

**State University of New York -Cortland  
Course Syllabus  
CHE 125 – Chemistry in the Environment  
College of Science and Arts  
Spring 2010**

***Instructor Information***

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Instructor: Raphael Klake, PhD  
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Office Hours: M 3:00Pm – 4:00pm or by appointment

***Course Identification***

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Course Number: CHE 125  
Course Name: Chemistry in the Environment  
Course Location: 108 Bowers Hall  
Class Times: MWF 12:40pm – 1:30pm  
Prerequisites: High School Algebra

***Course Description/Overview***

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Basic chemical principles applying to understanding modern environmental problems; food, materials, energy, pollution. Three lectures and/or demonstrations. Fulfills: GE 2 and GE 13; LASR. (3 cr. hr.)

***Course Learning Objectives***

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Rationale: Many of the serious problems facing mankind in the future are brought about by the changes in the chemical makeup of the environment resulting from the increasing need for energy, food, and the variety of materials necessary for life as we know it. These problems must be addressed and require an understanding of chemical principles in order for effective solutions to be found.

Objectives: Students completing the course will be able to:

1. Understand the basic chemical principles behind the current environmental problems.
2. Make informed judgments concerning environmental problems discussed in the media.
3. Understand the necessity of caring for the environment.
4. Understanding of the current environmental topics by researching the literature for their reports and from listening to other student reports.
5. Relate chemical ideas to major societal/environmental issues

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6. Develop problem-solving and critical thinking skills
7. Grasp the complexity of risk/benefit assessments

**Course Resources**

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**Course Website(s)**

<https://blaze.cortland.edu/cp/home/displaylogin>

**Required Course Text**

Required text: Chemistry in Context – Applying Chemistry to Society. Eubanks, L.P., Middlecamp, C.H., Heltzel, C.E., and Keller, S.W. 6th Edition, McGraw Hill, 2009  
(b) A scientific calculator is required.

**Other Resources:**

The internet can be a very useful tool, especially the Chemistry in Context web site. You should familiarize yourself with is the ACS-McGraw-Hill Online Learning Center at Choose the student side for the 6th Edition. Available resources, including interactive practice, self-checking quizzes and access to course-related web sites. ([www.mhhe.com/cic](http://www.mhhe.com/cic)).

**Grading Scheme**

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**IV. Grading Procedures: Grades**

Grades will be based on the following:

Quizzes (7) Best six	120
Assignments (5)	100
One hour exams (3)	300
Group work	80
Final	200
Total	800

Grades will be assigned on the basis of the overall score as follows

97-100 = A<sup>+</sup>      87-89 = B<sup>+</sup>      77-79 = C<sup>+</sup>      67-69 = D<sup>+</sup>      <60 = F

93-96 = A      83-86 = B      73-76 = C      63-66 = D

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90-92 = A<sup>-</sup>      80-82 = B<sup>-</sup>      70-72 = C<sup>-</sup>      60-62 = D<sup>-</sup>

Examination Schedule

Exam 1	February 19, Friday	11:30-12:20
Exam 2	March 29, Wednesday	11:30-12:20
Exam 3	April 21, Wednesday	11:30-12:20
Final	May, TBA	

***Course Policies***

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**II. Format and Procedures:**

The lectures are based on the material presented in the textbook. However, some of the material presented in class may be taken from other sources. A variety of activities will be held during lecture; it will not only be in lecture format. Some examples of these activities are working on problems in teams, having group discussions, playing occasional games, solving practice problems, answering student questions, and completing writing exercises.

Cellular phones and pagers with audible ringers are not permitted in the classroom during lectures or examinations. Anyone who disturbs the class with any such devices will be expelled from the class for that particular period.

**III. Course Requirements:**

1. Class attendance and participation policy:

“It is the policy of the College that regular class attendance is a basic requirement in all courses. However, as long as absences are not excessive, it shall be the students’ performance and not their attendance record which shall determine their course grades. Penalties for excessive absences, as determined by the instructor’s policy, shall not exceed one-third of a letter grade per class hour of absence” (SUNY Cortland College Handbook: 2006-2008, 410: 12A). For this course, a total of four absences will be acceptable. Absences in excess of this will result in deductions of one-third of a letter grade for each class hour missed.

