Continuation of Answers

Answers continued from p. 443

8. Answers may vary. A pencil sharpener, for example, is a compound machine that consists of a couple of screws (the blades to sharpen the pencil), wedges (the edges of those blades), and a wheel and axle (the crank).

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8. $KE = \frac{1}{2}mv^2 = (1/2)(0.02\text{ kg})(300\text{ m/s})^2 = 900\text{ J}$

9. **a.** $PE = mgh = (2.5\text{ kg})(9.8\text{ m/s}^2)(2.0\text{ m}) = 49\text{ J}$

b. $KE = \frac{1}{2}mv^2 = (1/2)(0.015\text{ kg})(3.5\text{ m/s})^2 = 0.092\text{ J}$

c. $PE = mgh = (35\text{ kg})(9.8\text{ m/s}^2)(3.5\text{ m}) = 1{,}200\text{ J}$

d. $KE = \frac{1}{2}mv^2 = (1/2)(8{,}500\text{ kg})[(220\text{ km/h})(1{,}000\text{ m/km})(1\text{ h}/3{,}600\text{ s})]^2 = 1.6 \times 10^7\text{ J}$

Answers continued from p. 461

6. A child on a swing undergoes energy transformations from maximum *PE* at the top (both sides) to maximum *KE* at the bottom and back to maximum *PE* at the top of the opposite side. The child needs a push every now and then to make up for the energy lost to friction between the rope and the support, as well as some energy lost to air resistance.

7. *efficiency = useful work output/work input* = (40 J)/(100 J) = 0.4 or 40%

8. **a.** *useful work output = (efficiency)(work input)* = (0.12)(6,500 J) = 780 J

b. $P = W/t = 780\text{ J}/1\text{ s} = 780\text{ W}$

9. **a.** $W = Fd = (150\text{ N})(4.0\text{ m}) = 6.0 \times 10^2\text{ J}$

b. *work input = useful work output/efficiency* $= 6.0 \times 10^2\text{ J}/0.50 = 1{,}200\text{ J}$