Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A CH 4.1 (p82-87)

Section: Development of the Atomic Theory

THE BEGINNING OF ATOMIC THEORY

_____ 1. The word *atom* comes from the Greek word *atomos*, which means
   a. "dividable."
   b. "invisible."
   c. "hard particles."
   d. "not able to be divided."

_____ 2. Which of the following statements is a part of Democritus's theory about atoms?
   a. Atoms are small, soft particles.
   b. Atoms are always standing still.
   c. Atoms are made of a single material.
   d. Atoms are small particles that can be cut in half again and again.

3. We know that Democritus was right to say that all matter was made up of atoms. So why did people ignore Democritus's ideas for such a long time?

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4. The smallest unit of an element that maintains the properties of that element is a(n) _____.

DALTON'S ATOMIC THEORY BASED ON EXPERIMENTS

_____ 5. Which of the following was NOT one of Dalton's theories?
   a. All substances are made of atoms.
   b. Atoms of the same element are exactly alike.
   c. Atoms of different elements are alike.
   d. Atoms join with other atoms to make new substances.

6. Dalton experimented with different substances. What did his results suggest?

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Name _____ Class _____ Date _____

Directed Reading A *continued*

THOMSON'S DISCOVERY OF ELECTRONS

7. In Thomson's experiments with a cathode-ray tube, he discovered that a(n) _____ charged plate attracted the beam. He concluded that the beam was made up of particles that have _____ electric charges.

8. The negatively charged subatomic particles that Thomson discovered are now called _____.

9. In Thomson's "plum-pudding" model, electrons are mixed throughout an _____.

RUTHERFORD'S ATOMIC "SHOOTING GALLERY"

_____ 10. Before his experiment, what did Rutherford expect the particles to do?
   a. He expected the particles to pass right through the gold foil.
   b. He expected the particles to deflect to the sides of the gold foil.
   c. He expected the particles to bounce straight back.
   d. He expected the particles to become negatively charged.

11. What were the surprising results of Rutherford's gold-foil experiment?

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WHERE ARE THE ELECTRONS?

_____ 12. In 1911, Rutherford revised the atomic theory. Which of the following is NOT part of that theory?
   a. Most of the atom's mass is in its nucleus.
   b. The nucleus is a tiny, dense, positively charged region.
   c. Positively charged particles that pass close by the nucleus are pushed away by the positive charges in the nucleus.
   d. The nucleus is made up of protons and electrons.

13. The center of an atom is a dense region consisting of protons and neutrons called the _____.

14. What are electron clouds?

_____

At the beginning of the 19th century, Englishman **John Dalton** built an atomic model called the "atomic theory of matter." According to his theory: Each type of matter is made of only type of _____. Each type of atom can be put into a group called an _____ — and every atom of an element was identical. For example, gold atoms make gold, iron atoms make iron, and so on. These atoms are way too small to see. Dalton also believed atoms could not be created, divided into smaller parts, or destroyed.

About 100 years after Dalton, British scientist **J.J. Thomson** discovered the _____. Thompson used a vacuum tube with metal plates at both ends and an electrical source for his experiment. He found that a beam would form between the two plates; the cathode and the anode. Putting a magnet near the beam caused it to bend, which meant that the particles of the beam were _____ charged. Thompson discovered that the cathode rays were made of negatively charged particles, later called _____.

Because matter is mostly neutral, with no net charge, atoms must contain both _____ and negative charges that cancel each other out. Thompson stated that negatively charged electrons must be stuck all throughout a positively charged area. Think of it like the atom is cookie dough and the electrons are chocolate chips.

The discovery of electrons was a big deal. But it left some questions to be answered. Where were the positive particles holding those electrons in place? In 1909 a New Zealand born British scientist named **Ernest Rutherford** and his team set up to answer some of these questions. They beamed _____ charged alpha particles at sheet of really thin gold foil. Because so many particles could pass right through the thin gold foil, Rutherford hypothesized that the gold atoms must be made of mostly _____ space. But some of the particles did bounce off, so Rutherford revised his hypothesis to say that a gold atom must have some very small _____ charged mass. He named this mass the _____. He called the positively charged nucleus particles _____, and said that the electrons were scattered in empty space around the nucleus.

James Chadwick, a student of Rutherford's, found new particles in the nucleus that weren't affected by an electric field at all. Alpha particles in the experiment had knocked them loose. Chadwick called these uncharged particles _____.

Also in the early 20th century, scientists discovered that electrons are arranged in energy _____ (**Bohr** Model). The lower energy levels are closer to the nucleus and can hold just a few electrons. The higher energy levels are _____ away and can hold more electrons. Electrons are so small and quick that their energy levels are not neat planet-like orbits around the nucleus. Instead they exist in a region called the _____ _____.

The atomic model is constantly evolving as scientists discover more and more about what makes the universe tick.

Brain POP ACTIVITY

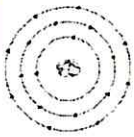
Name: .....

Date: November 16, 2015

SCIENCE > MATTER AND CHEMISTRY > ATOMIC MODEL

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.

.....	Atoms are made of empty space with electrons around a positively charged mass. The terms nucleus and proton (+) are introduced.	
.....	Negatively charged particles are called electrons. The atom is thought of as electrons scattered inside a positively charged mass.	
.....	Electrons exist in a region around the nucleus called the electron cloud, instead of energy levels.	
.....	Each type of matter is only made up of one type of atom. Atoms are too small to be seen.	
.....	Electrons are arranged in energy levels. Lower energy levels are close to the nucleus and higher energy levels are farther away from the nucleus.	

THINK ABOUT IT Why can't scientists see inside an atom?

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