Recommended problems will not be graded but will form the bases of the one hour exams. Students are expected to take all exams and quizzes.

**There will be no makeup exams during the semester. If an exam is missed, the final exam score scaled to 100 will replace the missed exam score. Only one exam grade can be replaced.**

### ***University Policies***

#### ***Collaboration/Plagiarism Rules***

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Each student in this course is expected to abide by the SUNY- Cortland Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action. Academic dishonesty will be dealt with in accordance with chapter 340 of the S UNY Cortland College Handbook

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[http://www.cortland.edu/copyright/default.asp?page\\_id=11](http://www.cortland.edu/copyright/default.asp?page_id=11)

#### **Affirmative Action:**

<http://www.cortland.edu/hr/aaction.html>

#### **Disability Services:**

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Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know of, or who need special arrangements in the event of an evacuation, should make an appointment with the instructor as early as possible in the semester, preferably during the first 2 weeks of the semester. Students are encouraged to register with Student Disability Services Located in B- 40 van Hoesen Hall or Call (607) 753-2066 for appointment. to verify their eligibility for appropriate accommodations. Guidelines for documentation are located on the Disability Services website at

<http://www2.cortland.edu/offices/student-development-center/disability-services/>

**Equal Opportunity Statement:**

<http://www2.cortland.edu/offices/student-development-center/disability-services/policy-and-procedures.dot#part1>

Tentative Schedule

Day	Date	Topic (Readings)	Assignment	Due Today
1	M, 1/25	Introduction course outline and some other book keeping Chapter 1 The air we breath Chapter 1 section 1-2		
2	W, 1/27	Chapter 1 section 3-6		
3	F, 1/29	Chapter 1 section 7-8		
4	M, 2/1	Chapter 1 section 9-10		
5	W, 2/3	Chapter 1 section 11-12		
6	F, 2/5	Chapter 1 section 13-14	Online Quiz 1	
7	M, 2/8	Chapter 2 Protecting the Ozone Layer Section 1-3		
8	W, 2/10	Chapter 2 Section 4-6		
9	F, 2/12	Chapter 2 Section 7-8	Online Quiz 2	
10	M, 2/15	Chapter 2 Section 9-10		
11	W, 2/17	Chapter 2 Section 11-12		

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12	F, 2/19	Exam 1		
13	M, 2/22	Chapter 3 The chemistry of Global Warming Section 1-3		
14	W, 2/24	Chapter 3 Section 4-6		
15	F, 2/26	Chapter 3 Section 7-8		
16	M, 3/1	Chapter 3 Section 9-10		
17	W, 3/3	Chapter 3 Section 11-12		
18	F, 3/5	Chapter 4 Energy Chemistry and Society Section 1-3	Online Quiz 3	
19	M, 3/8	Chapter 4 section 4-5		
20	W, 3/10	Chapter 4 section 6-7		
21	F, 3/12	Chapter 4 section 8-9		
22	M, 3/15	SPRING BREAK		
23	W, 3/17	SPRING BREAK		
24	F, 3/19	SPRING BREAK		
25	M, 3/22	Chapter 4 section 10-11		
26	W, 3/24	Chapter 5 The water we drink Section 1-3		
27	F, 3/26	Exam 2 Review	Online Quiz 4	
28	M, 3/29	Exam 2		
29	W, 3/31	Chapter 5 Section 4-5		
30	F, 4/2	Chapter 5 Section 6-9		
31	M, 4/5	Chapter 5 Section 10-11		
32	W, 4/7	Chapter 5 Section 12-14		
33	F, 4/9	Chapter 6 Neutralizing the threat of acid rain section 1-3	Online Quiz 5	
34	M, 4/12	Chapter 6 Section 4-6		
35	W, 4/14	Chapter 6 Section 7-9		

