

# Atomic nucleus

## Atomic nucleus

The atomic nucleus consists of nucleons (determined by mass number  $A$ ): protons (atomic or proton number  $Z$ ) and neutrons (neutron number  $N$ ). There is a mathematical relation between these numbers which says  $A=Z+N$ . The atomic number  $Z$  also indicates the number of electrons when the atom is electrically neutral.

### 1 Structure of the atomic nucleus

#### 1.1 Proton

##### 1.1.1 $H^+$ as a proton

#### 1.2 Neutron

### 2 Characteristics of the atomic nucleus

### 3 Links

#### 3.1 Related articles

#### 3.2 Literature which was used

### 1 Structure of the atomic nucleus

There are two particles in the atomic nucleus a- protons and neutrons. We call them nucleons. The radius of the nucleus is  $5 \cdot 10^{-15}$  m.

#### 1.1 Proton

The quark model of proton

Proton (p) is a subatomic particle which carries a positive elementary charge. The number of protons in atomic nucleus is characteristic for each chemical element. When the atom is electroneutral the number of protons is the same as the number of electrons in electron shell. The number of protons is determined by  $Z$  (atomic or proton number). The  $Z$  number also determines a position of chemical element in periodic table.

##### 1.1 $H^+$ as a proton

$H^+$  is a hydrogen cation which was formed during dissociations of acids. When the atomic nucleus of hydrogen loses its only proton, it becomes a hydrogen cation.

#### 1.2 Neutron

Neutron is a electroneutral particle. Its size is similar to proton's size. The number of neutron is indicated by neutron number ( $N$ ). The number of neutron is also a part of nucleon number ( $A$ ).

### Particle properties

Name Symbol Normal weight (g) Atom charge

Proton p  $1,6726 \cdot 10^{-24}$   $1,602 \cdot 10^{-19}$  +1

Neutron n  $1,6750 \cdot 10^{-24}$  0

Electron e  $9,110 \cdot 10^{-28}$   $-1,602 \cdot 10^{-19}$  -1

### Characteristic of the atomic nucleus

The weight of atom is expressed by weight unit :  $1 \text{ wu} = 1,66 \cdot 10^{-27} \text{ kg}$ .

The atom and nucleon number gives us characteristics of each chemical element. By this characteristics we can distinguish:

Isotopes - nuclides of the same chemical element which are composed of the same proton number ( $Z$ ) but different neutron number ( $N$ ). They have same chemical properties but different physical properties. Most of elements in nature are isotopes.

Isobars - nuclides of different elements which have different proton number but the same number of nucleons.

Isotons - Nuclides of different elements which have different atomic and nucleon number but their neutron is the same.

Isomers – molecules with the molecule formula, atomic and neutron number but with different chemical structure.

The total charge of the atomic nucleus is  $1,6 \cdot 10^{-19}$  C. The radius of the nucleus is calculated by formula:  $R_A = 1,23 \cdot 10^{-15} \cdot A^{1/3}$  (m).

Atomic forces are strong interactions. They can operate on distance  $10^{-15}$  m . Atomic force is the strongest type of force we know.

### 3 Links

Atomic nucleus (Wikipedia) ([https://en.wikipedia.org/wiki/Atomic\\_nucleus](https://en.wikipedia.org/wiki/Atomic_nucleus))

#### 3.1 Related articles

Atomic models

#### 3.2 Literature which was used

SILNÝ, Peter a Beata BRESTENSKÁ. Prehľad chémie 1. 1. vydání. Bratislava : Slovenské pedagogické nakladateľstvo, 2000. sv. 1. s. 246. ISBN 80-08-00376-6.