- Balance the following nuclear reactions by identifying the missing nuclear particle.

Marks 2

$^{234}_{90}\text{Th} \rightarrow \boxed{^{234}_{91}\mathbf{Pa}} + {}^{0}_{-1}\text{e}$

$^{234}_{92}\text{U} \rightarrow \boxed{^{230}_{90}\mathbf{Th}} + {}^{4}_{2}\text{He}$

- A nugget contains 2.6×10^{24} atoms of gold. What amount of gold (in mol) is in this nugget and what is its mass (in kg)?

2

One mole of gold corresponds to Avogadro's number, 6.022×10^{23}, atoms. 2.6×10^{24} atoms therefore corresponds to:

$$\textbf{number of moles} = \frac{\textbf{number of atoms}}{\textbf{Avogadro's number}} = \frac{2.6\times10^{24}}{6.022\times10^{23}} = 4.3\,\text{mol}$$

As one mole of gold has a mass, corresponding to the atomic mass, of 196.97 g. 4.3 mol of gold therefore corresponds to:

mass = number of moles × atomic mass = 4.3 × 196.97 = 850 g = 0.85 kg

(Note that the number of atoms is given to 2 significant figures in the question and this is reflected in the answers).

Amount: **4.3 mol**	Mass: **0.85 kg**