

Environmental Chemistry Syllabus

This is a one-semester integrated course that explores topics related to chemical effects in the natural environment. Chemistry topics include atomic, molecular, ionic and radical structures, stoichiometry and equilibrium. Environmental topics include the sources, reactions, transport, effects and fates of chemical species in the soil, water and air. These two areas are woven together in daily work and larger projects. Students will study current regional, national and global issues such as watersheds in Illinois, oil spills in the Gulf of Mexico and air quality in China. Students will work in research groups to find the causes and policies that lead to these situations and propose well supported changes that could be made by industries and governments.

- A.1 applying the skills of observation (describe, compare, and contrast characteristics; identify parameters, precisely observe phenomena) and accurately record findings. [IL-11.A.5a; IL-11.A.5c][NSES-A]
- A.2 designing and planning investigations and constructing questions which further understanding, forge connections, and deepen meaning. [IL-11.A.5b][NSES-A]
- A.3 carrying out investigations that develop skills, concepts, and processes that support and enable complex thought. [IL-11.A.5c][NSES-A]
- A.4 using appropriate technologies to collect, analyze and present information. [IL-11.A.5c][NSES-A]
- A.5 employing scientific reasoning to evaluate the soundness and relevance of information. [IL-11.A.5e][NSES-A]
- A.6 supporting judgments and constructing models based on evidence. [IL-11.A.5e][NSES-A]
- A.7 sharing results by communicating orally, in writing, and through display with power, economy, and elegance. [IL-11.A.5e][NSES-A]
- A.8 examining current issues in science and technology. [IL-][NSES-G]

Student Learning Objectives:

The goals of this course are:

- To develop an understanding of chemicals and their effects on the environment..
- To learn basic chemical content in context.
- To design and carry out field research.
- To how business and government policies toward chemicals in the environment effect the planet.

This course will require the student to integrate information, solve problems and engage in authentic inquiry to achieve these ends.

Week	Class work
.5-1	Introduction – Chapter 0 – Sustainability - IMSA Walkabout – Journal Entry – Local Problem –Air, Water and Soil of Aurora- Form the class' PBL questions. Have recommendations for IMSA by end of quarter.
	Chapter 1 – Air Pollution – Atmosphere Composition - Types of Matter and Mixtures, Parts Per ?? calculations, CO, O ₃ , SO ₂ , NO ₂ , Particulate, VOC's, Hydrocarbon and Covalent Nomenclature, Risk Assessment, Combustion, Policies Lab – Air That We Breathe-Comparison and Analysis of Gas (4 and 2 cycle) vs Diesel Engine product. (Students Design Lab)
2	Chapter 1 On-line Quiz –Journal Entry - Work on Car Product Lab
	Chapter 2 – Ozone – Atomic Structure, Valence Electrons, Lewis Dots, Ground Level Ozone, Light Energy Calculations, UV Biology, Stratosphere Destruction, Policies Finish Car Product Lab
3	Chapter 2 On-line Quiz – Chapter 3 - Global Climate Change Spectra, Excited State Electrons, Energy, Electron Configuration, UV, IR Spectroscopy, IR Camera, Mole Calculations. Simulated Atmosphere Lab in Aquariums. (Students Design Lab) Assign – mini-reports on climate change consequences.
	Mini – reports - Work on atmosphere lab.
4	Chapter 3 On-line Quiz – Chapter 4- Combustion of Fuels – Coal, Natural Gas, Petroleum, Ethanol, Thermo chemistry calculations, Heats of formation, Biomass – Lab -Find heat per mole of each available fuel(one per group). (Students Design Lab)
	Work on problems – Share lab data and finish lab write-up .
5	Chapter 4 On-line Quiz – Chapter 5 – Water- Guest speaker from Aurora Water Treatment - Polar molecules and bonds, intra and inter molecular forces, hydrogen bonding, solutions, solubility, molarity, ionic compounds
	IMSA Pond Study – Ion and dissolved gasses concentrations

6	Continue work on Pond
	Continue work on Pond
7	Share Data and Results –
	Article on the state of the pond due. Chapter 5 On-line Quiz – Chapter 6- Acid Rain – Acid, Base, Weak, Strong, Buffers, pH, sulfur and nitrogen oxides
8	Lab – Effects of acid rain on structural materials.
	Chapter 5 On-line Quiz – First Quarter Review
9	Midterm Exam
	Chapter 7 - Nuclear Fission – Lise Mitner video – Isotopes, $e=mc^2$, fission equations, alpha and beta, iodine, half -life, waste Lab – Half-life simulation lab

10	Chapter 7 On-line Quiz – Chapter 8- Energy for the Electron – batteries, Redox chemistry, fuel c ells, PV cells Activity PV- PEM Cell combo, Lab – fruit battery contest
	Work on Redox equations, Lab – rechargeable battery
11	Chapter 8 On-line Quiz – Chapter 9 – Polymers –addition, condensation, dispersion forces - Demo -Nylon and Flash Paper- Lab - polymer stations -
	Recycling and bio-degradable substitutes - The “Big 6” polymers – mini reports- Lab – indentify unknown polymers.
12	Chapter 9 On-line Quiz – Chapter10 – Designing Drugs - organic compound naming, isomers, conformers, functional groups, freebase, Lab – make aspirin
	Modern Drug Design – Guest Speaker –Abbott Drug design – SAR, substrate, pharmacophore, lead compound, combinatorial chemistry, drug libraries, chirality, steroids, generic, herbal, abuse, oxycodone, THC
13	Chapter 10 On-line Quiz – Chapter11- Environmental Implications of Food – Fats, oils, carbohydrates, proteins, vitamins, fertilizers , dead zone-
14	Chapter 11 On-line Quiz – Chapter12
15	Work on AP and Term Paper
	Work on AP and Term Paper
16	Work on AP and Term Paper
	Work on AP and Term Paper
17	Work on AP and Term Paper
	Work on AP and Term Paper
18	Presentations
	Presentations

Final Exam

Grading

Weekly Quizzes 20%

Lab Write-up, Written Work, Misc. Activities, and Homework 20%

Project Papers -30%

Tests -30% (Midterm 15% and Final 15%)

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