

(11.1) A 0.01 mm thick gold foil, 1 cm² in area, is irradiated with thermal neutrons. The (n,γ) cross-section is 99 b. What is the transformation rate at a n-flux of 10¹⁹ n m⁻² s⁻¹?

$$M_{Au} := 196.97 \cdot gm \cdot mole^{-1}$$

$$N_A := 6.022137 \cdot 10^{23} \cdot mole^{-1}$$

$$\rho_{Au} := 19.3 \cdot gm \cdot cm^{-3}$$

$$thickness := 0.01 \cdot mm$$

$$area := 1 \cdot cm^2$$

$$volume := thickness \cdot area$$

$$m_{Au} := volume \cdot \rho_{Au}$$

$$\sigma_{Au} := 99 \cdot 10^{-28} \cdot m^2$$

$$\phi := 10^{19} \cdot m^{-2} \cdot sec^{-1}$$

$$N_{Au} := \frac{m_{Au}}{M_{Au}} \cdot N_A$$

$$R_{Au} := \phi \cdot \sigma_{Au} \cdot N_{Au}$$

$$R_{Au} = 5.842 \cdot 10^{12} \cdot sec^{-1}$$

$$dm_{Au} := \frac{R_{Au}}{N_A} \cdot M_{Au}$$

$$dm_{Au} = 1.911 \cdot 10^{-12} \cdot kg \cdot sec^{-1}$$

$$transrate := \frac{dm_{Au}}{m_{Au}}$$

$$transrate = 9.9 \cdot 10^{-8} \cdot sec^{-1}$$