History of the Atom Worksheet

Name: _____ Date: _____ Class: _____

John Dalton (1766 – 1844):

John Dalton was an English chemist. His ideas form the atomic theory of matter. Here are his ideas.

- All elements are composed (made up) of atoms. It is impossible to divide or destroy an atom.
- All atoms of the same elements are alike. (One atom of oxygen is like another atom of oxygen.)
- Atoms of different elements are different. (An atom of oxygen is different from an atom of hydrogen.)
- Atoms of different elements combine to form a compound. These atoms have to be in definite whole number ratios. For example, water is a compound made up of 2 atoms of hydrogen and 1 atom of oxygen (a ratio of 2:1). Three atoms of hydrogen and 2 atoms of oxygen cannot combine to make water.

1. What is the name of John Dalton's theory? The Billiard Ball Model

2. What are elements made of? Atoms

3. An atom of hydrogen and an atom of carbon are different (distinct mass and size)

4. What are compounds made of? Atoms of different elements.

5. The ratio of atoms in HCl is: a) 1:3 b) 2:1 c) 1:1

J. J. Thompson (Late 1800s):

J. J. Thompson was an English scientist. He discovered the electron when he was experimenting with gas discharge tubes. He noticed a movement in a tube. He called the movement cathode rays. The rays moved from the negative end of the tube to the positive end. He realized that the rays were made of negatively charged particles – electrons.

1. What did J.J. Thompson discover? electrons

2. What is the charge of an electron? Negative

3. What are cathode rays made of? Fluorescent gas

4. Why do electrons move from the negative end of the tube to the positive end? Opposite charges attract. Therefore the negative electrons travel to the positive end of the tube.

5. What was Thompson working with when he discovered the cathode rays? Gas discharge tubes (cathode ray tube)

Lord Ernest Rutherford (1871 – 1937):

Ernest Rutherford conducted a famous experiment called the gold foil experiment. He used a thin sheet of gold foil. He also used special equipment to shoot alpha particles (positively charged particles) at the gold foil. Most particles passed straight through the foil like the foil was not there. Some particles went straight back or were deflected (went in another direction) as if they had hit something. The experiment shows:

- Atoms are made of a small positive nucleus; positive nucleus repels (pushes away) positive alpha particles
- Atoms are mostly empty space

1. What is the charge of an alpha particle? positive

2. Why is Rutherford's experiment called the gold foil experiment? He shot alpha particles at a piece of gold foil.

3. How did he know that an atom was mostly empty space? Many of the alpha particles passed straight through the foil (did not hit any obstacle).

4. What happened to the alpha particles as they hit the gold foil? Some passed straight through (empty space), some were reflected back at him (hit the nuclei of gold atoms), some were deviated as they passed through the foil (hit electrons).

5. How did he know that the nucleus was positively charged? The positive alpha particle was reflected back; therefore it was repelled from the nucleus.

Niels Bohr (Early 1900s):

Niels Bohr was a Danish physicist. He proposed a model of the atom that is similar to the model of the solar system. The electrons go around the nucleus like planets orbit around the sun. All electrons have their energy levels – a certain distance from the nucleus. Each energy level can hold a certain number of electrons. Level 1 can hold 2 electrons, Level 2 - 8 electrons, Level 3 - 18 electrons, and level 4 – 32 electrons. The energy of electrons goes up from level 1 to other levels. When electrons release (lose) energy they go down a level. When electrons absorb (gain) energy, they go to a higher level.

1. Why could Bohr's model be called a planetary model of the atom? He believed the electrons travelled around the nucleus in orbits, like planets around the sun.

2. How do electrons in the same atom differ? They contain different amounts of energy.

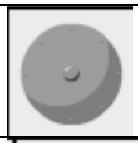
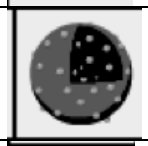
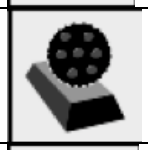
3. How many electrons can the fourth energy level hold? 32

4. Would an electron have to absorb or release energy to jump from the second energy level to the third energy level? Absorb energy

5. For an electron to fall from the third energy level to the second energy level, it must lose energy.

ORDER OF EVENTS

Using the numbers 1-5 (1 being the earliest), place the following atomic theories in order, according to when they were theorized.

3	**Atoms are made up of mostly empty space. Most of the mass is concentrated in the center nucleus.**	
2	**Negatively charged particles are called electrons. The atom is thought of as electrons scattered inside a positively charged mass.**	
5	**Electrons exist in a region around the nucleus called the electron cloud, instead of energy levels.**	
1	**Each type of matter is made up of only one type of atom. Atoms are too small to be seen.**	
4	**Electrons are arranged in energy levels. The atoms resembles the solar system.**	

QUESTIONS

1. Who first suggested the concept of atoms? Democritus.
2. John Dalton said atoms were the smallest Piece of matter.
3. The "pool ball" theory was invented by John Dalton.
4. Which scientist discovered electrons? Thomson.
5. J.J. Thomson discovered which theory? The Plum Pudding Model/ Chocolate cookie model
6. Who proved the "Cookie Dough" theory incorrect? Rutherford.
7. How did the scientist from #6 prove the theory was wrong? Gold Foil Experiment
8. In this experiment, which part of the atom did Rutherford discover? The nucleus.
9. Why is Rutherford's model called "the peach"? He saw the nucleus as a solid pit inside a peach, surrounded by empty space.
10. Who came up with the "solar system" model? Bohr.
11. In the "solar system" model, which part of the atom is the "sun"? Nucleus.
12. What is the model that is accepted today called? The Electron Cloud.

Directions: Put the number of the definition from the list below into the square with the appropriate term. Check your answers by adding the numbers to see if all the sums of all rows, both across and down add up to the same number, the Magic #.

Democritus 2	Dalton 7	Thomson 18	Chadwick 12	Total 39
Rutherford 8	Proton 5	Atom 11	Bohr 15	39
Wave Model 13	Neutron 17	Nucleus 6	Alpha particle 3	39
Electron 16	Model 10	Energy levels 4	Electron cloud 9	39
Total 39	39	39	39	

Magic Number _____

1. Represented by a symbol; all are found on the Periodic Table
2. Made a mental model of the atom; Greek philosopher
3. Used by Rutherford in his experiment; made of two protons and two neutrons
4. The paths in which electrons circle the nucleus according to the Bohr model
5. The positive particle in the nucleus of an atom
6. The tiny positive core of an atom; contains protons and neutrons
7. Formed the atomic theory model of the atom; English schoolteacher
8. Discovered the nucleus using his gold foil experiment
9. Current explanation of where electrons might be found in the atom
10. Used by scientists to explain something we cannot see or understand
11. The smallest particle of an element that has the properties of that element
12. Discovered the neutron
13. Current model of the atom; proposed by Schrodinger

14. Mass of protons and neutrons

15. Developed the model of the atom in which electrons orbit the nucleus in energy levels

16. The negative particle that circles the nucleus

17. The neutral particle in the nucleus of an atom

18. Proposed the “plum-pudding” model of the atom; discovered the electron