

# How a Lead Acid Battery Works

**Pb=metal lead**

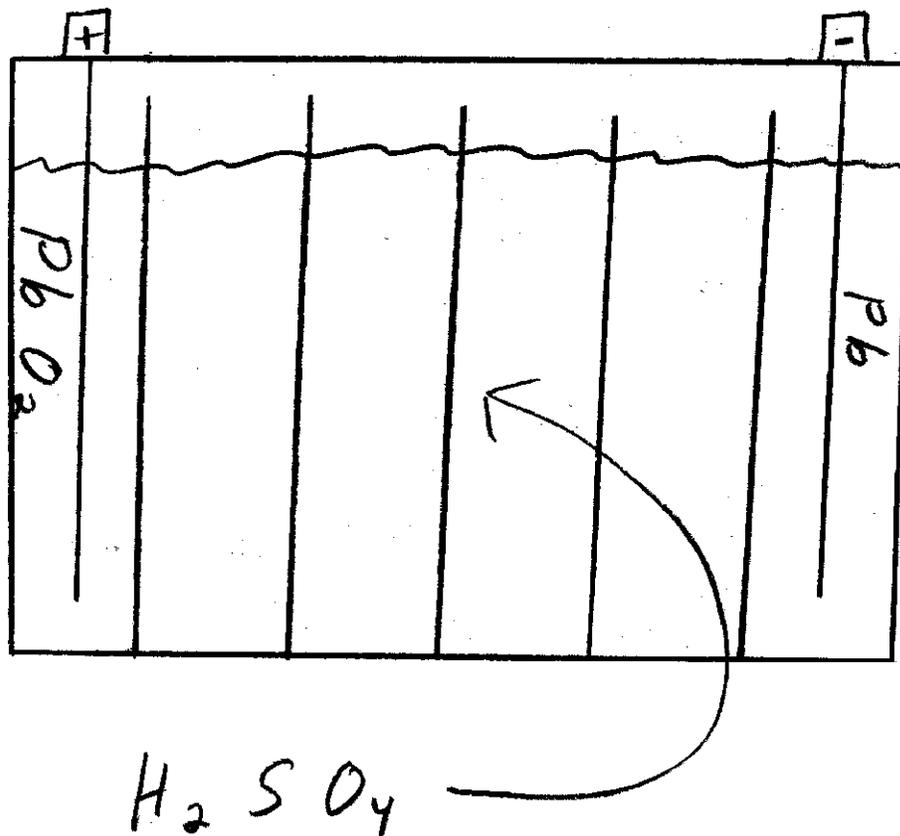
**PbO<sub>2</sub>=lead dioxide**

**PbSO<sub>4</sub>=lead sulfate**

**H<sub>2</sub>SO<sub>4</sub>=sulfuric acid**

A standard 12-volt lead acid battery consists of six cells. Each cell is made up of an equal number of negative and positive plates immersed in a solution of 33% sulfuric acid and water. The cells connect to a bus that connects them in series to the positive and negative posts.

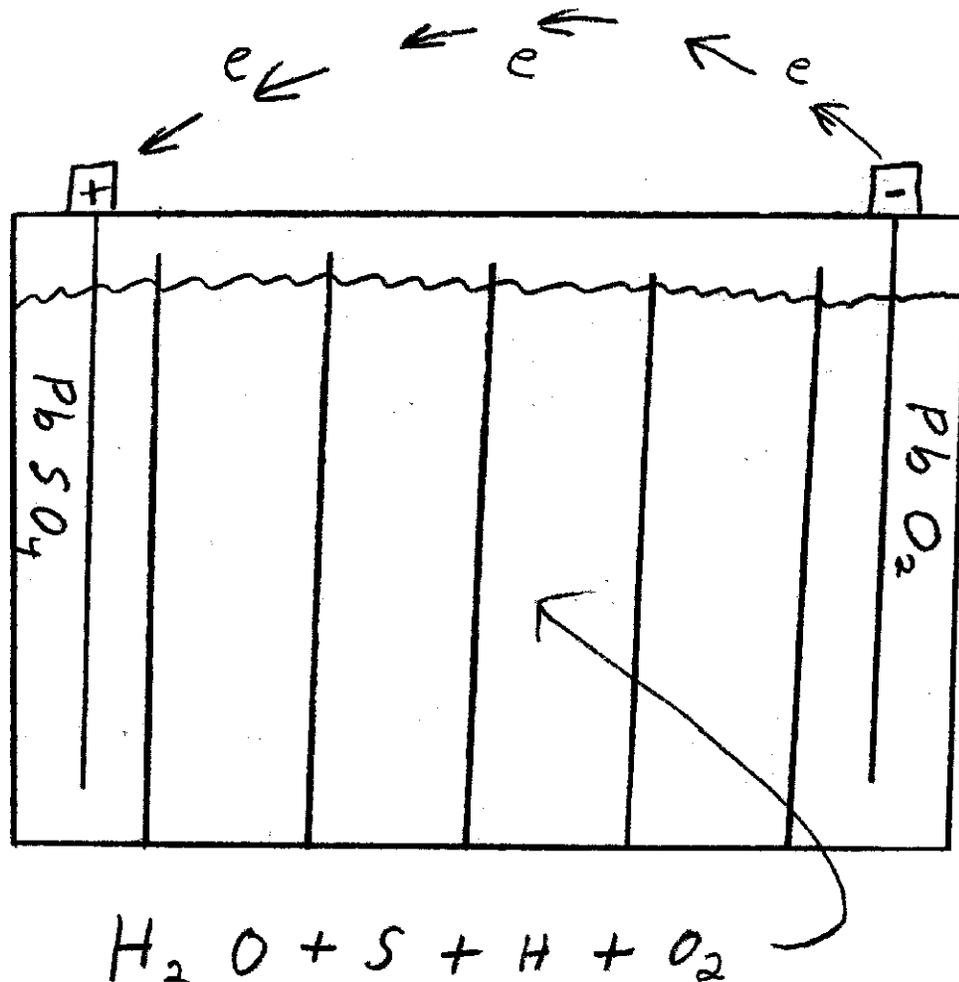
Each cell can produce approximately 2.05 volts. With the cells in series, the overall terminal voltage should be about 12.25 volts at rest with neither load nor charger connected.



When a load is connected, the metal lead that makes up the negative plate reacts with the sulfuric acid to form lead dioxide. The lead dioxide that makes up the positive plate reacts with sulfuric acid to form lead sulfate. The sulfuric acid electrolyte breaks down into water, free sulfur, hydrogen gas, and oxygen gas.

In order for these reactions to occur, the lead atoms that make up the negative plate must expel electrons while the lead dioxide molecules that make up the positive plate must receive electrons. The resulting flow of electrons from negative to positive can be used to do work.

However, the work stops when enough atoms and molecules have been used up to allow the reactions to move forward.



When the terminal voltage is elevated, as with a battery charger, the reactions reverse. Lead dioxide on the negative plate becomes metal lead again; lead sulfate on the

positive plate becomes lead dioxide; and the electrolyte mixture again becomes sulfuric acid.

Each time these reactions exercise, some components fail to return to their original condition. As a result, **all lead acid batteries begin to fail the instant they are made.** Eventually, age, heat, exercise, loss of fluid, and contamination along with other factors, bring about failure.

