Nice Try, But . . .

Antoine Laurent Lavoisier was a meticulous scientist. He realized that Rutherford and Priestley had carefully observed and described their experiments but had not measured the mass of anything. Unlike his colleagues, Lavoisier knew the importance of using a balance. He measured the masses of reactants and products and compared them. He observed that the total mass of the reactants equaled the total mass of the products. Based on these observations, which supported what would become known as the *law of conservation of mass,* Lavoisier endeavored to explain the results of Rutherford and Priestley.

Lavoisier put some tin in a closed vessel and weighed the entire system. He then burned the tin. When he opened the vessel, air rushed into it as if something had been *removed* from the air in the vessel during combustion. He then measured the mass of the burned metal and observed that this mass was greater than the mass of the original tin. Curiously, this increase in mass equaled the mass of the air that had rushed into the vessel. To Lavoisier, this change in mass did not support the idea of phlogiston escaping the burning material. Instead, it indicated that during combustion, part of the air reacted with the tin.

TABLE OF SIMPLE SUBSTANCES.

Simple fubftances belonging to all the kingdoms of nature, which may be confidered as the elements of bodies.

New Names.	*Correfpondent old Names.*
Light	*Light.*
Caloric	*Heat.* *Principle or element of heat.* *Fire. Igneous fluid.* *Matter of fire and of heat.*
Oxygen	*Dephlogifticated air.* *Empyreal air.* *Vital air, or* *Bafe of vital air.*
Azote	*Phlogifticated air or gas.* *Mephitis, or its bafe.*
Hydrogen	*Inflammable air or gas,* *or the bafe of inflammable air.*

▲ *Lavoisier's concept of simple substances was published in his book* Elements of Chemistry *in 1789.*

After obtaining similar results by using various substances, Lavoisier concluded that air was not an element but a mixture composed principally of two gases, Priestley's "dephlogisticated air" (which Lavoisier renamed *oxygen*) and Rutherford's "phlogisticated air" (which was mostly nitrogen but had traces of other nonflammable atmospheric gases). When a substance burned, it chemically combined with oxygen, resulting in a product Lavoisier named an *oxide.* Lavoisier's theory of combustion persists today. He used the name *oxygen* because he thought that all acids contained oxygen. *Oxygen* means "acid former."

The Father of Chemistry

By emphasizing the importance of quantitative analysis, Lavoisier helped establish chemistry as a science. His work on combustion laid to rest the phlogiston theory and the theory that air is an element. He also explained why hydrogen burned in oxygen to form water, or hydrogen oxide. He later published one of the first chemistry textbooks, which established a common naming system of compounds and elements and helped unify chemistry worldwide. These accomplishments earned Lavoisier the reputation of being the father of chemistry.

Questions

1. Why does the mass of tin increase when tin is heated in air?
2. What was the composition of Priestley's "dephlogisticated air" and Rutherford's "phlogisticated air"?