43. (a) Let M be the mass of the Sun at time t and E be the energy radiated to that time. Then, the power output is $P = dE/dt = (dM/dt)c^2$, where $E = Mc^2$ is used. At the present time,

$$\frac{dM}{dt} = \frac{P}{c^2} = \frac{3.9 \times 10^{26}\ \mathrm{W}}{(2.998 \times 10^8\ \mathrm{m/s})^2} = 4.33 \times 10^9\ \mathrm{kg/s}\ .$$

(b) We assume the rate of mass loss remained constant. Then, the total mass loss is $\Delta M = (dM/dt)\,\Delta t = (4.33 \times 10^9\ \mathrm{kg/s})(4.5 \times 10^9\ \mathrm{y})(3.156 \times 10^7\ \mathrm{s/y}) = 6.15 \times 10^{26}\ \mathrm{kg}$. The fraction lost is

$$\frac{\Delta M}{M + \Delta M} = \frac{6.15 \times 10^{26}\ \mathrm{kg}}{2.0 \times 10^{30}\ \mathrm{kg} + 6.15 \times 10^{26}\ \mathrm{kg}} = 3.07 \times 10^{-4}\ .$$