

Vocabulary: Atomic Structure

- Atom – the basic unit of matter.
 - An atom is the smallest particle of an element that still has all the properties of the element.
 - Atoms are made up of smaller particles called *protons*, *neutrons*, and *electrons*. The smaller electrons orbit around a central *nucleus* of protons and neutrons.

 - Atomic number – the number of protons in the nucleus of an atom.
 - Elements are distinguished from one another by their atomic numbers.
 - For example, any atom with two protons is an atom of helium.
 - The symbol for the atomic number is Z.
 - In an element symbol, the atomic number is shown at lower left.
- The diagram shows the chemical symbol for Helium, 'He'. To the bottom-left of the symbol is the number '2', and to the top-left is the number '4'. A red arrow points from the text 'Atomic number' below to the number '2'.
- Charge – a property of matter that can lead to electrostatic forces of attraction or repulsion.
 - Protons have a positive charge and electrons have a negative charge. To find the charge of an atom, subtract the number of electrons from the number of protons.
 - Objects with opposite charges are attracted to one another. Objects with similar charges are repulsed from one another.

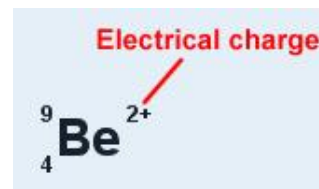
 - Electron – a negatively charged particle that moves around the nucleus.
 - The mass of an electron is less than one thousandth of the mass of a proton.

 - Electron cloud – a region surrounding the nucleus in which electrons may be found.

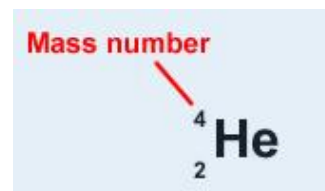
 - Electron dot diagram – a diagram that shows the element symbol surrounded by dots representing *valence electrons*.
 - For example, the electron dot diagram at right shows that neutral helium atoms have two valence electrons.
- The diagram shows the chemical symbol 'He' followed by two dots, representing the two valence electrons of a neutral helium atom.
- Energy level – a particular region where electrons can orbit a nucleus.

 - Group – a vertical column in the periodic table of elements.
 - Elements in the same group have the same number of valence electrons and have similar chemical properties.

- Ion – an atom or molecule that has an electric charge because it has gained or lost electrons.
 - An atom with more protons than electrons is a positively charged ion, or *cation*.
 - An atom with more electrons than protons is a negatively charged ion, or *anion*.
 - In an element symbol, the electric charge is shown at upper right.



- Mass number – the number of protons plus neutrons in the nucleus of an atom.
 - For example, the mass number of helium is 4 (2 protons and 2 neutrons).
 - The symbol for the mass number is *A*.
 - In an element symbol, the mass number is shown at upper left.



- Neutron – a particle with no charge located in the nucleus of an atom.
 - Neutrons have slightly more mass than protons.
 - The number of neutrons is described by the neutron number, *N*.
 - To find the number of neutrons, subtract the atomic number from the mass number.
- Noble gases – a group of chemical elements that do not readily form chemical bonds.
 - The noble gases are helium, neon, argon, krypton, xenon, and radon.
 - Helium has two valence electrons. Other noble gases have eight valence electrons.
- Nucleus – the positively charged, dense center of an atom.
 - The nucleus contains protons and neutrons.
- Period – a horizontal row of the periodic table.
- Periodic table – a chart that organizes the chemical elements based on their properties.
- Proton – a positively charged particle located in the nucleus of an atom.
 - Protons have slightly less mass than neutrons.
 - The number of protons determines the element.

- Subatomic particle – a unit of matter smaller than an atom.
 - Subatomic particles include the building blocks of atoms: protons, neutrons, and electrons.
 - Other subatomic particles include neutrinos, muons, tau particles, bosons, photons, and many others.
- Universal mass unit – a unit used to measure the mass of an atom.
 - The universal mass unit has approximately the same mass as a proton.
 - The symbol for universal mass units is u.
- Valence electrons – electrons found in the outermost energy level of an atom.