43. (a) The sample is in secular equilibrium with the source and the decay rate equals the production rate. Let R be the rate of production of ^{56}Mn and let λ be the disintegration constant. According to the result of problem 41, $R = \lambda N$ after a long time has passed. Now, $\lambda N = 8.88 \times 10^{10}\,\mathrm{s}^{-1}$, so $R = 8.88 \times 10^{10}\,\mathrm{s}^{-1}$.

(b) They decay at the same rate as they are produced, $8.88 \times 10^{10}\,\mathrm{s}^{-1}$.

(c) We use $N = R/\lambda$. If $T_{1/2}$ is the half-life, then the disintegration constant is $\lambda = (\ln 2)/T_{1/2} = (\ln 2)/(2.58\,\mathrm{h}) = 0.269\,\mathrm{h}^{-1} = 7.46 \times 10^{-5}\,\mathrm{s}^{-1}$, so $N = (8.88 \times 10^{10}\,\mathrm{s}^{-1})/(7.46 \times 10^{-5}\,\mathrm{s}^{-1}) = 1.19 \times 10^{15}$.

(d) The mass of a ^{56}Mn nucleus is $(56\,\mathrm{u})(1.661 \times 10^{-24}\,\mathrm{g/u}) = 9.30 \times 10^{-23}\,\mathrm{g}$ and the total mass of ^{56}Mn in the sample at the end of the bombardment is $Nm = (1.19 \times 10^{15})(9.30 \times 10^{-23}\,\mathrm{g}) = 1.11 \times 10^{-7}\,\mathrm{g}$.