I. Background and Definitions

Access to information is not a problem for most university students. What is a problem, however, is understanding what sources of information are appropriate to use as a university student of biology. In biology, our written arguments must be supported by a body of empirical facts or data. As you progress through a biology degree, you will be asked to write academic papers in which every statement in your paper must be either a logical conclusion from previous statements or is supported by reference to original observations (typically made by others) supporting that statement. While specific requirements will vary from one course to another, a critical skill that biology students must learn is how to discriminate among the different sources of information. Surprisingly, this is more difficult than it sounds. This assignment which has two parts is designed to help you with that task. First, you must find five sources of information (i.e., make a bibliography) that would help answer one of the biological questions listed on page 5 and second, you must answer a series of questions regarding your five sources of information. You must hand in your assignment to me in class, or at my office, or to a secretary in the Science Office by 4 pm Friday, March 25th (for Section 1) or Thursday March 24th (for Section 2).

For this course, we will define four different sources or types of information:

1. non-academic material
2. academic material that is not peer-reviewed
3. academic, peer-reviewed research material
4. academic, peer-reviewed review material

Discriminating among the different types of sources listed above is not based on the form of the source (i.e., book, webpage, journal article, or government publication), but is based on the content of the source and the process the information underwent as it was being published. Figure 1 on page 3 provides a flow chart that distinguishes among possible sources of information. For the purpose of this course, academic sources are distinguished by three characteristics: (1) they are written by an expert in the field, (2) they include “in-text citations,” and (3) they contain a bibliography (which may be labeled as “Bibliography,” “Literature Cited,” or “References”). Any source of information (such as encyclopedias, books, book chapters, newspapers, magazines and websites) that lacks one or more of the three characteristics is considered non-academic. Requiring the author to be an “expert” (defined in this course as someone who was either paid to do the research or has published peer-reviewed material based on the research) places a high standard on the source. If a source lacks “in-text citations,” it is impossible to track the authenticity of each statement the author makes. Likewise, if the
material lacks a bibliography, it is difficult to find the original references the author used to build his or her argument. Thus, it is inappropriate to use non-academic sources as a reference for your own research papers. This doesn’t mean that all non-academic sources are useless to consult when researching a biological question. Many non-academic sources of information like encyclopedias or books may provide a good introduction to your topic and may provide a bibliography that could list academic sources.

Academic sources of information include both peer-reviewed and non-peer-reviewed materials. **Non-peer reviewed academic sources** are published without the material undergoing a rigorous process of being critiqued by other experts in the field. Written material of this type may be an excellent source of information, as it tends to be easier to read than peer-reviewed information sources, yet still authoritative. Note, however, that it may not be easy to determine whether or not a source qualifies as academic. For instance, if a third-year biology student posts a term-paper on the web without providing any information about him or herself, it may be difficult to determine if the author is an expert. Library books related in some way to your topic often fall into this category. For instance, if you had chosen the topic “Coral Bleaching,” a book on invertebrates that refers to this phenomenon might be a good non-peer reviewed academic source you could use.

Before publication, peer-reviewed academic sources have been evaluated and critiqued by other experts in the field. In this process, authors submit their material (usually articles are submitted to a scientific journal, but some book chapters and other material may be peer-reviewed) and the editor of the publication asks one to three experts in the particular field of research (known as referees) to critique the submitted work. Ultimately the editor assesses the referees' comments and decides whether the work warrants publication.

Academic, peer-reviewed research articles are written to report the results of studies which have been undertaken by researchers to try and answer a specific question(s), and include detailed methods and results from a particular experiment(s). Academic peer-reviewed review articles typically examine several different lines of research (i.e., discuss several research articles) on a particular topic and summarize, synthesize, and/or critique the results of this research.

Peer-reviewed materials (both research and review) are most commonly available as articles published in peer-reviewed scientific journals. A variety of these may be found in “hard copy” in the TRU Library. Many of these, as well as thousands of others, can be also accessed through the Library website ([http://www.tru.ca/library/article.html](http://www.tru.ca/library/article.html)). In terms of an information source for biology students, peer-reviewed articles have the highest credibility and authority. They may, however, be difficult to understand if you are just beginning to learn about a subject.
Does the information source have all the following characteristics:
1. written by an expert in the field?
2. include in-text citations
3. contain a bibliography (a list of all the sources used)?

Yes → Academic material
No → Non-academic material

Has the source been reviewed by at least 1 referee before publication?

Yes → Peer-reviewed, academic material
No → Non peer-reviewed academic material

Does the source report results of a field or lab study completed by the authors (containing “Methods” and “Results” sections)?

