Fourth Quarter Projects

Structure

- The project will contain several different components: research, a written report of some type, and a presentation (to the class).
- Depending on the type of project you choose, more or less time will be spent on each part of the project.
- You may work on this project individually or with one other person.

Possibilities

My purpose for giving this assignment is not to torture you and make you hate me and chemistry. I'm hoping that you will each choose a topic that interests you in some way. To that end I have spent some time coming up with suggestions for projects. Below is what I have thought of so far. I highly encourage you to come up with your own topic if you prefer, but it must be approved by me first.

Experiment possibilities:

- What are those new packaging peanuts made of? Can you really eat them? Do they really dissolve in water? If so, how many? What factors affect this?
- Develop experiments to examine what factors affect rates of reactions (changes in environments, chemical concentrations, catalysts, etc.).
- Electrochemistry: Electroplating and other electrolytic processes. Alternatively, you might study how chemical electrodes are used in chemical analysis. Make tests and explain results.
- Calorimetry: work on building a better calorimeter, and use this to test the calorie claims on various food labels.
- Affect on boiling and freezing point of a substance by another substance. Explore the relationship between the changes in melting point or freezing point of a substance as various amounts of another substance are added to it. (ex. anti freeze and water in your car radiators).
- Photosynthesis: research the nature of this chemical reaction which is the fundamental means for the existence of life. Perform experiments to see what environmental factors affect the rate of this reaction.
- Liquid crystals: They form the displays on calculators, and make colorful thermometers. What are these strange chemicals and how do they do their jobs?
- Solubility curves: What aspects affect how much of a substance will dissolve in another substance? Develop experiments test and explain the solubility of various substances?
- Separation methods in chemistry: give an overview of the various separation methods (chromatography and/or distillation)we have seen and how they are used every day in industry and chemical analysis. Possibility for making chromatography tie die shirts or experimenting with various bases for fermentation of alcohol.
- Food chemistry: many topics here.
  - How are acids used to make things sour?
  - How can some common artificial flavorings be synthesized in the lab? You can actually do these experiments.
  - How do breads and other baked goods rise?
- Environmental analysis: Study the water quality or soil contents of the local area.

Topics in Chemistry:

- Origins of life. What is the chemistry behind the evolutionary theory for the origin of life on earth?
- Mummification: Explore and explain the processes used to create mummies.

• Explain in as much detail as possible what happens in an internal combustion engine. You might discuss fuel to air ratio, and compression, catalytic converters, and chemical reactions.
• How do various drugs affect our bodies and brains? This project could span anything from the history of herbal medicine to modern studies of drug interactions. Sorry, no experimentation is approved for this project.
• Hot air balloon: design and build a hot air balloon. This combined with some research about the development of hot air balloons and an explanation as to how they work would be an option.
• Lasers produce a special kind of light. Detail the inner workings of a laser. Explain some history and uses of lasers today.
• Materials science. Working with various materials, explain how the inherent molecular structure helps to predict what properties a substance will have. (some suggestions: glass, ceramics and glazes, metals, plastics and other polymers, paints, dyes or other art supplies)
• Museum chemistry. What processes are used to preserve artifacts and art materials? How are forgeries uncovered? How can chemistry be used to date materials and determine the elements present?
• Toy store chemistry: many common toys incorporate chemistry in their design - magic sand, lava lamps, etc. Explain the chemistry behind how these toys work.
• Astronomy: Astronomers use the color of stars to learn a great deal about their composition, size, temperature, and speed. The electromagnetic radiation (light and other forms such as x-rays, and radio waves) is what gives us these clues. Explain how we can learn about such distant objects.
• Photo chemistry: Research the chemistry of photography in more detail. How does this work? Possible combination with photo exhibit, using various photographic processes.
• Solar energy: How do the solar panels in your calculator work? Put together a presentation about this interesting conversion from light energy to electrical energy. How are solar panels being used today? Might they be an alternative energy source? Explore relationship between light and energy produced.
• The chemistry of life: What are some of the current scientific theories on the beginning of life? Perhaps you may be able to conduct some of the original experiments involved in creating simple organic molecules.

