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Chapter 1 : McMurry & Fay, General Chemistry: Atoms First | Pearson

My school now has the full solutions manual available to use in the library so I'm able to see how additional problems are calculated. I wish I'd had that for the first half of the textbook. Having additional problems to practice and being able to see the step by step of how to calculate the answers really helps you to master and understand the.

Their attitudes and levels of preparation greatly affect the quality of education that the students receive. Following is an excerpt from the TA manual used at the University of Illinois. We hope these comments will also be helpful to TAs at other institutions. The quality of the instruction is highly dependent on your attitude and your teaching skills. You have most of the close contacts with the students and thus can most directly influence their performance. It is very important that you take this responsibility seriously and do the best job possible. Following are some specific suggestions that you should find helpful. Spend some time thinking about the learning process. Think about your experience as a student. Figure out why some teachers were very effective and others very ineffective. Your long experience as a student is excellent preparation for your teaching career. Your attitude is crucial in setting the correct tone for your class. Project a positive attitude toward your students and the subject. Let this enthusiasm shine through. Avoid being cynical and negative. Poor attitudes will rub off on your students. Your attitude has a very important effect on the attitudes of your students. Be sure to help students realize that chemists use terms in many ways and they need to look at the context of the word to be sure that they understand what is intended. Chemists are accustomed to thinking about things at the macroscopic and microscopic level simultaneously. Encourage students to think about what they read and to consider how the terms are being used. John Dalton was trying to explain laws such as the law of constant composition. The success of this makes the model successful, but not absolutely correct a model is always a simplification. But no model answers all questions. To characterize electromagnetic radiation in terms of wavelength, frequency, and speed. To introduce the concept of quantized energy. To show that light has both wave and particulate properties. To describe how diffraction experiments were used to demonstrate the dual nature of all matter. To show that the line spectrum of hydrogen demonstrates the quantized nature of the energy of its electron. To describe the development of the Bohr model for the hydrogen atom. To show how standing waves can be used to describe electrons in atoms. To describe the Heisenberg uncertainty principle. To explain the significance of electron probability distributions. To explain the quantum numbers n, l, and ml. To describe the shapes of orbitals designated by s, p, d, and f and to discuss orbital energies. To define electron spin and the electron spin quantum number. Chapter Discussions To explain the Pauli exclusion principle. To show how the quantum mechanical model can be applied to atoms besides hydrogen. To trace the development of the periodic table. To explain the Aufbau principle. To show general trends in ionization energy, electron affinity, and atomic radius in the periodic table. To show what types of information can be obtained from the periodic table. This chapter combines into one what many texts do in two. Particular attention is paid to the relationship between models and facts. The order of topics is very similar to texts that treat electronic structure and the periodic table separately. The nature of light and the quantum mechanical model of the hydrogen atom are discussed. Then the historical development of the periodic table is followed by a discussion of the quantum mechanical model of polyelectronic atoms and how the model fits the periodic table. In discussing polyelectronic atoms, observation and the periodic table are emphasized. The concept of shielding is used to rationalize the periodic trends in size, ionization energy, and electron affinity. At first this may seem to be too sophisticated and abstract an approach for first-year chemistry students. However, the approach is very pictorial and easy to comprehend. We have found this approach to work well in our classes. Combining the atomic theory with the periodic table makes this easier. The last part of the chapter discusses the periodic trends and properties of the alkali metals. This presents the instructor with another opportunity to integrate more descriptive chemistry in with the chemical principles. Chapter 19 is organized to discuss the elements by periodic group. Instructors may choose other groups from these chapters to illustrate chemical periodicity. A further point should be made concerning atomic radii. The volumes given in Chapter 2 are for covalent radii. The covalent radii of He, Ne, and Ar are estimates. All comparisons of atomic sizes to each other can be done consistently with this set of radii. In Chapter 3, instructors may want to compare the sizes of a series of ions to the isoelectronic noble gases. The radii of the noble gases for this comparison should be the univalent crystal radii. Huheey1 and Pauling2 provide detailed information on uses of ionic radii and tables of their values. A person can move from one step to another or even move up 2 or 3 steps and down a similar number. It is not possible however to move up or down a part of a step. Within atoms electron energies are quantized â€" the energy levels are like stairsteps. Electrons can change only between established energy levels, not in between. Compare this to using a ramp which is like continuous energies. Students often forget that they are observing multiple atoms simultaneously when observing a line emission spectrum. It is comforting to students to realize that this topic is complicated even to people who have been studying it for awhile. The mercury vapor lights have a blue cast, while the sodium lights are yellow and neon lights are more orange. You may also want to discuss the difference between an incandescent light and a vapor light. Many students think all lights are the same. They may not realize that an incandescent lamp produces a continuous spectrum since the tiny filament is radiating all wavelengths of visible light while vapor lamps like many street lights are more like gas discharge tubes in their operation. A discussion of this model is useful in discussing the nature of science. The Bohr model is a relatively simple model with the sole intent of explaining the results of the hydrogen emission spectrum. It succeeded in doing so and this is why it was considered powerful. However, this model does not fit polyelectronic atoms and electrons do not move in fixed orbits. This will be new to all students and most will find it confusing. It is a fundamental change from determinism in looking at the world and it is understandable that students will have difficulty with it. For example, students Chapter Discussions will tend to think of orbitals as physical structures and will find it difficult to think of them as probability distributions. This is a good way for the students to think about it initially. An orbit describes a particular path an object follows as it travels around another. For example, the moon has an orbit about the earth. Electrons do not follow a particular path around the nucleus. An orbital describes the volume around the nucleus where an electron is likely to be found. The exact path of an electron in this area is not known. In the hydrogen atom the 2s and 2p orbitals have the same energy. However, multiple electrons change this. With multiple electrons, in a given energy level the s orbitals are lower in energy and thus filled first than the p orbitals, which in turn are lower in energy than the d orbitals. Once they see that they can just move across the rows, filling electrons into the s and p orbitals, electron configurations become much easier to write. This should be used to emphasize the periodicity of the periodic table even though the table was invented before the discovery of electrons. Thus, the students should realize that with an understanding of how the periodic table is put together, the students can figure out the expected electron configuration of any element. They need not memorize these. If they understand these trends, the trends for ionization energy are much easier to grasp. The students should be able to see that the trends for atomic size and ionization energy are consistent with one another. Energy is always required to remove an electron, and successive electrons can only be removed with an increasing amount of energy. This emphasis on models is extremely important in chemistry and will be further stressed in Chapter 7. When several hundred incoming UIUC students were asked what happens to the size of molecules and to the mass of a sample as ice is heated until it is steam , about one-third of the students believed that the mass and molecular size varies.

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