POWER BASICS PLUS

Chemistry

Workbook

WALCH PUBLISHING

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Unit 4: Topics in Chemistry

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UNIT 2 • ACTIVITY 24
Dalton's Atomic Theory

John Dalton was an English schoolteacher who was serious about his search for an atomic theory. The following is a brief summary of his atomic theory:

1. All matter is composed of tiny particles called atoms, which are indivisible.
2. All atoms of a given element are identical; in particular, they have the same mass.
3. All atoms of a given element are distinct from all atoms of any other element; in particular, they have different masses.
4. Chemical compounds form when atoms combine in whole-number ratios.
5. Atoms cannot be created or destroyed in a chemical reaction.

Although Dalton's theory was quite an advance for its time, it has flaws that were corrected when new information became available.

Research the three major differences between Dalton's atomic theory and modern atomic theory. Describe those differences in a brief essay on another sheet of paper. In the space below, write research notes, brainstorm ideas, or organize information.

NAME:

UNIT 2 • ACTIVITY 25
John Dalton

John Dalton was an English chemist, physicist, schoolteacher, meteorologist, and college professor who lived from 1766 to 1844. Dalton made an impressive number of contributions to fields such as chemistry, optics, and meteorology. The following are some of Dalton's contributions:

- constructed his atomic theory in chemistry
- discovered color blindness, which is still called Daltonism
- stated what is now known as Gay-Lussac's gas law before Gay-Lussac himself did
- stated his law of partial pressures
- created his own table of atomic weights
- stated the law of multiple proportions, which contradicted a popular theory that had existed for at least 2200 years
- explained the law of definite proportions
- discovered that when some kinds of salts were added to water, the volume of the solution did not increase

Write two analogies that describe the law of definite proportions and the law of multiple proportions.

Example: The law of definite proportions is similar to when you take apart the ingredients in a bottle of cola. There will always be a fixed amount of sugar, a fixed amount of water, and a fixed amount of caffeine. The ratios are always the same.

1. _____

_____

_____

_____

2. _____

_____

_____

_____

NAME:

UNIT 2 • ACTIVITY 26
Joseph Proust

Joseph Proust was a French chemist who lived from 1754 to 1826. Like many academics of the time, he worked in many fields. He was a hot-air balloon flight instructor and a chemistry teacher at an artillery school, for example.

Proust's claim to fame in chemistry was his formulation of the law of definite proportions. This law states that the proportion by mass of the elements in a given compound is always the same. Using this law, he was able to show that there were actually three different kinds of sugars in some vegetables and thereby discovered glucose, fructose, and sucrose. Proust spent a fair amount of time defending his law against a well-known scientist of the day named C. L. Berthollet, who believed that elements could combine in any combination given the correct conditions. (In the time of Proust and Berthollet, the equipment needed to make the incredibly small measurements did not exist. Much of the equipment was constructed by chemists who were often inventing the laboratory equipment they needed as they went along.)

On another sheet of paper, write a brief essay describing how the law of definite proportions makes it easier to determine the products formed by a chemical reaction. In the space below, brainstorm ideas, organize information, or write a first draft.

NAME:

UNIT 2 • ACTIVITY 27
Electrons, Protons, and Neutrons

The particles that make up most atoms include protons, neutrons, and electrons. These particles are quite small and have tiny amounts of electric charge associated with them. In the case of the neutron, the charge is zero. Below is a chart that summarizes the properties of these particles.

Particle	Symbol	Charge	Mass
electron	e	-1.6022×10^{-19} C	9.1094×10^{-31} kg
proton	p	$+1.6022 \times 10^{-19}$ C	1.6726×10^{-27} kg
neutron	n	0	1.6749×10^{-27} kg

Using the chart above and the periodic table, answer the following questions.

1. How many protons are there in a carbon-12 atom? _____
2. How many electrons are in a carbon-12 atom? _____
3. How many neutrons are in a carbon-12 atom? _____
4. How many particles make up a carbon-12 atom? _____
5. What is the mass of the protons in an oxygen-16 atom? _____
6. What is the mass of the neutrons in an oxygen-16 atom? _____
7. What is the mass of the electrons in an oxygen-16 atom? _____
8. What is the total mass of one oxygen-16 atom? _____
9. What is the charge on the electrons in a calcium atom? _____
10. What is the charge of the protons in a calcium atom? _____
11. What is the charge of the neutrons in a calcium atom? _____
12. What is the total charge on a calcium atom? _____