Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd: \_\_\_\_\_ Ast: \_\_\_\_\_

**Atoms Study Guide**

**VOCAB** – Match each term with its definition by drawing a line between them.

1. Atom - a negatively charged (-) particle that occupies the space in an atom outside the nucleus
2. Element - a positively charged (+) particle in the nucleus of an atom
3. Electron - a substance made of only one kind of atom
4. Nucleus - the region at the center of an atom that contains most of the mass of the atom
5. Proton - a small particle that is the building block of matter
6. Atomic Number - an uncharged (Ø) particle in the nucleus of an atom
7. Neutron - the number of protons in the nucleus of an atom of an element
8. Electron Cloud - atoms of an element with the same number of protons but a different number of neutrons
9. Isotope - an atom that has a charge because it has gained or lost electrons
10. Ion - the region surrounding an atom’s nucleus where electrons are most likely to be found

**DIAGRAM** – Use the diagram to identify the parts of the atom based on the modern electron cloud model.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**+**

**+**

**+**

**+**

**+**

**+**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SUB-ATOMIC PARTICLES** – Identify whether each statement refers to electrons (“E”), protons (“P”), or neutrons (“N”) by writing the corresponding letter on the line.

1. \_\_\_\_\_ the only sub-atomic particle that is NOT found in the nucleus
2. \_\_\_\_\_ the only sub-atomic particle that does NOT have a charge
3. \_\_\_\_\_ the last sub-atomic particle discovered when James Chadwick explained the “extra” mass in atoms
4. \_\_\_\_\_ has a positive charge
5. \_\_\_\_\_ first sub-atomic particle discovered when JJ Thomson bent the beam in a cathode ray tube with a magnet
6. \_\_\_\_\_ discovered by Ernest Rutherford when he realized alpha particles were hydrogen nuclei
7. \_\_\_\_\_ by far the LEAST massive of the sub-atomic particles
8. \_\_\_\_\_ has a negative charge
9. \_\_\_\_\_ has the same mass as a proton
10. \_\_\_\_\_ determines the type of atom, or the element

**ELEMENTS** – Use the information provided about each element to answer the questions below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| boron**5****B**10.811 | carbon**6****C**12.011 | nitrogen**7****N**14.007 | oxygen**8****O**15.999 | fluorine**9****F**18.998 | neon**10****Ne**20.180 |

1. What makes a carbon atom different from a nitrogen atom?
2. On average, which of the elements shown above has the most particles in its nucleus?
3. How many protons are in the nucleus of a fluorine atom?
4. What is boron’s atomic mass?
5. What is the atomic number for oxygen?
6. Carbon12 has 6 neutrons, carbon13 has 7 neutrons, and carbon14 has 8 neutrons. What is the term for these atoms?
7. Sometimes a fluorine atom will gain a tenth electron, causing it to have a negative charge. What is the term for this type of atom?

**HISTORY** – Provide a short answer for each question about the history of atomic theory.

1. The modern word, “atom”, comes from the latin word, “atomos”, used by Democritus to describe the smallest individual particle of matter. What does “atomos” mean?
2. What sub-atomic particle did JJ Thomson discover when he placed the negative end of a magnet next to a cathode ray tube and observed the beam repel away from the magnet?
3. Inspired by the Sun at the center of the solar system, what feature of an atom was first proposed by Hantaro Nagaoka and later confirmed by Ernest Rutherford’s alpha-particle cannon & gold foil experiment (when some of the alpha particles bounced back)?
4. Which sub-atomic particle was discovered by Ernest Rutherford when he realized that alpha particles are the nuclei of hydrogen atoms?
5. Which sub-atomic particle was discovered by James Chadwick when he explained the existence of a third sub-atomic particle in the nucleus with the same mass as a proton?