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<b>36</b>	F, 4/16	Chapter 6 Section 11-3	Online Quiz 6	
<b>37</b>	M, 4/19	Exam 3 Review		
<b>38</b>	W, 4/21	Exam 3		
<b>39</b>	F, 4/23	Chapter 7 The fires of Nuclear fission . Section 1-3		
<b>40</b>	M, 4/26	Section 4-6		
<b>41</b>	W, 4/28	Section 4-6		
<b>42</b>	F, 4/30	Chapter 11 Nutrition food for thought Section 1-3	Online Quiz 7	
<b>43</b>	M, 5/3	Chapter 11 Section 4-5		
<b>44</b>	W, 5/5	Chapter 11 Section 6-7		
<b>6</b>	F, 5/7	Chapter 11 Section 8-9		
<b>45</b>	M, 5/10	Final Exam Review		
<b>46</b>	5/14-5/19	Final exams		

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Suggested Problems to guide you in your study

**Chapter 1**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 1.1, 1.2, 1.6, 1.12, 1.28, 1.30, and 1.37

Your Turn (YT): 1.5, 1.10, 1.13, 1.15, 1.16, 1.18, 1.19, 1.20, 1.22, 1.24, 1.25, 1.26

At the end of the Chapter 2 - 5, 7, 12, 13 - 18, 20 - 23, 24, 28, 30 -31, 35, 37, 38, 41, 46, 56, 60

**Chapter 2**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 2.3, 2.11, 2.14, 2.17-2.21, 1.25, 2.29, 2.30, 2.31

Your Turn (YT): 2.2, 2.4- 2.7, 2.8 - 2.10, 2.12 - 2.13, 2.16, 2.22

Sceptical Chymist (SC): 2.28

At the end of the Chapter 1 - 6, 7 - 11, 13 - 14, 15 - 20, 22, 23 -25, 26, 27, 28, 29, 31, 32, 34, 40, 43 - 44, 52, 57, 58

**Chapter 3**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 3.9, 3.14 - 3.16, 3.28, 3.30, 3.36

Your Turn (YT): 3.2, 3.3, 3.10, 3.11, 3.13, 3.18, 3.20 - 3.23

Sceptical Chymist (SC): 3.7

At the end of the Chapter 1, 3, 4, 5, 7, 9, 11 - 14, 16 - 17, 19, 21, 22-24, 25 - 27, 31, 33, 36, 38, 40, 41, 44, 45, 51, 54, 57, 60

**Chapter 4**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 4.1, 4.4, 4.14, 4.19, 4.20, 4.22, 4.24, 4.26

Your Turn (YT): 4.2, 4.6, 4.8 - 4.10, 4.12, 4.7

Sceptical Chymist (SC): 4.5, 4.21

At the end of the Chapter 2, 4, 5 - 9, 10, 11 - 13, 17 - 18, 19, 21, 27, 28, 34, 35, 37, 41, 42, 43, 48, 51, 53, 54, 57

**Chapter 5**



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Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 5.1, 5.2, 5.3, 5.4, 5.12, 5.14, 5.24, 5.27, 5.30, 5.32, 5.35

Your Turn (YT): 5.6, 5.9, 5.10, 5.11, 5.13, 5.16 - 5.20, 5.22

At the end of the Chapter 2, 4, 6 - 7, 9-11, 13 - 16, 20-27, 29, 34, 36, 36, 37, 39 - 40, 44, 48, 56

### **Chapter 6**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 6.3, 6.8, 6.10, 6.1, 6.20, 6.21, 6.24, 6.30, 6.31

Your Turn (YT): 6.2, 6.4, 6.5, 6.6, 6.7, 6.9, 6.12, 6.13, 6.14, 6.15, 6.17, 6.18, 6.19, 6.21, 6.23, 6.25, 6.26, 6.27, 6.33

At the end of the Chapter 1-5, 6-13, 17-19, 20, 21, 24, 26, 27, 28, 30, 34, 36, 37, 40, 41, 44, 45, 46, 47, 50, 52, 54, 56, 59

### **Chapter 7**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 7.1, 7.5, 7.6, 7.8, 7.9; 7.12, 7.14; 7.20, 7.22; 7.23

