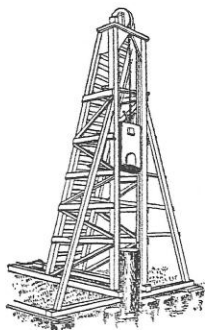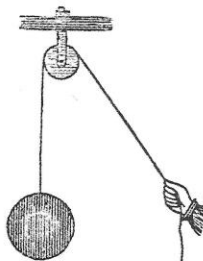Name _____ Date _____ Period _____

Answer the following questions about Power on a separate sheet of paper.

1. A box weighs 1.00×10^3 N is lifted a distance of 20 m straight up by a rope and pulley system. The work is done in 10.0 seconds. What is the power developed in watts and in kilowatts?

$$P = \frac{Fd}{t} = \frac{(1000N)(20m)}{10s} = 2000W$$
$$2 \, KW$$

2. A diesel engine lifts a 2.25×10^3 N hammer of a pile driver 20.0 m in 5.00 seconds. What is the power of the engine in kilowatts?

$$P = \frac{Fd}{t} = \frac{(2.25 \times 10^3 N)(20.0m)}{5.00s} = 9000W = 9kW$$

3. A rock climber wears a 12.0 kg knapsack while scaling a cliff. After 30.0 minutes, the climber is 8.2 m above his starting point.
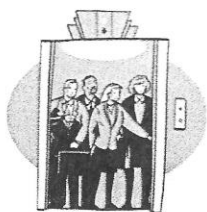
  a. How much work in joules is done on the knapsack?

$$W = Fd = (12kg)(9.8m/s^2)(8.2m) = 964J$$

  b. If the climber weighs 6.00×10^2 N, how much total work is done?

$$W = Fd = (12 + 600.N)(9.8m/s^2)(8.2m) = 5884J$$

  c. During the 30.0 minutes, what is the climber's average power in kilowatts?

$$P = \frac{Fd}{t} = \frac{(12 + 600.N)(9.8m/s^2)(8.2m)}{30.0 \, min \cdot \frac{60sec}{1min}} = 3.27W = 3.27 \times 10^{-3} kW$$

4. An electric motor develops kilowatts of power as it lifts a loaded elevator 18.0 m in 40.0 seconds. How much force does the motor deliver?

$$P = \frac{Fd}{t}$$
$$F = \frac{Pt}{d} = \frac{(65000W)(40.0s)}{18.0m} = 1.45 \times 10^5 N$$

5. A gardener applies a force of 150 N to push a wheelbarrow 60.0 m at a constant speed for 20.0 seconds.

  a. What is the gardener's power in watts?

$$P = \frac{Fd}{t} = \frac{(150N)(60m)}{20s} = 450W$$

  b. What is the gardener's power if the speed is doubled?

$$P = \frac{Fd}{t} = \frac{(150N)(60m)}{10sec} = 900W$$