

Introduction to the Course

(as opposed to the book)

This text is intended to provide an in-depth introduction to the key ideas in chemistry. We have designed the book to show how these ideas are developed from simple to complex systems and how they relate to each other. We consider three ideas central to an understanding of chemistry: the structure of matter, the properties of matter, and the energy changes involved in the reorganization of matter; all are connected by the interactions or forces that cause matter to interact. We aim to provide compelling reasons why you will find yourself wanting to learn chemistry and to illustrate what you will be able to do with this knowledge once you have learned it.

We hope that you will find the book both readable and engaging, but keep in mind, it is not intended to contain everything that will be learned in this course. It is purposely not cluttered with boxes, asides, and long descriptions about how to solve problems or learn other skills such as learning how to construct a scientific explanation, or developing a model. This is not because these aspects of chemistry are unimportant – quite the contrary – but rather that there is little evidence that reading a book will lead to effective mastery of such skills. Instead, you will work with activities within the class. We have designed these to be interactive and to support and expand on the text. In some cases these ancillary materials introduce ideas that are not, perhaps, as engaging to read about even though they are important to master. These ancillary CLUE materials include:

1. A set of class presentations and activity materials;
2. A set of YouTube videos showing how to do various skills and solve different types of problems; and
3. A set of online activities using the beSocratic system that can be done in class, in recitation, or for homework.

Much like the “questions to answer, questions to ponder, and questions for later” sections of the book, these ancillary activities require you to actively construct answers rather than choose from a list of responses. This is a deliberate focus of the CLUE curriculum because we have compelling evidence that drawing, writing, and constructing answers help students learn more deeply. These materials are also available as worksheets that can be done off-line.

Materials integral to the CLUE curriculum but that are not covered exhaustively in the text are:

1. Common chemistry calculations, illustrated by YouTube videos, including:
 - Stoichiometry;
 - Energy, frequency, and wavelength conversions;
 - Mass energy conversions;
 - Thermochemistry, including specific heat, bond energy and entropy, enthalpy, and Gibbs energy;
 - Equilibrium calculations, pH and K_a ;
 - Reaction rates and rate law determinations; and
 - Buffers and linked chemical reaction energy changes.
2. Common skills, including:
 - Electron configurations, particularly to determine the number of valence electrons;
 - Drawing Lewis structures;
 - VESPR;
 - Assigning oxidation numbers; and
 - Using curved arrows to predict the outcome of simple reactions.