Your Turn (YT): 7.4, 7.5, 7.7, 7.9, 7.12, 7.14, 7.20, 7.21, 7.23, 7.24

At the end of the Chapter 1 - 12, 14 - 16, 20, 22 - 24, 26, 27, 30, 33, 34, 37, 38, 39, 42, 45, 47, 51, 55, 56

### **Chapter 11**

Within the Chapter - Check links at the Chemistry in Context Site for additional information

Consider This (CT): 11.1, 11.2, 11.7, 11.9, 11.14; 11.16; 11.22; 8.23

Your Turn (YT): 11.4, 11.5, 8.7, 11.12, 11.17, 11.20, 11.21, 11.26

At the end of the Chapter 1 - 12, 14 - 16, 20, 22 - 24, 26, 27, 30, 33, 34, 37, 38, 39, 42, 45, 47, 51, 55, 56

Chapter by chapter objectives chapter by chapter.

By the end of the course students should be able to:

## Chapter 1

- Describe air in terms of its major components, their relative amounts, and the local and regional variations in the composition of air (1.1 – 1.3)
- List major air pollutants and describe the effects of each on humans.
- Compare and contrast indoor and outdoor air, in terms of which pollutants are likely to be present and their relative amounts (1.3, 1.11 – 1.13)
- Interpret values of the color – coded AQI and know how to assess local air quality data from the EPA (1.3)
- Understand the terms NAAQS, exposure, and toxicity, and why the NAAQS are set at different levels for different periods of time (1.3)
- Evaluate conditions significant in risk – benefit analysis (1.4)
- Identify the general regions of the atmosphere with respect to altitude (1.5)
- Interpret air quality data in terms of concentration units (ppm, ppb) and pollution levels, including unreasonableness of “pollution-free” levels (1.2-1.3, 1.12, 1.14)
- Relate these terms and differentiate among them: matter, pure substances, mixtures, elements, and compounds (1.6)
- Discuss the features of the periodic table, including the groups it contains and the locations of metals and nonmetals (1.6)
- Understand the difference between atoms and molecules, and between the symbols for elements and the formulas for chemical compounds (1.7)
- Name select chemical elements and compounds (1.7)
- Write and interpret chemical formulas (1.8)

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- Balance chemical equations (1.9 – 1.10)
- Understand oxygen's role in combustion, including how hydrocarbons burn to form carbon dioxide, carbon monoxide, and soot (1.9 – 1.10)
- Discuss the green chemistry initiative (1.11)
- Explain the different pollutants produced by burning coal and gasoline and how reductions in emissions have occurred ( 1.11)
- Describe how ozone forms, including how sunlight, NO, NO<sub>2</sub> and VOCs are involved (1.12)
- Identify the sources and nature of indoor air pollution (1.13)
- Interpret the nature of air at the molecular level (1.14)
- Use scientific notations and significant figures in performing basic calculations (1.4 and 1.14, respectively)

## Chapter 2

- Differentiate between harmful ground-level ozone and beneficial stratospheric ozone layer (2.1)
- Describe the chemical nature of ozone, location of the ozone layer, and factors affecting its existence (2.1, 2.6, 2.8 – 2.10)
- Apply the basics of atomic structure to atoms of certain elements (2.2)
- Understand the organization of the periodic table (2.2)
- Relate an element's atomic number to its position in the periodic table (2.2)
- Differentiate atomic number from mass number and apply the latter to isotopes (2.2)
- Write Lewis structure, be able to identify the covalent bonds present in a molecule (2.3)

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- Describe the electromagnetic spectrum in terms of frequency, wavelength, and energy (2.4, 2.5)
- Interpret graphs related to wavelength and energy, radiation and biological damage, and ozone depletion (2.4-2.8)
- Understand the natural Chapman cycle of stratospheric ozone depletion (2.6)
- Understand how the stratospheric ozone layer protects against harmful ultraviolet radiation (2.6, 2.7)
- Compare energies and biological effects of UV-A, UV-B, and UV-C radiation (2.6,2.7)
- Relate the meaning and the use of the UV index (2.7)
- Recognize the complexities of collecting accurate data for stratospheric ozone depletion and interpreting them correctly (2.8, 2.9)
- Understand the chemical nature and role of CFs in stratospheric ozone depletion (2.9,2.10)
- Explain the unique circumstances responsible for seasonal ozone depletion in the Antarctic (2.10)
- Summarize the scientific and political dimensions of the Montreal protocol and its amendments (2.11, 2.12)
- Evaluate articles on green chemistry alternatives to stratospheric ozone-depleting compounds and recognize the effect that market forces have on the success of these innovations (2.12)
- Discuss the factors that will help lead to the recovery of the ozone layer (2.11, 2.12)