Yes → Academic, peer-reviewed research material
No → Academic, peer-reviewed review material

Figure 1. Flow chart for discriminating among different sources of information available to biology students. The different types of information sources are identified in bold text.
II. Assignment

Your assignment is as follows: working alone, or in groups of no more than three people, find five information sources that would help answer one of the questions listed on page 5. Your information sources must include at least one of each the following: a non-academic source, a non-peer-reviewed academic source and a peer-reviewed academic source. Your assignment must be typed (font size 12), double-spaced, with 2.5 cm margins, and must include the following:

1. The name(s) of people in your group and the number of the question you have chosen to answer.

2. A bibliography that lists the five information sources and for each, indicates what “type” of information source it is following the citation. Use the CSE (Council of Science Editors) citation style for your bibliography– see the library website under citation styles and click on the first resource from the University of Guelph to follow as your style guide: http://www.tru.ca/library/guides/citation_styles.html#cse

3. Photocopy and include enough of each information source to make it possible for me to check your categorization of each information source. Thus, include where necessary:
   - the first page if it is an article or the title page and publication information if it is a book
   - one page of the bibliography (often called the “Literature Cited” or “References” section)
   - one page showing in-text citation(s)
   - some evidence to show that the information source has been peer-reviewed. Note that for library books and things like government documents, you may limit your search for this “evidence” to information contained either within the book or within the TRU library catalogue’s description of that book or document.
   - some evidence that the author(s) is/are expert in the field

Use a highlighter to point out the required information, and organize your information to make it very clear which photocopies belong to which information source (you might use some kind of tabs, for example).

4. On a separate sheet of paper answer the following questions:
   a. Describe the similarities and differences between peer-reviewed academic and non-peer-reviewed academic sources.
   b. Describe at least two features that allowed you to identify your peer-reviewed information source(s) as a review or research article(s).
   c. The journal, Nature, publishes peer-reviewed articles. Does this mean that every piece of writing within each issue is peer-reviewed? If not, give an example of what wouldn’t be peer-reviewed. If you are stumped by this question, go to the journal stacks in the library and flip though an individual issue of Nature.
   d. What type of information source is your course textbook? Explain your answer.

Notice that in this assignment you do not actually have to supply an answer to the biological question you have chosen. However, in the final exam for this course you will be asked to write a paragraph – in your own words – explaining the answer to the question, so make some notes from your information sources.
III. Biological Questions: CHOOSE ONE OF THE FOLLOWING QUESTIONS

1. What are the potential consequences of global warming for organisms that live in freshwater environments?
2. Describe several mechanisms by which either plants or animals can survive the heat and dry conditions of a desert or semi-desert—such as you might find around Osoyoos, B.C.
3. Choose either plants or animals and discuss what factors promote abundance; that is, why are some able to become very abundant (whereas others often become, or stay rare).
4. What advantage do deciduous plants gain by dropping their leaves over the winter?
5. Every year more of the world’s surface becomes desert. Is desertification a problem? Explain your answer.
6. Invasive species of fish pose serious problems for those attempting to conserve native species in BC. Explain why: you may focus either on the problems that such species cause or what features of these species make them “invasive.”
7. During a period of 50 years starting in the 1920s, wolves on Vancouver Island were culled, partly so that Black-tailed Deer would remain abundant enough to hunting (by humans). This had lead to several problems. Discuss these problems, with a focus either on either (1) Black-tailed deer OR (2) wolves.
8. What is the effect of global warming on tropical species? You might choose one group of species, such as birds, reptiles or primates.
9. In 2006, the first hybrid between a polar bear and a grizzly bear was recorded. How could human activities be influencing hybridization rates between species?
10. Lichens are regarded as important indicator species, which can be used to monitor the health of an environment. Explain why and describe at least one example in which lichens are used in this way.
11. In 1979, scientists released the first of many hundreds of reports about the causes and effects of acid rain. What is acid rain, and what has been done about it since it was first discovered? Is the situation improving today or not?
12. Recent years have seen worldwide declines in the populations of many different types of amphibians. Why? You might choose to describe some of the hypotheses that have been generated to explain the decline or to focus on one or two hypotheses and describe the evidence for or against them.
13. Why are some types of seafood considered to be sustainable by environmental groups, such as the David Suzuki Foundation, whereas others are not? Is there evidence that some types of fishing are better than others? You might choose to focus on one or two examples in your answer.
14. Many of the forests of British Columbia have been decimated in recent years as a result of the Pine Beetle epidemic. Provide an overview of this problem, describing the general cause and biological effects of the loss of so much forest.
15. Certain chemicals found in many cosmetics, cleaning products etc. are referred to endocrine disrupters. What does this mean? Is there evidence that these chemicals are harmful to living organisms, including humans?