p2

$$M \cong 50 \times 10^3 \text{ kg} \quad \text{of } Ga^{71}$$

So

$$N_n \cong \frac{M}{m_{p^+}} \left(\frac{40\,n}{31\,p^+ + 40\,n} \right)$$

$$\cong 1.7 \times 10^{31} \text{ neutrons}$$

Using the cross section for neutrino-neutron collision of

$$\sigma = 10^{-50} \text{ m}^2 \quad \text{from the lecture}$$

the total area is

$$\sigma_{tot} = \sigma N_n = 10^{-50} \text{ m}^2 \left(1.7 \times 10^{31} \text{ neutrons} \right)$$

$$= 1.7 \times 10^{-19} \text{ m}^2$$

So, the number of interactions inside SAGE would be

$$N_{inter} = \sigma_{tot} F_\nu$$

$$= \left(1.7 \times 10^{-19} \text{ m}^2 \right) \left(4.2 \times 10^{33} \text{ } \nu/\text{m}^2 \right)$$

$$\boxed{N_{inter} \cong 7 \times 10^{14}}$$

Can we estimate the number of interactions between neutrinos and neutrons inside a typical human body?

$$N_n \cong \frac{m_{human}}{m_p} \cdot \frac{1}{2}$$

assuming most elements in human body are half proton/half neutron

C_{12}, O_{16}, for example