## Chapter 3

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- Understand the different processes that take part in Earth's Energy balance (3.1)
- Realize the difference between Earth's natural greenhouse effect and the enhanced greenhouse effect (3.1)
- Understand the major role that certain atmospheric gasses play in the greenhouse effect (3.1-3.2)
- Explain the methods used to gather past evidence for global warming (3.2)
- Explain the methods used to gather past evidence for global warming (3.2)
- Relate Lewis structures to molecular geometry, including bonds angles (3.3)
- Understand how molecular geometry is related to absorption of infrared radiation (3.4)
- List the major greenhouse gases and explain why each has the appropriate molecular geometry to be a greenhouse gas (3.4)
- Explain the roles that natural processes play in the carbon cycle and through it, in global warming (3.5)
- Summarize how human activities contribute to the carbon cycle and through it, to global warming (3.5)
- Understand how molar mass is defined and used (3.6)
- Use Avogadro's number to calculate the average mass of an atom (3.6)
- Understand the chemical mole and explain how it is useful (3.7)
- Assess the sources, relative emissions quantifies, and effectiveness of greenhouse gasses other than CO<sub>2</sub> (3.8)
- Recognize the successes and limitations of computer based models in predicting climatic changes(3.9)

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- Summarize the different levels of confidence in drawing conclusions about climate change (3.9)
- Consider the global and national implications of a rise in Earth's average temperature (3.10)
- Identify the single most effective strategy for reducing CO<sub>2</sub> emissions (3.10)
- Explain world and U.S. policy concerning the now ratified Kyoto Protocol (3.11)
- Give reasons for projected changes in the relative amounts of CO<sub>2</sub> emissions (3.10)
- Compare how the issue of global warming is both similar to and different from the issue of ozone depletion (3.12)
- Read and hear news stories on global warming with some measure of confidence in your ability to interpret the accuracy and conclusions of such reports (3.1-3.12)
- Take an informed position with respect to issues surrounding global warming (3.1-3.12)

## Chapter 4

- Distinguish between energy and heat, and be able to convert among energy units: Joules, calories, Calories (4.1)
- Relate the energy theoretically available from a process with the efficiency of that process (4.2)
- Understand the difference between kinetic and potential energy, both on the macroscopic and molecular level (4.2)
- Use the concept of entropy to explain the second law of thermodynamics (4.2)
- Apply the *exothermic* and *endothermic* to chemical systems (4.3 – 4.5)

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- Interpret chemical equations and basic thermodynamic relationship to calculate heats of reaction, particularly heats of combustion (4.4-4.5)
- Use bond energies to describe the energy content of materials, and to calculate energy changes in reactions (4.4)
- Describe the factors related to the United States' dependency on fossil fuels for energy (4.5)
- Evaluate the risks and benefits associated with petroleum, coal, and natural gas and fossil-fuel energy sources (4.6-4.7)
- Relate energy use to atmospheric pollution and global warming (4.7-4.8)
- Understand the physical and chemical principles associated with petroleum refining (4.7-4.8)
- Describe how octane ratings are assigned and explain how the reforming process, and use of gasoline additives such as lead, ethanol, and MTBE affect octane ratings (4.8)
- Describe why reformulated and oxygenated gasolines are used (4.9-4.10)
- Understand activation energy, and how it relates to the rates of reaction (4.10)
- Compare and contrast ethanol and biodiesel fuels (4.10)
- Take an informed stand on what energy conservation measures are likely to produce the greatest energy savings (4.11)
- With confidence, examine news articles on energy crises and energy conservation measures and interpret the accuracy of such reports (4.11)

