

The Atom: From Philosophical Idea to Scientific Theory

Section Review 3.1

DIRECTIONS: Write on the line at the right of each statement the letter preceding the word or expression that best completes the statement.

1. The schoolteacher who studied atoms and proposed an atomic theory was (a) John Dalton; (b) Jons Berzilius; (c) Johann Dobereiner; (d) Dmitri Mendeleev. _____ 1
2. According to Dalton's atomic theory, atoms (a) are destroyed in chemical reactions; (b) can be subdivided; (c) of a particular element are identical in size, mass, and other properties; (d) of different elements cannot combine. _____ 2
3. One part of Dalton's atomic theory that has been modified is the idea that (a) all matter is composed of atoms; (b) atoms of different elements have different properties and masses; (c) atoms can combine in chemical reactions; (d) atoms cannot be subdivided. _____ 3
4. Dalton's atomic theory successfully explained the law of (a) whole-number ratios; (b) definite proportions; (c) conservation of mass; (d) conservation of energy. _____ 4
5. The law of definite composition (a) contradicted Dalton's atomic theory; (b) was explained by Dalton's atomic theory; (c) replaced the law of conservation of mass; (d) assumes that atoms of all elements are identical. _____ 5
6. The fact that lead forms two oxides of different formulas, PbO and PbO₂, is an example of the (a) periodic law; (b) law of multiple proportions; (c) atomic law; (d) law of conservation of mass. _____ 6

DIRECTIONS: Write on the line at the right of each statement the word or expression that best completes the meaning when substituted for the corresponding number.

7. Water, H₂O, has a mass ratio of oxygen to hydrogen of 8:1. Hydrogen peroxide, H₂O₂, has a mass ratio of oxygen to hydrogen of (7). _____ 7
8. If 3 grams of element C combine with 8 grams of element D to form a compound CD, (8) grams of D are needed to form compound CD₂. _____ 8
9. Evidence in support of the law of (9) is that in oxides of nitrogen, such as N₂O, NO, NO₂, and N₂O₃, atoms combine in small whole-number ratios. _____ 9
10. (10) is the person credited with being the first to recognize that the relative number of atoms that combine are proportional to the masses that combine. _____ 10
11. An example of the law of (11) is the fact that the mass ratio of two elements in a compound is constant. _____ 11
12. If atoms of element D weigh three mass units and atoms of element E weigh nine mass units, a chemical compound composed of one atom each of D and E will weigh (12) mass units. _____ 12
13. If 2 grams of element A combine with 10 grams of element B, then 12 grams of element A will combine with (13) grams of element B. _____ 13

DIRECTIONS: Write the answers to the following on the lines provided.

14. State the law of multiple proportions. _____

 _____ 14

15. State the two main ideas of Dalton's atomic theory that have remain unchanged since he first proposed his theory. _____

 _____ 15

Composition of the Atom

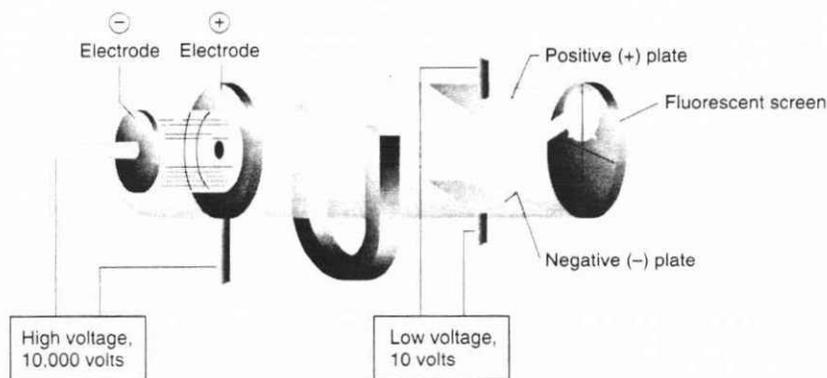
Name _____

Class _____

Date _____

A. Charged Particles

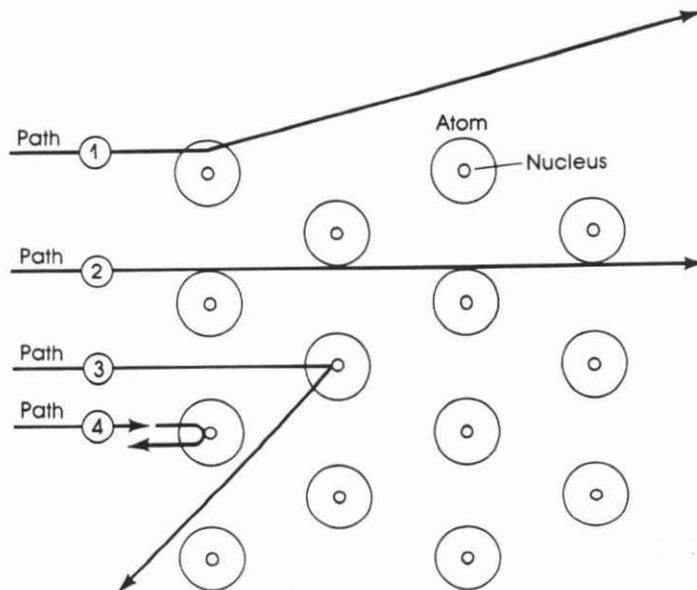
In 1897, J.J. Thomson constructed a Cathode Ray Tube like the one depicted below, filled with gas at very low pressure. When a high voltage is applied to the electrodes, a glowing beam is projected toward the fluorescent screen, creating a pinpoint glow. The position of the glow shows that the beam is deflected down when the magnet is put in place and up when a charge is applied to the plates near the fluorescent screen.



1. William Crookes had already demonstrated the deflection of the beam caused by the magnet. The deflection established an important fact about the glowing beam. Why was the deflection significant?

2. After passing the magnet, the beam is redirected by the field between the charged plates. What is the significance of the fact that the beam is deflected up toward the positively charged plate?

What is the beam composed of? _____



- Which of the four paths is most common?
a. 1 b. 2 c. 3 d. 4
- Which of the four paths is least common?
a. 1 b. 2 c. 3 d. 4
- Path 2 is a straight line because of the alpha particles'
 - magnetic repulsion.
 - high velocity.
 - distance from gold nuclei
 - interaction with electrons
- Path 4 will most likely
 - never be observed.
 - be characteristic of only the fastest-moving alpha particles.
 - be characteristic of alpha particles that collide with a nucleus.
 - result in an atomic reaction.
- When Rutherford analyzed his results, he suggested that
 - the atom is mostly empty space.
 - the atomic center is positive in charge.
 - the mass of an atom is mostly in a small, dense center.
 - all of the above

C. Nuclear Symbols

Chemical symbols are often accompanied by notation that gives information on atomic composition. The subscript, written to the lower left of the chemical symbol, represents the atomic number. The superscript, written to the upper left of the symbol, represents the mass number, or total number of protons and neutrons. Using this information, complete the table on page 38. Assume that the mass of a neutron or the mass of a proton is 1 amu.

5. What is radioactivity?

6. Explain why the results of Rutherford's gold foil experiment startled him.

7. How did Rutherford's model illustrate his experimental results?

8. Rutherford proposed that the nucleus of an atom also contained neutral particles. Why did he make this proposal? What are those neutral particles now called?

9. Discuss how Rutherford's atomic model differs from Thomson's.

10. Where is most of the mass of an atom found?

11. What occupies most of the volume of an atom?