

# SCI 342U-001: Biological Concepts and Applications

Win 2017 lecture: TuTh 845-9:50 SRTC 201

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## **Overview**

In Biological Concepts and Applications (SCI 342) we will be discussing the fundamental biological processes that unite and maintain life such as physiology and metabolic processes. We will be developing a basic understanding as to how life functions and how our environment can alter these essential processes, particularly in terms of anthropogenic contaminants in our natural environment. In addition to in-class presentations, discussions and activities, you will be conducting individual investigations and inquiry-based projects. The successful completion of these projects will require that you (a) work independently and collaboratively, (b) use the PSU library and associated databases to access scientific articles, (c) collect data (d) organize, analyze and present information and (e) arrive at and defend substantiated (thus persuasive) conclusions.

## **Course objectives:**

- 1) Students will understand, discuss and apply biological concepts that relate physiology to environmental change or damage.
- 2) Students will find and use primary literature resources and become able to access and evaluate information on the topics of pollutants, environmental toxicology and health.
- 3) Students will collect data, design, conduct, present and defend a scientific study related to biology

## **Expectations**

- **Be prepared** for class
  - Arrive on time (absence will result in the loss of participation points)
  - Communicate and collaborate with your classmates on group assignments.
  - Read assigned papers and come to class with assignments completed.
- **Participate** in class activities
  - Be aware that good grammar, clear structure and scientific reasoning will all be incorporated into your grades.
  - For goodness' sake, take notes. My notes will not be available to you online or otherwise.
- **Ask Questions!**

Adhere to the code of conduct: <http://www.pdx.edu/dos/codeofconduct>; e.g., no academic dishonesty or negligence; no harassment or discrimination. As an instructor one of my responsibilities is to help create a safe learning environment for all of my students and campus as a whole. We expect a culture of professionalism and mutual respect in our department and class, you may report any incident of discrimination or discriminatory harassment, including sexual harassment to either the office of equity and compliance or to the office of the dean of student life. Please be aware that as a faculty member I have a responsibility to report any instances of sexual harassment, violence or other forms of prohibited discrimination. If you would rather share information of this nature to a confidential employee who does not have this reporting responsibility you may find a list of those individuals: [www.pdx.edu/sexual-assault/get-help/](http://www.pdx.edu/sexual-assault/get-help/)

Limit spread of diseases: wash hands (20 sec!); use a tissue to cover your sneeze/cough; get a flu shot; stay at home if sick; go to the doctor as necessary.

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**Schedule (SUBJECT TO CHANGE, ALWAYS use the in-class announcements of assignments as the most up-to-date information; if you miss a class then contact a class-mate for current assignments and notes)**

\*\* Assignments are due on the listed day by the start of class.

### Class Policies:

- Assignments must be in **on time**. I will not accept unexcused late homework.
- **Type** your homework assignments. Handwritten homework will not be graded.
- **Quality** is important and is factored into the grade of each assignment
- Although much of the work will be conducted as a class or in small groups, your homework must be your *own work*. I encourage you to discuss the *concepts* and interpretations of the data with your classmates, however, you must generate your own reports, graphs, etc... **Do not turn in identical or strikingly similar assignments as your classmates (current or anyone who has taken this class previously)**. You will not receive a score and you risk further academic prosecution for plagiarism.
- If you choose not to participate in this course, please do not converse or distract the other students.
- Be considerate of your classmates. Because this class will involve group activities, please come prepared and ready to participate in group and class activities.
- Arrive to class on time. If you arrive late, you disrupt the class activities and will miss valuable information presented at the beginning of class. **You are responsible for any material and activities that are conducted in class, even if you are not there!**
  - Familiarize yourself with the academic code in the University catalog.
  - There are many forms of plagiarism, including:
    - Copying word for word without quotation marks and proper citation
    - Closely paraphrasing without proper citation
    - Be especially careful of information obtained from the Internet. In general, for your reports **do not cite work from the web**. Follow the information to its source and cite the primary, peer reviewed literature.