## Chapter 5

- Describe the desirable properties of drinking water (5.2, 5.14)
- Explain some of the reasons why bottled water is so popular (5.2, 5.14)
- Recognize the sources and distribution of water (5.2)
- Discuss why water is such an excellent solvent for some ionic and some covalent compounds (5.3, 5.7-5.10)
- Describe the factors involved in providing pure drinking water (5.3, 5.11 – 5.15)
- Use concentrations units: percent, ppm, ppb, and molarity (5.4)
- Discuss the relationship between the properties of water and its molecular structure (5.5 – 5.6)
- Describe the specific heat of water and compare it with that of other substances (5.5-5.6)
- Understand how electro negativity and bond polarity are related to the structure of water (5.5)
- Describe hydrogen bonding and its importance to the properties of water (5.6)
- Describe how the densities of ice and water are related to the structure of the water molecule (5.6)
- Determine the formulas for ionic compounds, including those with common polyatomic ions (5.7-5.8)
- Provide the names of simple ionic compounds, given their formulas (5.7-5.8)
- Explain how ionic substances dissolve in water (5.9)
- Explain how covalent substances dissolve in water (5.10)
- Understand the role of federal legislation in protecting safe drinking water (5.11)



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- Discuss the maximum contaminant level goal (MCLG) and the maximum contaminant level (MCL) established by the EPA to ensure water quality (5.11)
- Discuss how drinking water is made safe to drink (5.11-5.15)
- Relate chlorination with water purification (5.11)
- Describe atomic absorption spectrophotometry as a method for analyzing contaminants in water (5.13)
- Explain how lead can be ingested and how it affects humans. Be able to use a calibration graph to determine the lead concentration of a water sample (5.13)
- Compare and contrast tap water, bottled water, and filtered water in terms of water quality (5.14)
- Appreciate the relative availability to pure drinking water in the united states and compare with international needs (5.15)
- Understand the processes of distillation and reverse osmosis for producing potable water (5.15)

## Chapter 6

- Define the terms acid and base and know how to use these definitions to distinguish acids from bases (6.1-6.3)
- Use chemical equations to represent the dissociation (ionization) of acids and bases (6.2-6.2)
- Write neutralization reactions for acids and bases (6.3)
- Describe solutions as acidic, basic and bases (6.3)

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- Describe solutions as acidic, basic, or neutral based on their pH or concentrations of  $H^+$  and  $OH^-$  (6.3 – 6.4)
- Calculate pH values given hydrogen or hydroxide ion in whole-number concentrations (6.4)
- Describe the differences between the pH of water, the pH of ordinary rain, and the pH of acid rain, and locate on a map of the United States where the most acidic rain falls (6.4-6.5)
- Explain the role of sulfur oxides and nitrogen oxides in causing acid rain (6.7-6.8)
- List the different sources of  $NO_x$  and of  $SO_2$  and explain the variations in the levels of these pollutants over the past 30 years (6.9)
- Explain the production of acidic aerosols and their effects on building materials and human health (6.10-6.11)
- Explain why  $N_2$  is a relatively inert element. Describe different forms of reactive nitrogen and how they are produced both naturally and by humans. Use the nitrogen cycle to explain the cascading effects of reactive nitrogen (6.12)
- Describe how the industrial production of ammonia and the acidic deposition of nitrates both contribute to the buildup of reactive nitrogen on our planet (6.12)
- Describe nitrogen saturation and its consequences for lakes (6.13)
- Discuss the 1990 clean air act amendments and the cap and trade program. Describe the effect these continue to have on  $SO_2$  emissions (6.13-6.14)
- Describe how  $NO_x$  emissions have been controlled differently from  $SO_2$  emissions (6.13)
- Outline different ways to control acid rain, noting the cost-benefit considerations involved (6.13-6.14)

- Explain why acid rain control is an exceedingly wise investment in terms of the benefits to human health (6.15)