Science and society:

• Nuclear issues:

-Pros and cons of nuclear power. Maybe you could put together materials for a class debate, providing each side with information to attack or defend nuclear power.

- Pros and cons of food irradiation

• Pollution of various sources:

- Ozone: What is the suggested chemical reaction that causes the ozone hole? Where does ozone come from? Is ozone always a good thing?

- Research and present recent issues dealing with chemical pollution: acid rain, pesticides vs. alternatives, the Love Canal disaster, mercury poisoning, lead poisoning.

- The Sudbury River and its history: how it became polluted and what is its current state.

• Human synthesized vs. naturally occurring chemicals: natural rubber vs. synthesized rubber and neoprene, cotton and silk vs. nylon, drug synthesis vs. naturally occurring chemicals.
• Animal testing: what are the pros and cons? How are animals used by scientists in various industries? What are the alternatives? Both positive and negative aspects should be explored.
• Taxol: What is the debate and history over this promising new cancer drug that can only be extracted from the bark of the relatively rare yew tree?
• People of color in science:

- Create a presentation that chronicles some of the struggles and triumphs of under represented populations in the sciences. You might choose 1 - 3 people of interest and talk about their lives in depth.

or

- Talk about the general struggle for equality of people of color, linking other social forces with the inroads recently made by under represented populations into the science field. Who

were some of the pioneers and what other events in history were correlated with their success or difficulties.

• Women in the sciences:

- Create a presentation that chronicles some of the struggles and triumphs of women in the sciences. You might choose 1 - 3 people of interest and talk about their lives in depth.

or

- Talk about the general struggle for equality of women, linking other social forces with the inroads recently made by women into the science field. Who were some of the pioneers and what other events in history were correlated with their success or difficulties.

• Choose any important scientist and present some of his or her experiments to the class. You may even be able to demonstrate some of the principles developed by that scientist.

• Philosophy of science. Does objectivity exist? How are decisions influence in science by factors not inherent in the data collected?

Other:

• Create a website that has some chemical or chemistry related content. Any of the above topics could be the primary content of the website. If you are interested in making a website but don't know how, I can assist you.

• Developing a lesson plan to teach some aspect of chemistry that we have learned about to an elementary level class. (You may actually get to teach this, I have been talking to an elementary school teacher who is interested in having students come and make presentations.) Some suggestions: density, atoms and molecules, polymers, phase changes and states of matter, etc.

• Develop a lesson plan and supporting materials for an upcoming topic in our class. You would be expected to teach the class (or maybe two), as well as, give and grade the homework on this topic. I would be willing to work closely with anyone who would like to try this topic.

Presentation possibilities:

Think about alternative ways of making presentations. You might use posters, the overhead projector, video clips that you created (we can get video equipment), short skits, poems, artistic creations related to chemistry, lyrics to rap tunes or other recognizable melodies, etc. Creativity will be considered in the grading of your project.

Grading

Depending on the project, each part (written, and presentation) will be given more or less weight. If you are doing an experiment, I will consider the quality of your results and your data presentation more than the research aspect. If you choose a socially oriented project, the research will be worth more. However all projects will be required to consider the following:

- They should be neatly done (typed) and clearly written.
- You will need to construct a bibliography of all the sources you consulted.
- The length of the written part will vary depending on the kind of project you choose. For the written portion I expect 6-8 pages.

Time Line

The final deadline for this project is **June 3rd**. This is not a project that you can do by staying up all night the day before it is due. I will be asking for different parts of the projects to be done before the final deadline. The first deadline will be next class: You need to decide by then who you are working with and which topic you wish to study. A one paragraph project proposal is due. Only one is needed per pair.