 Name: Answers

6.6 Theories of the Atom

Learning Goals/Success Criteria: *At the end of this lesson, I will be able to:*

- ☐ Explain how different atomic models evolved over time
- ☐ Describe the current model of the atom

You have been provided with 6 research guides to aid you as you begin your investigation into the ever-evolving theory of atomic structure. Using this research, you will construct a timeline of the most important advancements in the atomic theory, including who was responsible for the discovery, and what experiments they conducted, or the observations they made that lead them to their groundbreaking conclusion.

After you have completed your foldable, test your knowledge with the questions below.

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 Dalton's theory? Billiard Ball model
2. What are elements made of? atoms
3. An atom of hydrogen and an atom of carbon are **IDENTICAL / (DIFFERENT.)**
4. When is something considered a compound? made up of different elements
5. If the ratio of atoms in a molecule of water (H_2O) is 2:1, than the ratio of atoms in a carbon dioxide molecule (CO_2) is

   2H : 1O
   1C : 2O

   a. 1:3 b. 2:1 (c.) 1:2

J.J. Thompson (1856-1940)

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 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? electrons
4. Why would negatively charged electrons move from the negative end of the tube to the positive end? opposite charges attract
5. What was Thompson working with when he discovered the cathode rays? gas discharge tubes

Lord Ernest Rutherford (1871-1937)

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

- *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"?
   shot alpha particles at a thin piece of gold foil
3. How did he know that atom was mostly empty space?
   most of the particles passed straight through the foil
4. What happened to the alpha particles as they hit the gold foil?
   some went straight through, some were deflected
5. How did he know that the nucleus was positively charged?
   it repelled the positive charge

Niels Bohr (1885-1962)

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 also be called a planetary model of the atom?
   electrons revolve around the nucleus like the planets around the sun
2. How do electrons in the same atom differ? they are found at different levels
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 (gain)
5. For an electron to fall from the third energy level to the second energy level, it must release (lose) energy.