

Department: CHEM

Course No.: 101

Title: Chemistry for an Informed Electorate

Credits: 3

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Content Area: CA3 Science and Technology

Catalog Copy: 101. Chemistry for an Informed Electorate Either semester. Three credits. Three class periods. Not open to students who have passed CHEM 122, 127, 129, 137, or 153. *Knox* Basic concepts and applications of chemistry. Contributions of chemistry to our everyday lives. Chemical issues and problems in our society. Designed for students in fields outside of science. Assumes no prior knowledge of chemistry.

Course Information:

a. Course Goals and Objectives.

This course is designed for students who are not majoring in science, students who might have been turned off by negative experiences in previous science classes. One goal is to try to reverse this conditioning. Besides the fact that learning science has intellectual value in its own right, our citizens are generally being exposed to more and more scientific information, much of it molecular in nature, that requires some knowledge of chemistry to understand and interpret. The overall goal of the course is to study basic chemistry in order to explore areas and issues involving molecular science that directly affect the lives of students and citizens in general. Some of the individual objectives are: To become conversant in the language of chemistry (atoms, molecules, formulas, structures etc.). To use this knowledge to explore related areas of interest (e.g. pollution, energy sources, food additives etc. To interpret quantitative and graphical such as might be found in the popular press (e.g. trace concentration units of pollutants, dosages of drugs, etc.). To distinguish scientific fact from interpretation when looking at controversial issues (e.g. global warming). To relate scientific data to political, economic, and social issues. To recognize models as an integral part of scientific inquiry. To explore the limitations of science.

b. Course requirements.

1. There are in-class exams in addition to the final. Each exam has questions ranging from totally factual (elements, compounds, formulas etc.) to interpretive questions in which students can flex their intellectual muscles (should the U.S build more nuclear power plants)? A question of the latter type would include first the fundamentals of nuclear energy and would be graded not on the specific answer but on how well it was backed up scientifically. In between, might be some analytical questions (which of the following compounds might make good active ingredients in sun tan lotion and why?).

2. There are weekly homework questions. These include a lot of basic material with one or two thought questions often included. The latter are discussed in class.

3. There are some in-class "workshops" and discussions. These could range from a structure "workshop" building with molecular models to a discussion on whether developing countries should get a break when it comes to use of CFC's.
4. Students keep a "News Portfolio" by collecting on a weekly basis articles related to chemistry from newspapers and magazines in the popular press. Three or four times a semester, these are discussed in class.
5. Students may be required to write a short paper (5 pages) on a chemical issue.

c. Major Themes.

The fundamental theme is the structure of chemical knowledge: atoms, molecules, compounds, reactions, bonding, molecular structure and its relationship to function. This is interwoven and developed throughout the course using topics of interest to the students in particular and to our society in general. The group of topics can change from semester to semester but would include some of the following, not necessarily in the order or organization given:

- Carbon compounds: Synthetic compounds vs. "natural" compounds
- Synthetic Polymers
- Biochemistry
- Foods and Nutrition
- Drugs and Pharmaceuticals
- Toxicology
- Household chemicals
- Agricultural Chemicals
- Water Resources and Pollution
- pH, acid rain trace concentration levels etc.
- regulations: Safe Drinking Water Act, Clean Water Act, TRI etc.
- The chemical industry Green chemistry
- Waste disposal
- Air Pollution
- Clean Air Act
- Ozone depletion
- Greenhouse gases, global warming
- Energy Sources
- Fossil fuels and combustion
- Alternative energy Sources
- Battery power (Ni/Cd, Ni. Metal hydride)
- Fuel cells
- Solar energy
- Nuclear chemistry Power Other uses Weapons

Meets Goals of Gen Ed:

Students who successfully complete Chemistry 101 will come away with a basic knowledge of chemistry and some of its applications to technology. They will appreciate the relationship between data, hypothesis, and theory. They will gain some understanding about the intersection

of science, politics, and economics. Hopefully they will learn enough to make informed decisions about scientific issues on a personal level or as voters, or at the very least they will know what questions to ask and where to begin to get answers. In the best of all possible worlds, the course will have piqued an interest in scientific issues and they will continue to learn more on their own. And in a few unusual cases, perhaps some students will even decide to pursue science as a major interest!

CA3 Criteria:

Criterion #1: Explore an area of science and technology.... The course presents a complete picture of the field of chemistry at a level needed in order to understand the issues explored.

Criterion #2: Promote an understanding of.... In at least one of the units, data, hypotheses, development and application can be addressed explicitly. For example, the nature of ozone depletion is a good issue to use in addressing this criterion. There is some incredible graphical data showing the decrease in stratospheric ozone as the concentration in atomic chlorine in the stratosphere increases. Rowland and Molina earned the Nobel Prize for their sorting out of this data to implicate CFC's in ozone depletion. We can look at the set of chemical reactions that fit the data and are consistent with the hypothesis. There are any number of areas in which one can look at such interplay between data and hypothesis: pharmaceutical investigations, use of herbal products, effects of insecticides or herbicides etc.

Criterion #3: Introduce students to unresolved questions.... A perfect unresolved question is global warming. It is also the perfect place to talk about scientific models. In the past, we have had a class discussion on global warming after which students have been asked to take a stand on emission controls based on scientific facts, not emotion. There are certainly many other examples of material in the course that would serve the same purpose.

Criteria #4: Promote interest, competence.... We attempt to hold the interest of the class by choosing topics that they are interested in and/or that directly affect them. The news portfolio assignment seems to have gotten students interested in learning more when they see that many of the issues they are reading about are dealt with in class. Hopefully, they will continue to read the NY Times Science Page or at least their local newspaper even when they no longer have to hand in and respond to news articles.