

Chemical Choices Assignment #1 Oxygen or Air?

In the early discoveries of elements, chemists burned different substances and elements and noted the results. Phlogiston was one early part of combustion that was later replaced by oxidation, or the combining of a substance with oxygen. Oxygen is once again part of popular culture. Oxygen was the name of an internet magazine for women. Oxygen bars are a new thing. Portable oxygen tanks for people with reduced lung capacity, allow these individuals to live far more normal lives. Athletes breathe oxygen on the sidelines of big games.

What is the difference between oxygen and air? Answer this question by looking up both oxygen and air in your chemistry textbook and the internet. Start to look further in your chemistry textbook or on the internet for uses of both air and oxygen. Bring your results from your initial search to class next Thursday, January 27.

On January 27, you will have the opportunity to form a group of four students to discuss your findings and results. During the discussion with other students you can decide on one particular cultural application of oxygen, and decide on how to present it to the entire class. Some further questions to consider on January 27 may come from your research, or some possible questions follow: Is opening an oxygen bar a good business idea? Does breathing oxygen boost the performance of an athlete? Will breathing oxygen at an oxygen bar make you feel better or is it dangerous too your health? Is a portable oxygen tank a risk on an airplane flight? On February 1 and 3, you can again meet with your group and decide how your group wants to present your data and opinions. On February 8, a one page paper on the difference between oxygen and air as well as your cultural application/topic is due. Each group will also have a short time (5-10 minutes) to present their arguments.

As you look up your information and as you write your paper remember to:
Clearly state and define the problem or issue. Give some perspective as to what part or parts of the issue you are considering. Clearly state and reference your data and evidence to support your position. If it is appropriate you can also discuss evidence that might refute your position and discuss why it is possibly not as important. Finally, clearly state and support your conclusions to the cultural application. (While your paper is only expected to be one page long, it is expected that it will be supported by references, not included in the one page limit)

Chemical Choices Assignment #2 Water--Bottled or Tap?

In the first chemical choices assignment, air versus oxygen was considered. In the second assignment you are challenged to take a closer look at water. Water is also a requirement for life. Compared to some places on earth, North Americans tend to have an abundance of water sources. Today, consumers usually have a choice of drinking either tap water or various types and brands of bottled water. What is your preference? What do you base your preference decision on?

In this assignment, you can design your own study of people's preferences for either tap or bottled water. Meet with some team members and decide to either poll and/or test your family or friends water preferences. As you decide how to do this, be sure to keep notes on what variables you want to try to test and which variables you want to control. As you start your study, decide how you will try to understand the differences and similarities between tap water and bottled waters. Show up at the next class meeting with a list of water characteristics that could be evaluated for different water samples. The list should be written down to help with discussion. Chapter 13 of your textbook may be helpful. The paper and presentations will be due March 22. The due date is extended to March 24, 2005

As in the previous chemical choices assignment, you will present your results as a group in a short presentation. Additionally, you write a short, one page paper describing your preference and the reasons for your preference. **If your paper contains supporting data or arguments that you did not personally collect or propose, that data and or argument must be supported by references. Your list of cited sources is not included in the one paper limit.** As you write your paper remember this is a chemistry class. We are interested in whether or not there are real differences between tap and bottled water. What are these differences? Are these chemical differences? Are the differences perceived to be significant by consumers? Some possible differences to be considered might be safety (biological (bacterial) or chemical contamination,) source, and or composition, taste, treatment, price, etc.

The grading of the one page paper will be based upon how well you:

Present the problem

Describe your approach or perspective to the problem

Report your data or chemical information that either supports or refutes your approach, perspective, or hypothesis. (This is the bulk of your short paper.) **(Reporting facts and or data without a short procedure or reference or source in this section of the paper will result in no credit in this section of the paper.)**

Consider other approaches that the data or information also supports.

Conclude your investigation by summarizing the significance of your study of the problem. This may be personal and or reflective, but should also refer to your understanding of the facts and/or data.

To Filter or Not To Filter Challenge and Choice

Part I A Filter plus Iodine Solution

The challenge:

Many common water filters are used to remove the chlorine or chlorine taste from water. Since chlorine is colorless in water, and its analysis is a bit more complicated, this challenge models the interaction of a filter and chlorine containing water with a filter and iodine containing water with a filter. Iodine with povidone is used as an antiseptic rinse so it is available. Iodine also reacts with Vitamin C so its concentration can be checked by reacting a 5 mL aliquot of iodine containing solution with drops of a Vitamin C solution.

Investigation:

Decide which iodine concentration to investigate.

Record the number of Vitamin C drops necessary to react with all the iodine present in the unfiltered solution. (Do enough runs so that you are confident of your results.)

Filter the iodine water. Record the number of Vitamin C drops necessary to react with all the iodine present if any after the iodine solution is filtered. Again do enough runs so that you are confident of your results.

What other factors might be important in this experiment.

Write this up as a one class challenge.

The choice:

A one page Chemical Choices paper will be due next week Thursday, April 14, 2005 on whether you think tap water should be filtered or not. Your position may be based on both or either library research or your in class investigations.

