Assignment I-2 Sun Safety & the Electromagnetic Spectrum

(Individual Assignment worth 35 pts)

OBJECTIVE: To construct an informative report that summarizes the science underlying sun safety and recommends consumer-savvy product choices based on this information.

Your report should contain the following 5 sections. **Total length of report will be ~ 4 - 6 pages plus table and/or graph**. (Plus an additional bonus point section if you chose to do the bonus point activity.) [If necessary, the page limits are flexible -- but don't go to either extreme: a "bare bones" report with minimal content or an over-the-top report with too much info.]

THE SCIENCE OF SUN SAFETY

1. Background on UV Radiation

Length: 3 or more paragraphs; at least one for each check box: (~ 1-2 typed pages)
In this section you should:

- ❑ **Define** which wavelengths of sunlight are harmful to humans
- ❑ **Explain** why these wavelengths are harmful (what damage is caused by these wavelengths and what are the scientific processes governing this damage)
- ❑ **Discuss** why more UV radiation may be reaching the earth's surface in recent decades and explain the global change process involved in this increased UV exposure (i.e., *Why* might more UV be reaching the Earth's surface since the middle of the 20th century?)

2. Geography & Sun Safety: The UV Index

Length: 4 or more paragraphs; at least one for each checkbox;(~1- 2 pages)
In this section you should:

- ❑ **Explain** what the **UV index** is and how it can be used to guide your sun exposure timing decisions.
- ❑ Describe what a **typical range for the UV index is for Arizona at various times of the yea**r (e.g., which months tend to have the highest UV indices and what is a typical range, which have the lowest index values and what is the typical range, etc.)
  *[HINT: to answer, collect data by examining the UV Index Annual Time Series over several years. Use the **Phoenix values** to represent Arizona as a whole]*
- ❑ Discuss **whether Arizonans are more or less at risk for sun-related damage than other state**s in the U.S and **explain why or why not.** *[HINT: compare the UV Index Annual Time Series graphs for Phoenix with those of cities in other states, e.g. Anchorage, Honolulu, Milwaukee, Bismark, Concord, etc. -- Also look at the maps of UV Index Monthly Means & Maximums where you can compare the states via mapped averages for each month.]*
- ❑ **Identify** which **other areas of the world are especially vulnerable** to UV exposure based on: (a) the UV index or other UV-related information, and (b) *increases* in UV exposure due to global change (i.e., tie in with ozone depletion – refer to Section 1 above)
  [HINTS: check out this Erythemal (sunburn) UV Exposure Data Product obtained from the TOMS sensor to see global patterns of UV exposure; find UV index websites for many places in the world at THIS LINK.]

CONSUMER-SAVVY CHOICES FOR SUN SAFETY

3. Sunscreen Active Ingredients

Length: 1 - 4 paragraphs; can all be written as one paragraph as long as it addresses all 4 checkbox items (~ ½ - 1 page) In this section you should:

- ❑ **Describe** what common **sunscreen ingredients** provide protection against UV radiation
- ❑ **State** which parts of the **UV spectrum** are absorbed by each of these ingredients
- ❑ **Explain** why is it important to look at the **active ingredients** in sunscreens.

- ❑ **Describ**e what the **SPF** (Sun Protection Factor) of a product means and what role SPF plays (if any) in designating a product's ability to protect across different parts of the UV spectrum.

4. **Product Comparison**

This section involves field work for data collection and the presentation of your data in an annotated table and/or graph. NOTE: What you do in THIS section will make your report uniquely your own! Go for it!

❑ **Field Work:** Visit a drug store, departments store, cosmetics counter, grocery store, discount store, etc. and **select 5 sunscreen or skin care products to compare.** These can be regular sunscreens, waterproof sunscreens, lip balms, moisturizers, foundations, sunglasses, even clothing -- as long as they make some claim of sun protection. However, be sure to select 5 items of the same *type* of product for a fair comparison, (i.e., compare a waterproof sunscreen with other waterproof sunscreens, a moisturizer with other moisturizers, etc.)

[NOTE: This "field work" can be done with one or more other students from the class, as long as you each focus on a different set of products or category of product, collect your own data and write up your own unique reports. Be sure you list the names of any other students you worked with on your survey activity in your report.]

- ❑ **Determine** to what degree each **product provides UV protection** based on what you reported in **Section 3** above (i.e., full spectrum, only some wavelength ranges, etc.)

NOTE: If you choose to research **sun-protective clothing** or **sunglasses** instead of skin care products, you will have to set up different criteria to establish the degree of UV protection. See what you information you can find on this by contacting a reference librarian in the UA Main or Science Library.

[No purchase necessary! You can do this without actually purchasing any products -- just take notes in the store.]

