

Physical Science Chapter 5 Work & Simple Machines

Key

Wkst - Power Worksheet

1. What is the formula used to calculate power?

$$\text{Power} = \frac{\text{work}}{\text{time}}$$

2. The metric unit for power is the watts.

3. A horse performs 15000 joules of work pulling a wagon for 20 seconds. What is the horse's power?

Given:

$$P = ?$$

$$W = 15000 \text{ J}$$

$$t = 20 \text{ sec}$$

Soln:

$$P = \frac{W}{T} = \frac{15000 \text{ J}}{20 \text{ sec}}$$

$$P = 750 \text{ W}$$

4. A student who weighs 500 Newtons climbed the stairs from the first floor to the third floor, 15 meters above, in 20 seconds.

a. How much work did she do?

Given:

$$W = ?$$

$$F = 500 \text{ N}$$

$$d = 15 \text{ m}$$

Soln:

$$W = Fd$$

$$W = (500 \text{ N})(15 \text{ m})$$

$$W = 7500 \text{ J}$$

b. What was her power?

Given:

$$P = ?$$

$$W = 7500 \text{ J}$$

$$t = 20 \text{ sec}$$

Soln:

$$P = \frac{W}{T}$$

$$P = \frac{7500 \text{ J}}{20 \text{ sec}}$$

$$P = 375 \text{ W}$$

5. A box is pushed across the floor for a distance of 5 meters with a force of 50 Newtons in 5 seconds.

a. How work is done?

Given:

$$W = ?$$

$$F = 50 \text{ N}$$

$$d = 5 \text{ m}$$

Soln:

$$W = Fd$$

$$= (50 \text{ N})(5 \text{ m})$$

$$W = 250 \text{ J}$$

b. What is the power?

Given:

$$P = ?$$

$$W = 250 \text{ J}$$

$$t = 5 \text{ sec}$$

Soln:

$$P = \frac{W}{T}$$

$$= \frac{250 \text{ J}}{5 \text{ sec}}$$

$$P = 50 \text{ W}$$

6. If it takes 50 seconds to lift 10 Newtons of books to a height of 7 meters, calculate the power required.

Given:

$$P = ?$$

$$W = ? \quad F = 10 \text{ N}$$

$$t = 50 \text{ sec}$$

$$d = 7 \text{ m}$$

Soln:

$$F = d \text{ w } 1 \text{ st}$$

$$W = Fd$$

$$= (10 \text{ N})(7 \text{ m})$$

$$W = 70 \text{ J}$$

$$P = \frac{W}{T}$$

$$= \frac{70 \text{ J}}{50 \text{ sec}}$$

$$P = 1.4 \text{ W}$$

7. The power rating of an electric lawn mower is 2000 watts. If the lawn mower is used for 120 seconds, how many joules of work can it do?

Given:
 $P = 2000\text{W}$
 $W = ?$
 $T = 120\text{sec}$

Soln.: $P = \frac{W}{T}$
 $W = PT$
 $W = (2000\text{W})(120\text{s})$
 $W = 240,000\text{J}$

8. A 750-watt hairdryer is used for 60 seconds. How many joules of energy are used?

Given:
 $P = 750\text{Watt}$
 $W = ?$
 $T = 60\text{s}$

Soln.: $P = \frac{W}{T}$
 $W = PT$
 $= (750\text{W})(60\text{s})$
 $W = 45,000\text{J}$

↑ Another name for Work!

9. A 500 N passenger is inside a 24500 N elevator that rises 30 m in exactly 1 minute. How much power is need for the elevator's trip?

Given:
 $F_1 = 500\text{N Passenger}$
 $F_2 = 24500\text{N Elevator}$
 $D = 30\text{m}$
 $t = 1\text{min} = 60\text{sec}$

$P = ?$

Soln.: $P = \frac{W}{T}$

Need W

$W = F \cdot d$

$= (500\text{N} + 24500\text{N})(30\text{m})$

$W = 750,000\text{J}$

$P = \frac{W}{T}$
 $= \frac{750,000\text{J}}{60\text{s}}$

$P = 12,500\text{Watts}$

10. Josh and Jake are both helping to build a brick wall which is 6 meters in height. They each lay 250 bricks but Josh finishes this task in 3 hours while Jake requires 4.5 hours to complete his part. Who does more work, or do they both do the same amount? Who has more power? Explain!

Work of laying 250 Bricks is the same, time is
 Not a factor in work

Josh uses more power Because he does the
 work faster