

Radius of a gold nucleus is

$$R = 1.2 \times \sqrt[3]{197} \text{ fm} = 7 \text{ fm}$$

$\text{fm}$  is  $10^{-15} \text{ m}$

Cross section for alpha particle is then

$$\sigma \approx \pi R^2 \approx 1.5 \times 10^{-24} \text{ cm}^2$$