Mass Defect

> Calculate the nuclear mass defect of cesium-137 if it has a mass of 136.87522 amu. ($m_e = 5.5 \times 10^{-4}$ amu, $m_p = 1.00728$ amu, $m_n = 1.00867$ amu)

Takeaways

The mass defect is the mass converted into energy when the atom is made from its components. A larger mass defect creates a larger binding energy. The greater the binding energy per nucleon, the more stable the nucleus.

1) Tally the number of protons, electrons, and neutrons for cesium.

55 protons + 55 electrons

# of neutrons = 137 − 55 = 82

To find the number of protons, look up cesium on the periodic table. It is element number 55. This means that it has 55 protons. We assume that it is a neutral atom, which means there are also 55 electrons. The 137 indicates that the number of protons plus neutrons is 137. Subtract 55 from 137 to find the number of neutrons.

Things to Watch Out For

Make sure that your mass defect is a positive number.

2) Add up the components.

$$55 \times 1.00728 \text{ amu}$$
$$55 \times 0.00055 \text{ amu}$$
$$+ \; 82 \times 1.00867 \text{ amu}$$
$$\overline{138.14159 \text{ amu}}$$

Find the total mass of the components of the atom using the masses for each particle given in the question.

Similar Questions

1) Calculate the mass defect of strontium-84 at 83.9134 amu.

2) Calculate the mass defect of mercury-204 at 203.9735 amu.

3) Calculate the mass defect of tin-122 at 121.9034 amu.

3) Calculate mass defect.

mass defect = sum of components − mass of atom
$$= 138.14159 \text{ amu} - 136.87522 \text{ amu}$$
$$= 1.26637 \text{ amu}$$

The mass defect is the difference between the mass of the components and the actual mass of the atom.

Remember: *The mass defect will always be a positive value because the sum of the components is greater than the mass of the isotope.*