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

$$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{141}_{56}Ba + ^{92}_{36}Kr + 3^{1}_{0}n$$

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

n=m/M;

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

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

$N=N_A \cdot n$

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

n – amount of substance

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

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:

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

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