Exercise 1.25

(**a**) Calculate the kinetic energy, in joules of a 1200-kg automobile moving at 18 m/s. (**b**) Convert this energy to calories. (**c**) When the automobile brakes to a stop is the "lost" kinetic energy converted mostly to heat or to some form of potential energy?

Solution

The kinetic energy of a 1200-kg automobile moving at 18 m/s is

$$\text{KE} = \frac{1}{2}(1200 \text{ kg})\left(18 \, \frac{\text{m}}{\text{s}}\right)^2 = 194\,400 \text{ kg} \cdot \frac{\text{m}^2}{\text{s}^2} \approx 1.9 \times 10^5 \text{ J},$$

rounding to two significant figures because of 18 m/s. Convert this energy to calories.

$$\text{KE} = \frac{1}{2}(1200 \text{ kg})\left(18 \, \frac{\text{m}}{\text{s}}\right)^2 \times \frac{1 \text{ calorie}}{4.184 \text{ J}} \approx 4.6 \times 10^4 \text{ cal}.$$

Kinetic energy is converted to thermal energy as a result of braking in typical automobiles. More advanced cars don't let it all go to waste, though.