### STUDENT EVALUATION & POLICIES:

#### LECTURE (35%)

Attendance and Participation	10%
Midterm	10%
Final	15%

#### LAB (65%)

Lab I: Metabolism (part a+b)	10%
Lab II: Animal Hormones (part a+b)	10%

#### PROJECT

Personal Inventory	5%
Project Proposal + bibliography (group)	3%
Introduction + bibliography	3%
Methods	3%
Primary data analysis	4%
Final paper	15%
Presentation (group)	5%
Peer review	2%
Participation	5%
Total	100%

A= 100 to 94%; A-= 93 to 90%; B+= 89 to 87%; B= 86 to 84%; B-=83 to 80%; C+=79 to 77%; C=76 to 74%; C-= 73 to 70%; D= 69 to 60%; F= 59% and below.

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### SCI 342 Lecture schedule

Date	#	Topic, due dates*	Assignments Due*
T 1/10	1	Introduction: How do we work? Basic laws,	
TH 1/12	2	Cells, energy	Why life does not really exist
T 1/17	3	Form	All mammals have seven cervical vertebrae
TH 1/19	4	Size and scale	Organisms usually bigger in colder environments. <b>Find newer paper, I think there is a 2007 paper that addresses this</b>
T 1/24	5	Size and scale	<i>Kleiber 1947</i>
TH 1/26	6	Toxins in our environment	Mind Games
T 1/31	7	Toxins in our environment	The Plastic Panic
TH 2/2	8	High Risk groups and why?	Precautionary principle
T 2/7	9	Stress: Salinity, Temperature and its effects:	Linking biogeography to physiology
TH 2/9	10	Midterm	
T 2/14	11	Heat shock proteins	New jobs for chaperones
TH 2/16	12	Hormones and chemical control systems: Endocrine system	Cocaine, spices, hormones Animals' sexual change
T 2/21	13	Endocrine system	Potomac, Swan
TH 2/23	14	Hormone control: behavior	Neuroscience of the Gut, The tantalizing links between gut microbes and the brain
T 2/28	15	Behavior: Ultimate and proximate causes	
TH 3/2	16	Signaling systems: Vision systems	feet for eyes, Vision optics and Evolution
T 3/7	17	Signaling systems: Vision	Ecological Light pollution Animal Behavior in Urban Ecosystems
TH 3/14	18	Signaling systems: Chemical	Ocean acidification disrupts predator detection
T 3/16	19	Signaling Systems: Auditory	Noisy Spring
TH	20	Finish Signaling systems and review	

## SCI 342U-001: Biological Concepts and Applications

FINAL WEEK		Final Exam	
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### SCI 342 Lab Schedule

Date	#	Topic,	due dates*
	1	Metabolism and oxygen consumption: Crayfish and oxygen consumption: Is there a body-size effect on specific metabolic rate?	
	2	Metabolism and oxygen consumption: What are the effects of environment, exercise or other variables on metabolic rate? Crawfish in crater lake? Discuss personal inventory	Metabolism and oxygen consumption part a.
	3	Assemble personal inventory data as group, Library use introduction: looking for papers.	Metabolism and oxygen consumption written Personal inventory
	4	Group presentation: Animal Hormones (blackworms)	Project proposal, supply requests. develop annotated bibliography
	5	Animal hormones (blackworms)	Introduction and references
	6	Group project: impacts of environment on physiology. Set-up project	Animal Hormone lab Parts a and b Methods
	7	Group project: impacts of environment on physiology: Collect primary data. Develop Second question, data analysis	
	8	Group project: impacts of environment on physiology. Collect follow-up data	Primary data analysis
	9	Group project: impacts of environment on physiology: Data analysis	
	10	FINAL Presentations	Final Paper

#### **\*Participation & Attendance:**

Each day you will be awarded points for: attendance, being prepared for class with any assignments due, participation in discussions and in-class activities. Any time I assign a reading, you must submit two discussion questions online before the class begins. You are responsible for any assignments whether or not you attend class. At the end of the term I will drop your two lowest daily participation scores. Participation is a substantial portion of your grade, please be prepared to attend and be prepared for each class. Missing more than 2 classes will substantially impact your grade.

