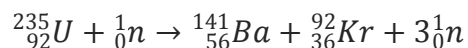


Answer on Question #77995, Chemistry / General Chemistry

250.0 grams of uranium-235 are placed in a reactor. A nucleus of uranium-235 absorbs a neutron and undergoes nuclear fission to produce barium-141 and krypton-92. A single atom's fission produces 211.3 MeV of energy.

Solution



Find amount of substance of 250.0 g of uranium-235:

$$n = m/M;$$

$$n({}_{92}^{235}\text{U}) = \frac{250.0\text{g}}{235\text{g/mol}} = 1.064\text{ mol}$$

Find how many atoms of uranium-235 are in 1.064 mol:

$$N = N_A \cdot n$$

Where N_A is Avogadro number, $N_A = 6.02 \cdot 10^{23} \text{ mol}^{-1}$

n – amount of substance

$$N({}_{92}^{235}\text{U}) = 6.02 \cdot 10^{23} \cdot 1.064 = 6.404 \cdot 10^{23}$$

Though there is no question in this task we can make an assumption that the total value of energy produced by 250.0 g of uranium -235 undergoing nuclear fission is asked.

A single atom's fission produces 211.3 MeV of energy. As we know the number of uranium-235 atoms ($6.404 \cdot 10^{23}$), we can find the energy produced by these atoms:

$$E = 211.3 \text{ MeV} \cdot 6.404 \cdot 10^{23} = 1.35 \cdot 10^{26} \text{ MeV}$$

Answer: $1.35 \cdot 10^{26} \text{ MeV}$