters, which you can record in Column 2 in Table 1.
5. With a ruler, measure the length of the string from the black cord to the top of the pulley (while pulling the block to the colored tape). Record this in Row 1 in Column 3.
6. Now use the spring scale to measure how many Newtons it takes to lift the block up to the tape and record in row 1, column 4. This is the input force.
7. Unclip the string from the bottom block, and clip it onto the underside of the top block. Pass the string around the middle pulley on the bottom block, and loop is up over the middle pulley of the top block. Pull the string to lift the block up to the tape.
8. Measure the length of string and force in the same manner you did before and record in row 2 of Table 1.
9. Rearrange the yellow string so that is passes over 3, 4, 5, and then all 6. Each time record the length of the string and force in Newtons .

1	2	3	4	5	6	7
# of Pulleys	**Height (m)**	**String Length (m)**	**Input Force (N)**	**Output Force (weight of block) (N)**	**Work done on block (work output) (J)**	**Work done by you (work input) (J)**
1	.2					
2	.2					
3	.2					
4	.2					
5	.2					
6	.2					

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10. Calculate the work done on the block. This is equal to the output force times the height. The work done on the block should technically be the same for all configurations of the strings because the weight of the block and the height it was lifted did not change!
11. Next, calculate the work you did as you pulled the string. To do this multiply the input force by the string length.
12. As the number of supporting strings increased, what happened to the input force needed to lift the block?

    ____
    ____
    ____
    ____
13. As the number of supporting strings increased, what happened to the length of string that was pulled to raise the block?

    ____
    ____
    ____
    ____
14. As the number of supporting strings increased, what happened to the amount of work you had to do (input force) to lift the block?

    ____
    ____
    ____
    ____
15. Write the equation for work:

    ____
16. Write the equation for power:

    ____

Next Class will be your test! Finish any make-up work you have<u>! Anything turned in after the test is considered LATE and marked off 50%</u>!!!! The assignments that have a grade for Chapters 7 & 8 are:

1. Chapter 7 reading guide (20 points)
2. Chapter 7 worksheet (20 points)
3. Chapter 7 lab (50 points)
4. Chapter 8 reading guide (20 points)
5. Chapter 8 worksheet (20 points)
6. Chapter 8 lab (this) (50 points)

And the test (50 points)

For a total of 230 points for this unit

<u>There is a review for the test on my website! If you make over an 85% on the test (uncurved) you can drop your lowest grade from this unit</u>