Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1999 Volume V: How Do You Know? The Experimental Basis of Chemical Knowledge

The Rediscovery of Matter: A Historical Trek Through Classical Chemistry

Guide for Curriculum Unit 99.05.03
by Theodore L. Johnson

The technological development that launched the modern society into the space and computer age has relied heavily on a number of basic scientific principles. For example, our electron manipulation makes it possible for computers to functions properly or electricity to power our homes. Despite these types of contributions, the average citizen, regrettably, has little true appreciation for science; what one cannot see, feel, or touch becomes magical, beyond his/her ability to comprehend. This may explain why students often have difficult grasping scientific concepts. As teachers we must reincarnate science by explaining the tricks behind the magic. Through discussions, experimentation, and review and analysis of the classic experiments, we can rediscover those basic laws, theories and principles and thereby guide students toward a better understanding of science.

This unit explores that historical development of the modern atomic theory through the study of matter and the analysis of several classic experiments. It begins by asking the question "What is matter?". Students will collectively develop a definition though discussions and debates of several ancient philosophical theories by individuals like Plato, Anaxinander, Aristotle, etc. By first developing an independent picture of matter students will be able to recognize any flaws in their definition as new facts, concepts, and/or laws regarding matter are presented. To monitor the progress at constructing a well-formulated definition students will keep a journal. Once a working definition of matter is developed, the unit will proceed with of the study of classic experiments by scientist like Dalton, Faraday, Thomson, Millikan, and Rutherford. As major theme throughout the unit is *rediscovering of matter* students become the scientists and, presented with experimental data, must interpret and make conclusions. This method will allow students to seek a clear understanding of why and how the established conclusions were made.

With the review of classic experiments completed, students will establish connections between their findings through debate and discussion, and formulate a hypothetical atomic theory. Students can than review the actual atomic theory as it exist today and compare and contrast this theory with their hypothetical theory.

(Recommended for Chemistry, grades 9-12.)