## Chapter 7

- Give an overview of our past and current use of nuclear power in the United States (7.1)
- Explain the process of nuclear fission and the role of neutrons in sustaining a chain reaction, and the source of the energy it produces(7.2)
- Compare and contrast how electricity is produced in a conventional power plant and in a nuclear power plant(7.3)
- Report on the use of nuclear power for electricity worldwide(7.4)
- Compare the process of alpha, beta, and gamma decay in terms of what happens in the nucleus (7.5)
- Interpret the meaning of the word radiation, depending on the context (7.5)
- Explain how the radioactive decay of Uranium-238 leads to the production of radioisotopes. Also explain why naturally occurring radioisotopes such as carbon-14 and hydrogen-3 are not part of this series(7.5)
- Describe the accident at Chernobyl and explain why radioactive iodine was released and was hazardous to people (7.6)

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- Rank the sources that contribute to your annual dose of radiation both natural and human made (7.7)
- Explain why nuclear radiation is also termed ionizing radiation. In your body explain the connection between ionizing radiation and the production of free radicals (7.7)
- Some units describe the radioactive sample others describe the damage it does to tissue. Use the Curie the rad and the rem to illustrate this (7.7)
- Apply the concept of half life to radiocarbon dating and in the storage of nuclear waste (7.8)
- Evaluate radioisotopes in terms of their health hazards discussing factors such as half life, type of radioactive decay, effect once in the body, and route of entry into the body. For example, compare radon-222, iodine-131 and strontium-90 (7.8)
- Describe the issues associated with the production and storage of high-level radioactive waste including spent nuclear fuel (7.9)
- Take an informed stand on how high level radioactive waste, should be handled and stored (7.9)
- Evaluate news articles on nuclear power and nuclear waste with confidence in your ability the scientific principles involved(7.9-7.11)
- Describe the connection between nuclear power and nuclear weapons proliferation (7.10)

- Assess the risks and benefits in regard to the use of nuclear power (7.11)
- Take an informed stand on the use of nuclear power for electricity production (7.12)
- Outline the factors that will favor or oppose the growth of nuclear energy in the next decade (7.12)

## Chapter 11

- Differentiate between malnutrition and undernourishment (11.1)
- Understand the physiological functions of food (11.1)
- Describe the distribution of water, fats, carbohydrates, and proteins in the human body and some typical foods (11.1)
- Identify the major elements found in the human body (11.1)
- Recognize and use the chemical composition and molecular structure of fats and oils (11.2)
- Identify sources of saturated and unsaturated fats and their significance in the diet (11.2)
- Show how fatty acids and glycerol can combine to form a triglyceride (11.2)
- Understand how hydrogenation leads to the formation of trans fats (11.2)
- Discuss sources of cholesterol and its significance in the diet (11.2)

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- Recognize and use the chemical composition and molecular structure of carbohydrates (11.3)
- Differentiate among the structures and properties of sugars, starch, and cellulose (11.3)
- Describe the symptoms and cause of lactose intolerance (11.3)
- Give the general molecular structure of an amino acid (11.4)
- Identify and use the chemical composition and molecular structure of proteins (11.4)
- Discuss the importance of essential amino acids and their dietary significance (11.4)
- Explain the principle of protein complementarity (11.4)
- Describe the symptoms and cause of Phenylketonuria (11.4)
- Discuss the effects of selected vitamins on human health (11.5)
- Differentiate chemically between fat-soluble and water soluble vitamins (11.5)
- Describe the effects of selected minerals on human health (11.5)
- Discuss the necessity of macro minerals, micro minerals, and trace minerals for human health (11.5)
- Explain carbohydrates, fats, and proteins as energy sources (11.6)
- Discuss typical recommended daily energy intakes (11.6)
- Relate energy expenditures in various activities (11.6)
- Identify and use basal metabolism rate (BMR) (11.6)
- Know appropriate resources for obtaining up-to-date dietary advice (11.7)
- Use resources to determine personal diet plans (11.7)
- Discuss the problems of undernourishment in the world (11.8)
- Identify some contributing factors to observed trends in undernourishment (11.8)
- Describe various strategies for feeding the world's growing population (11.8)

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- Discuss various methods of food preservation, including use of antioxidants (11.9)
- Weigh the risks and benefits of food irradiation and take an informed stand (11.9)