

Power & Ohm's Law

Concepts

1. What is the definition of power? (This was back in December!)

Power =

Units of Power =

2. If a hot plate uses 10000 J of energy in 5 seconds, what is the power of the hot plate?
3. A pump has a power of 1500 W. That means it can do _____ J of work every second. How much work would it do in one minute?
4. A 75 W light bulb is on for 15 seconds. How much energy does it use?
5. A 60 W light bulb is on for one hour. How much energy does it use?
6. For electrical circuits, what is the equation that relates power, voltage and current? Also show how the units all work out correctly.

Problems

7. A 75 W light bulb is in a 120 V outlet.
- What is the current drawn by the light bulb?
 - What is the resistance of the light bulb?
 - How many electrons would pass through the light bulb in one hour?
8. There is a current of 3 amps passing through a 25 Ω resistor.
- What is the potential difference across the resistor?
 - What power is dissipated by the resistor?
 - How much energy is dissipated by the resistor in 30 minutes?
9. A hair dryer is plugged into a 120 V outlet and draws 4 amps of current.
- What is the power of the hair dryer?
 - What is the resistance of the hair dryer?

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10. There is a current of 2 A flowing through a 2700 Ω resistor.
- What is the voltage across the resistor?
 - What is the power rating of the resistor?
 - How much energy is dissipated at the resistor in 1 second?
 - How much energy is dissipated at the resistor in 1 minute?
11. A hair dryer has two settings: 600 W and 1200 W. (Household voltage is 120 V)
- Calculate the current draw for both settings.
 - At which setting do you expect the resistance to be higher? Why?
 - Calculate the resistance at each setting. (Household voltage is 120 V.)
12. What is the resistance and current through a 60 W light bulb if it is connected to its proper source voltage of 120 V?
13. You buy a 60 W light bulb in Europe, where electricity is delivered to homes at 240 V.
- If you use the bulb in Europe, what is the current through the light bulb?
 - What is the resistance of the bulb?
14. A freezer of resistance 10 Ω is connected to a 110 V source.
- What is the current?
 - What is the power delivered to the freezer?

Answers: 7.a) 0.63 A b) 192 Ω c) 1.42×10^{22} 8.a) 75 V b) 225 W c) 405,000 J
 9.a) 480 W b) 30 Ω 10. a) 5400 V b) 10,800 W c) 10,800 J d) 648,000 J
 11. a) 5 A & 10 A b) 600 W, less current for same voltage c) 24 Ω & 12 Ω 12) 0.5 A & 240 Ω
 13. a) 0.25 A b) 960 Ω 14. a) 11 A b) 1210 W