

NTI Day 1

Atomic Structure

- An atom is not the smallest particle of matter
- Atoms are the smallest type of unique matter
- All atoms are made up of subatomic particles which are identical in all atoms
- It is the way in which these subatomic particles are put together which determine the properties and type of atom that is formed
- There are a number of different subatomic particles of which there are three that we concern ourselves with:
 - Protons
 - Neutrons
 - Electrons
- The number of protons in an atom determines the identity and to a large extent the chemical properties of an atom
- The number of protons is known as the Atomic Number
- All atoms which have the same number of protons will have very similar chemical properties and are considered the same element. There are currently discovered atoms that contain up to 118 protons.
- Protons have a charge of +1 and a relative mass of 1 AMU.
- Neutrons have a charge of 0 and a relative mass of 1 AMU.
- Electrons have a charge of -1 and a relative mass of 0 AMU.
- The number of neutrons can vary and will affect the mass, but not the identity, of an atom. The chemical properties may vary slightly but will be very similar.
- Atomic Mass = # of protons + # of neutrons
- Atoms of an element which have a different atomic mass are called Isotopes.
- The average atomic masses given on the periodic table are a weighted average of the different naturally occurring isotopes of an element.
- The entire atomic mass is made up of only protons and neutrons and therefore the number of neutrons can be found by taking the mass and subtracting the # of protons.
- An electrically neutral atom will always have the same number of positively charged protons and negatively charged electrons.
- If the number of protons and electrons is not equal, then it is referred to as an ion.
- Ions can be either negatively charged if they have more electrons than protons, or they can be positively charged if they have more protons than electrons.
- Protons and neutrons (and therefore all of the mass) are located in the center of the atom in a region called the nucleus.
- Electrons are located relatively far from the nucleus in “energy levels” where they move randomly at very high speeds creating “shells.” These “electron clouds” make up more than 99% of the volume of an atom, but almost none of the mass.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- Rutherford's gold foil experiment provided evidence for which of the following statements?
 - Negative and positive charges are spread evenly throughout an atom.
 - Alpha particles have a positive charge.
 - Gold is not as dense as previously thought.
 - There is a dense, positively charged mass in the center of an atom.

- Which subatomic particle has a negative charge?
 - electron
 - neutron
 - neutron
 - proton

- Atoms have no electric charge because they
 - have an equal number of charged and noncharged particles.
 - have neutrons in their nuclei.
 - have an equal number of electrons and protons.
 - have an equal number of neutrons and protons.

- Which statement about subatomic particles is NOT true?
 - Protons and neutrons have almost the same mass.
 - Protons and electrons have opposite charges.
 - Unlike protons and electrons, neutrons have no charge.
 - Protons and neutrons have the same charge.

- Which statement about subatomic particles is true?
 - Protons, neutrons, and electrons all have about the same mass.
 - Protons, neutrons, and electrons have no mass.
 - Neutrons have no charge and no mass.
 - An electron has far less mass than either a proton or neutron.

- Which of the following is unique for any given element?
 - the number of neutrons
 - the charge on the electrons
 - the number of protons
 - the mass of a neutron

- The number of protons in one atom of an element is that element's
 - mass number.
 - balanced charge.
 - atomic number.
 - isotope.

8. To find the number of neutrons in an atom, you would subtract
- A. mass number from atomic number.
 - B. atomic number from mass number.
 - C. atomic number from electron number.
 - D. isotope number from atomic number.
9. Suppose an atom has a mass number of 23. Which statement is true beyond any doubt?
- A. The atom has an odd number of neutrons.
 - B. The atomic number is less than 11.
 - C. The atom is not an isotope.
 - D. The number of protons in the nucleus does not equal the number of neutrons.
10. Which statement is true about oxygen-17 and oxygen-18?
- A. They do not have the same number of protons.
 - B. Their atoms have an identical mass.
 - C. They are isotopes of oxygen.
 - D. They have the same mass number.
11. How many electrons are needed to “fill up” the outermost orbital to make a stable configuration?
- A. 4
 - B. 8
 - C. 6.5
 - D. 10
12. What can you assume has happened if an electron moves to a higher energy level?
- A. The atom has become more stable.
 - B. The electron has lost energy.
 - C. The electron has gained energy.
 - D. The atom has lost an electron.
13. Atoms whose outermost energy level is not filled may gain or lose valence electrons. What do you call these atoms?
- A. isotopes
 - B. nucleons
 - C. neutrons
 - D. ions
14. Moving from left to right across a row of the periodic table, which of the following values increases by exactly one from element to element?
- A. isotope number
 - B. atomic number
 - C. atomic mass unit
 - D. mass number
15. What element would result from the addition of four protons to (B) boron?
- A. C (carbon)
 - B. F (fluorine)
 - C. N (nitrogen)
 - D. Cl (chlorine)