Power Problems—Additional Practice

Power is the rate of doing work or the rate of transforming energy. Power can be calculated using the following equations:

$$P = \frac{W}{\Delta t} \text{ or } P = \frac{\Delta E}{\Delta t}$$

where P is power measured in J/s or W (watts), W is work (in J), E is energy (in J), and Δt is time (in s).

Solve each of the following problems in the space provided. Be sure to express your answers properly.

1. During a 1.0-h period, the average consumption of electricity by an electric motor was 225 W. How much electrical energy, in joules, was transformed by the motor during that time?

2. A farmer raises a 12-kg bucket of water from a well 7.0 m deep in 15 s. What is the power associated with this task?

3. The engine of a 1500-kg car is rated at 225 hp. How much energy can it produce in 6.0 s? (1 hp = 746 W)

4. How long would it take for a 40-W fluorescent tube to transform 15 J of energy, which is the approximate amount of energy required to lift this book from the floor to the desk?

5. A stationary 7.0-kg box is pushed along a smooth surface, reaching a speed of 4.0 m/s after being pushed for 2.5 s. What is the power generated by the push?

6. It takes about 3.4×10^5 J of thermal energy to bring one litre of water from a temperature of 20°C to the boiling point. How long would it take an electric kettle to perform this task if it operates at 900 W? Express your answer in minutes.

7. Imagine you are pushing a large trunk across the floor. If you exert a force of 75 N as you push the trunk 4.0 m in 3.0 s, what is the power of your push?