Name: _____ Date:_____

Mr. Croom's Physics Chapter 5: Work and Energy

Power 1

Solve the following problems.

UNITS UNITS UNITS!!!

Unit of Work : Newton × meter = Joule (J)

Unit of Power: Joule ÷ second = Watt (W)

Unit of Energy: $kg \times m/s^2 \times m$ = Joule (J)

1. A machine does 600J of work in 15 seconds on a widget, how much power does the machine use?

2. A person uses 300W to for 20 seconds. How much work did the person do?

3. A car exerts 2.5×10^3W while working 6000J. How long did the work?

4. A person exerts 600N of force to lift a set of weights .75m, 10 times in 30 seconds. How much power does the person have? If they do it in 25 seconds, how much power do they have?

5. (Walker, p. 195 #35) What is the average power needed to accelerate a 950-kg car from 0 to 65 mi/h in 6.0 seconds? Assume that all forms of frictional losses can be ignored.

6. (Serway, p. 181, #4) How long does it take a 19kW steam engine to do 6.8×10^7 J of work?

7. (Walker, p. 195 #36) A record was set for stair climbing when a man ran up the 1600 steps of the Empire State Building in 10 minutes and 59 seconds. If the height gain of each step was 0.20 m, and the man's mass was 70.0 kg, what was his average power output during the climb? Give your answer in both watts and horsepower. (1 hp = 746 watts)

8. (Walker, p. 195 #37) How many joules are in a kilowatt-hour? (A kilowatt-hour is used for your electric bills. It is not a measure of power, but a measure of energy. It represents 1000 watts * 3600 seconds. Check the units)

9. (Walker, p. 195 #38) Calculate the power output of a 1.3-g fly as it walks straight up a window pane at 2.5 cm/s.

10. (Walker, p. 195 #39) An ice cube is placed in a microwave oven. Suppose the oven delivers 105 W of power to the ice cube and that it takes 32,200 J to melt it. How long does it take for the ice cube to melt?

11. (Walker, p. 195 #40) You raise a bucket of water from the bottom of a deep well. If your power output is 108 W, and the mass of the bucket and the water in it is 5.00 kg, with what speed can you raise the bucket? Ignore the weight of the rope.

12. (Walker, p. 195 #41) In order to keep a leaking ship from sinking, it is necessary to pump 12.0 lb of water each second from below deck up a height of 2.00 m and over the side. What is the minimum horsepower motor that can be used to save the ship?

13. (Walker, p. 195 #42) A kayaker paddles with a power output of 50.0 W to maintain a steady speed of 1.50 m/s. **(a)** Calculate the resistive force exerted by the water on the kayak. **(b)** If the kayaker doubles her power output, and the resistive force due to the water remains the same, by what factor does the kayaker's speed change?

14. (Giancoli, p. 177, #60) What is the horsepower rating of a 100W light bulb?