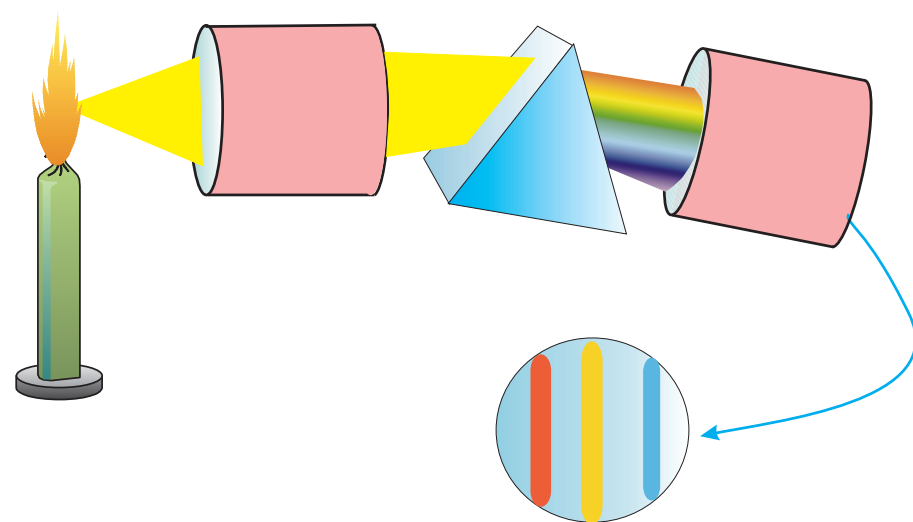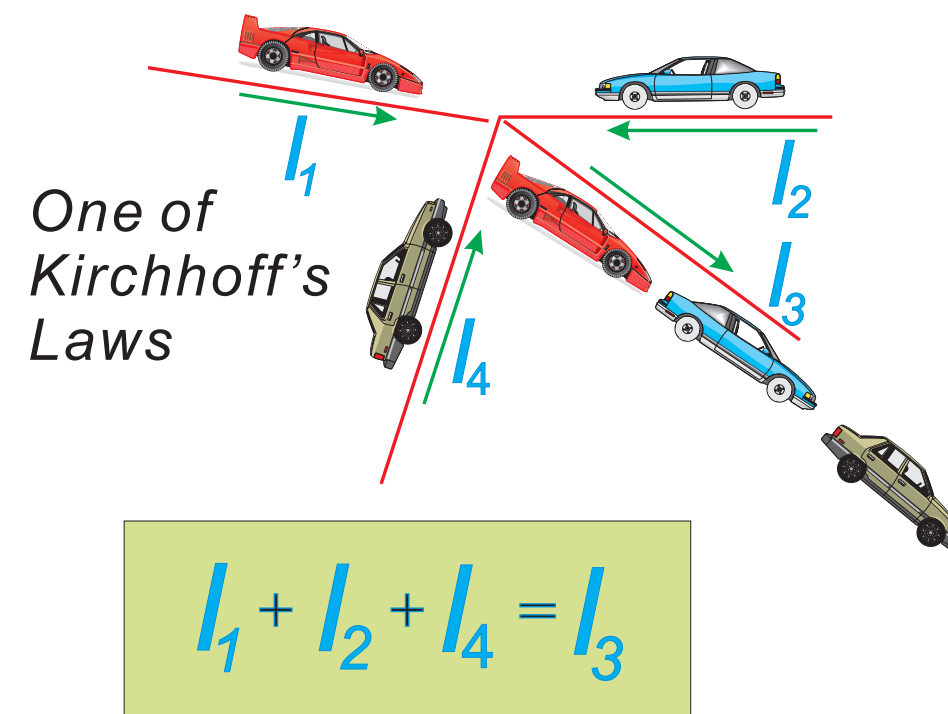# Gustav Robert Kirchhoff

## 1824 - 1887

Gustav Robert Kirchhoff was the famous German physicist who derived the laws now known as **Kirchhoff's laws** which state: **1) the total current entering any junction in a circuit is the same as the total current leaving it,** this is an expression of the conservation of electric charge; **2) the sum of the potential drops across each resistance in any closed loop in a circuit is equal to the total electromotive force acting in that loop**, this is the expression of the energy conservation. It is easy to understand: if you imagine a T-branch in a water pipe and you have one litre per minute coming in to one pipe, you can not have three litres per minute going out of the other two pipes.

Gustav Robert Kirchhoff was born in Königsberg. Kirchhoff's father, a law councillor, belonged to the strongly disciplined body of state functionaries. He regarded it as a matter of course that his sons would keep up, according to their diverse talents, the family's allegiance to the service of the Prussian state.

After graduating from the gymnasium, the young Kirchhoff entered Königsberg University. He formulated the so called 'Kirchhoff's law' while he was still a student in 1845.

In 1850 he became an Extraordinary Professor in Breslau. There he met a talented experimenter Robert Bunsen. Together, they made a great contribution to science. The collaboration of the two prominent physicists continued at Heidelberg University, where Kirchhoff supervised the Physics Department.

One of Kirchhoff's Laws

$$I_1 + I_2 + I_4 = I_3$$

Investigating the flames of various salts using a spectrometer they established that **each substance when heated emitted light that had its own unique pattern of spectral lines** a discovery that began the spectroscopic method of chemical analysis. Using this method they found two new elements: *caesium and rubidium*. They also studied the spectral lines of the Sun.

Kirchhoff's other important achievement was that he established that **the ratio of absorptive and emissive powers for each wavelength must be independent of the nature of the bodies at a given temperature.**

In 1875 he accepted a chair of theoretical physics in Berlin. He was an excellent teacher and gave a course of mathematical physics.

He was married. His first wife died in 1869, leaving him with two sons and two daughters. In 1872 he married for the second time.

Contemporaries described him as a cheerful person with an 'obliging disposition'. A disability from an accident, which compelled him to use crutches or a wheelchair, did not alter his cheerfulness and he bore the long illness of his later years with patience.

He studied light spectra using the spectrometer

S.E.