❑ In addition to the UV protection provided, come up with **at least 3 additional criteria** that are important to YOU for **evaluating the type of product** you are investigating (e.g. price, feel, greasiness, texture, look, odor, hypoallergenic properties, ease of application, fragrance, etc.) In a **paragraph or footnote annotate** your table and/or graph (see below) with information on your criteria and how you rated the products according to your criteria.

[For criteria that involve actual "testing" of the product -- depending on the type of store you are in -- you may want to actually purchase samples so you don't upset the clerks!]

❑ **Illustrate** the differences between your five selected products by **displaying the data** you gathered in a **table, graph, or both** *with* **annotation (**described above) in a footnote or text box underneath the table or graph. See **AN EXAMPLE online**

> **NOTE:** From your table and/or graph produced in this section, a reader should be able to easily determine the active ingredients of each product, the level of protection provided, what your additional criteria were, and how you rated this product on your additional criteria

5. **Product Recommendation**

This section will also make your report uniquely your own! Explain and defend your recommendation in a convincing way that is backed by your data and your newly-acquired knowledge in Global Change science! Length: 1-2 paragraphs (½ – 1 page)

- ❑ **Write up a discussion** of your table and/or graph pointing out the **most important things** your data collection revealed.
- ❑ Referring to your data displayed in Section 4, **make a product recommendation**
- ❑ **State why** you would recommend this product

Bonus Points Opportunity: Tanning Options

*[NOTE: this bonus activity may be done **with one or more other students in the class.** Each student needs to write up and post his/her OWN unique statement. If you worked with others, be sure you list their name(s).]*

- ❑ Field Work: Visit 2-3 different types of tanning salons and interview the operators to find out what they are saying about UV radiation
- ❑ Rate the salons in terms of the accuracy of the information provided, safety of method used, and price
- ❑ Display the results of your field work using a table and/or graph
- ❑ Write up a statement of what you learned in this bonus activity. Attach it and your table/graph to you **I-2 Assignment** AND **post it** to the **D2L Discussion Board.**

RESOURCES TO GIVE YOU THE INFO YOU NEED:

☑ To determine the protection provided by various **active ingredients**, READ: **Sun Essentials** by Paula Begoun. See also the **bottom of p 43 in CLASS NOTES**, which Dr H developed from Begoun's information. *(Note that the boundaries of UVA, UVB & UVC differ slightly in different sources. The UVA-UVB boundary is usually reported as 315 nanometers, but is rounded to 320 nm in the IGC text & the UVB-UVC boundary is usually reported as 280 but is given as 290 nm in IGC.)*

☑ **Links** to various other websites **containing the information you'll need to write your report** can be found by clicking on the **I-2 LINKS** webpage.

☑ **IGC Chapter 17** (pages 343-348) and **IGC/Hobson Chapter 9** (pp 459-466) contain pertinent information related to **ozone depletion** that will be useful for **Section 1.**

GRADING CRITERIA -- see the online GRADING RUBRIC *for specifics on how this assignment will be graded and in what format it should be presented]*

☑ You will be graded on the **clarity, content, and presentation** of each section of your report. **Information should be presented in paragraph form and in full sentences.** You can highlight key points with bulleted lists, or boxed text, but this information should be included in greater detail in paragraph form somewhere else in the report.

☑ Make sure each section contains **all the required information** as listed above in the checkboxes. In particular, make sure you've included graphs and tables where directed to do so. Make sure the information displayed in your graphs and tables is discussed somewhere in the text of your report. You can be creative with your formatting, but the most important thing is the proper presentation of clear, accurate, and relevant information along with solid, well substantiated recommendation -- not lots of fluff. Part of your grade WILL depend on the professional look of your report, however -- proper sentences, no typos, etc.

☑ Be sure to **carefully evaluate** and **properly reference** the information found at the various links on the **I-2 LINKS** page using the guidelines and format suggested at the top of the I-2 LINKS page

☑ You are encouraged to show an **outline** or **rough draft** of your report to someone on the Teaching Team (Dr H & TA's during office hours, or one of the preceptors), or to come in and ask us any questions that might help you with your report.

Field Notes Worksheet

(This is an optional worksheet designed to help you organize the data you obtain during your fieldwork. You should <u>not</u> turn it in with your assignment.)

Product	Active Ingredients	UV Protection Offered (UVA, UVB, etc)	Additional Criteria			
			Criterion 1:	Criterion 2:	Criterion 3:	Criterion 4:
1.						
2.						
3.						
4.						
5.						

Bonus Point Worksheet

(This is an optional worksheet designed to help you organize the data you obtain during your fieldwork. You should not turn it in with your assignment)

Salon	Tanning Services Provided	Information Provided	Accuracy of Information	Price	Safety of Method
1.					
2.					
3.					

Additional Comments & Observations: