

Name _____
 Regents Physics

Mr. Mellon

Unit 7: Work, Power, and Con. of Energy

Work Packet

Work and Power

- 1) A girl weighing 500. N takes 50. s to climb a flight of stairs 18 m high. What is her vertical power output?

$F = 500. \text{ N}$
 $t = 50. \text{ s}$
 $d = 18 \text{ m}$
 $P = ?$

$$P = \frac{Fd}{t} = \frac{(500. \text{ N})(18 \text{ m})}{50. \text{ s}} = \boxed{180 \text{ W}}$$

- 2) A 500. N girl lifts a 2.00 kg box vertically upward a distance of 0.50 m. Determine the work done on the box.

$F_g = 500. \text{ N}$
 (Girl)
 $m = 2.00 \text{ kg}$
 box
 $d = 0.50 \text{ m}$
 $W = ?$
 box

$$W = Fd = (19.62 \text{ N})(0.50 \text{ m}) = \boxed{9.81 \text{ J}}$$

$F = F_g = mg = (2.00 \text{ kg})(9.81 \text{ m/s}^2) = 19.62 \text{ N}$
 (USE WEIGHT OF BOX)

- 3) What is the maximum height to which a 1,250 W motor could lift an object weighing 200. N in 4.0 s?

$P = 1,250 \text{ W}$
 $F_g = 200. \text{ N}$
 $t = 4.0 \text{ s}$
 $h = ?$

$$P = \frac{Fd}{t} \rightarrow d = \frac{Pt}{F} = \frac{(1250 \text{ W})(4.0 \text{ s})}{200. \text{ N}} = \boxed{25 \text{ m}}$$

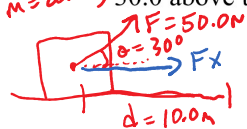
- 4) What is the average rate of work developed by a motor as it lifts a 400. kg mass at a constant speed through a vertical distance of 10.0 m in 8.0 s?

$m = 400. \text{ kg}$
 $d = 10.0 \text{ m}$
 $t = 8.0 \text{ s}$
 $P = ?$

$P = ?$

$F = F_g = mg = (400. \text{ kg})(9.81 \text{ m/s}^2) = 3924 \text{ N}$
 $P = \frac{Fd}{t} \rightarrow \frac{(3924 \text{ N})(10.0 \text{ m})}{(8.0 \text{ s})} = \boxed{4905 \text{ W}}$
 $\rightarrow 4900 \text{ W}$

- 5) A 20.0 kg box is pulled a distance of 10.0 m on a level floor by a 50.0 N force acting at an angle of 30.0° above the horizontal. Determine the amount of work done.



$W = ?$

$$W = F \cos \theta d = (50.0 \text{ N})(\cos 30.0^\circ)(10.0 \text{ m})$$

$$\boxed{W = 433 \text{ J}}$$

- 6) At what constant speed can a 2,000 W motor working at full capacity vertically lift a 400. N weight?

$P = 2,000 \text{ W}$
 $F = 400. \text{ N}$
 $\bar{v} = ?$

$$P = F\bar{v} \rightarrow \bar{v} = \frac{P}{F} = \frac{2000 \text{ W}}{400. \text{ N}} = \boxed{5 \text{ m/s}}$$

- 7) Determine the time it takes a 1,500 W motor to lift a 20.0 kg mass a distance of 10.0 m.

$P = 1500 \text{ W}$
 $m = 20.0 \text{ kg}$
 $d = 10.0 \text{ m}$
 $t = ?$

$$P = \frac{Fd}{t} \rightarrow t = \frac{Fd}{P} = \frac{(196.2 \text{ N})(10.0 \text{ m})}{1500 \text{ W}} = \boxed{1.3 \text{ s}}$$

$$F = F_g = mg = (20.0 \text{ kg})(9.81 \text{ m/s}^2) = 196.2 \text{ N}$$