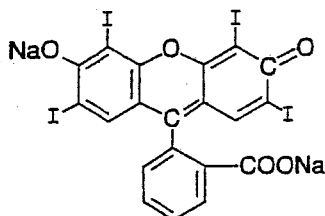
To Filter or Not To Filter Challenge and Choice

Part II A Filter plus FD & C Red No 3

The challenge:

Many common water filters are used to remove the chlorinated organic compounds from water. As in the first part of the challenge, the chlorinated compounds are replaced with iodinated compounds. One iodinated organic compound that is colored is a F. D. & C. Red No 3. The red food color has a molecular weight of 879.6 grams/mole.

How many moles of the dye are contained in 0.010 grams of Red #3?



FD&C Red No. 3

The concentration of the dye can be determined by a spectrophotometer. An spectrophotometer is an instrument that measures the amount of light absorbed by a light absorbing chemical. The greater the absorption of light, the higher the concentration of the absorbing chemical compound.

What is the observed absorption of the following concentrations of Red # 3?

1.15 X 10⁻³ M dye

2.30 X 10⁻³ M dye

4.60 X 10⁻³ M dye

What is the observed absorption of the following concentrations of Red # 3, after the dye solution is treated with a filter?

1.15 X 10⁻³ M dye

2.30 X 10⁻³ M dye

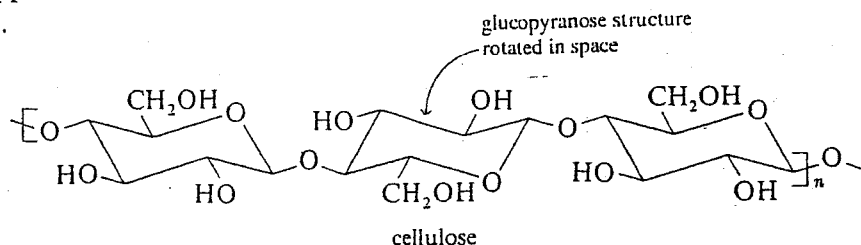
4.60 X 10⁻³ M dye

Challenge: How effective is the filter?

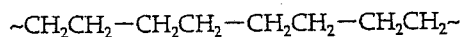
Paper or Plastic Challenge

At the grocery store, the bagger may ask you for your choice of bag for your groceries. In this challenge, you look at this choice from a chemical perspective as well as a consumer perspective.

The approximate chemical formulae of both the paper and the plastic bag are shown below.



Paper bag, 57.5 grams



Polyethylene Plastic bag, 5.5 grams

In your chemical perspective,

Draw the smallest unit of each of the polymeric units composing the bag. (These structures may be hand drawn.) (Draw the monomer.)

What is the mass of one mole of each of these repeating units?

Approximately how many of these units are present in each bag?

Which bag contributes greater mass to the landfill when it is disposed?

Which bag is more hydrophilic and therefore possibly more easily decomposed?

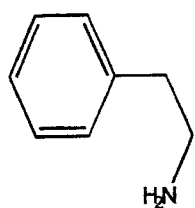
What natural resources are used to produce each bag?

In the chemical choice section of this response,

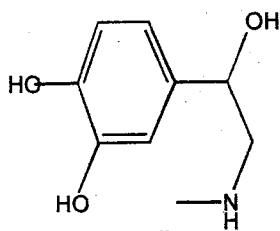
Which bag do you choose to carry your groceries home and why?

The chemical choice section will be graded according to the modified rubric.

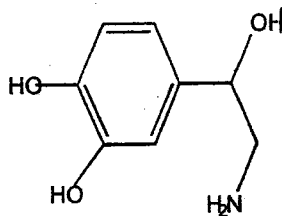
Essay: Assume that you are a state representative, a member of a committee that is deciding whether or not to fund (about 1/2 million dollars annually) a "super scholar" position at one of your state's universities. (The support includes the salary of the researcher, two assistants and supporting expenses.) The university has provided you with an overview of the scholar's research. The researcher studies what chemical compounds are involved in productive, healthy people's brain processes. The researcher has identified a compound, beta phenylethylamine that is present when individuals feel excited and motivated. The researcher has many papers in refereed journals, usually has at least one outside grant from a federal source of funding (\$250,000 annually) but has not produced any patented drugs. The description of the research also contains formula for some of the following compounds.



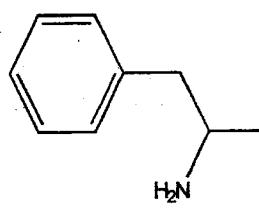
Phenylethylamine



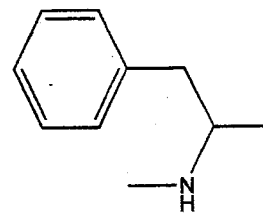
Adrenaline
(Epinephrine)



Norepinephrine



Amphetamine



Methamphetamine

What is the molecular formula for phenylethylamine?

What is the mass of one mole of phenylethylamine?

Do you think funding the researcher at your state university is good for your state? Why or why not? (What other questions might you want to consider before deciding?)