

Answer on the question #54660 – Chemistry – General chemistry

Question:

Explain the following terms:

- (i) Mass defect
- (ii) Binding energy per nucleus
- (iii) Binding energy per nucleon
- (iv) Nuclear fusion
- (v) Nuclear fission

Answer:

- (i) Mass defect is the amount by which the mass of an atomic nucleus is less than the sum of the masses of its constituent particles.
In chemistry and nuclear physics, the use of this term is the explanation of the fact that the mass of an atom is less than the sum of the masses of its constituents. For example, the mass of hydrogen atom is less than the sum of the masses of electron and proton. This difference is called mass defect. The reason of its occurrence is the equivalence of mass and energy. As the energy is released within the atom formation from the elementary particles, the mass is reduced.
- (ii) Binding energy per nucleus is the energy required to decompose a nucleus into its constituent particles. It is the same as the mass defect.
- (iii) Binding energy per nucleon is the total binding energy in nucleus divided by the number of nucleons (the structural parts of nucleus, protons and neutrons).
- (iv) Nuclear fusion is the synthesis of the new atomic nucleus from the two other nuclei, smaller than the resulting one. This nuclear reaction takes place only when strict conditions are met, e.g. extremely high temperatures, pressures and velocities of the nuclei. These nuclei form another one within the collision; the enormous amount of energy is released.
- (v) Nuclear fission is the process that is opposite to the process of nuclear fusion. This is the decomposition of the nucleus, or its radiative decay. The most unstable atoms in the Periodic table can exhibit this kind of reaction with release of radiation, or energy. These atoms are often heavy, i.e. their nuclei contain large number of protons and neutrons.