**List of papers. Reading assignments are subject to change, always check on the board at the beginning of class:**

## SCI 342U-001: Biological Concepts and Applications

- Jabar, F 2013, Why Life Does Not Really Exist. Blogs.scientificamerican.com. December 2, 2013  
<http://blogs.scientificamerican.com/brainwaves/why-life-does-not-really-exist/>
- Galis, F, 1999, Why do almost all mammals have seven cervical vertebrae? Developmental constraints, Hox genes and cancer. J. Exp. Zool (Mol. Dev. Evol) 285:19-26  
[http://onlinelibrary.wiley.com/doi/10.1002/\(SICI\)1097-010X\(19990415\)285:1%3C19::AID-JEZ3%3E3.0.CO;2-Z/epdf](http://onlinelibrary.wiley.com/doi/10.1002/(SICI)1097-010X(19990415)285:1%3C19::AID-JEZ3%3E3.0.CO;2-Z/epdf)
- Atkinson, D. and Sibly, R. M., 1997, Why are organisms usually bigger in colder environments? Making sense of a life history puzzle, Trends in Ecology & Evolution, v.12(6), 235-239  
<http://www.sciencedirect.com/science/article/pii/S0169534797010586>
- Kleiber, M 1947, Body Size and Metabolic Rate. Physiological Reviews. V.27(4): 511-541.  
<http://physrev.physiology.org/content/27/4/511.full-text.pdf+html>
- Steingraber, S., 2011, Mind Games: How toxic chemicals are impairing children's ability to learn, Orion, March/April, Issue, Number, <http://www.orionmagazine.org/index.php/articles/article/6162>
- Groopman, J., 2010, The Plastic Panic: How worried should we be about everyday chemicals?, The New Yorker, Issue,  
[http://www.newyorker.com/reporting/2010/05/31/100531fa\\_fact\\_groopman?currentPage=all](http://www.newyorker.com/reporting/2010/05/31/100531fa_fact_groopman?currentPage=all)
- Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E. L., Quinn, M., Rudel, R., Schettler, T. and Stoto, M., 2001, The Precautionary Principle in Environmental Science, Environmental Health Perspectives, 109, 9, 871-876 <http://www.jstor.org/stable/3454986>
- Somero, G. 2005, Linking biogeography to physiology: Evolutionary and acclamatory adjustments of thermal limits. Frontiers in Zoology. 2(1) <http://www.frontiersinzoology.com/content/pdf/1742-9994-2-1.pdf>
- Srivastava, P. K., 2008, New Jobs for Ancient Chaperones, Scientific American, July, 50-55  
<http://www.nature.com/scientificamerican/journal/v299/n1/full/scientificamerican0708-50.html>
- Dell'Amore, C., 2010, Cocaine, Spices and Hormones, National Geographic, 26 February, Issue, Number,  
<http://news.nationalgeographic.com/news/2009/11/091112-drinking-water-cocaine.html>
- Owens, J., 2004, Animals' Sexual Changes Linked to Waste, Chemicals, National Geographic News, Issue, Number,  
[http://news.nationalgeographic.com/news/2004/03/0301\\_040301\\_genderbender.html](http://news.nationalgeographic.com/news/2004/03/0301_040301_genderbender.html)
- Avasthi, A., 2007, Sex-Changing Chemicals Found in Potomac River, National Geographic News, Jan 22, Issue, Number,  
<http://news.nationalgeographic.com/news/2007/01/070122-sex-change.html>
- Swan, S. H., 2006, Semen quality in fertile US men in relation to geographical area and pesticide exposure, International Journal of Andrology, 29, 1, 62-68  
<http://stats.lib.pdx.edu/proxy.php?url=http://search.ebscohost.com/login.aspx?direct=true&db=hch&AN=19630121&site=ehost-live>
- Martone, R., 2011, The Neuroscience of the Gut. Strange but true: the brain is shaped by bacteria in the digestive tract, Scientific American, <http://www.scientificamerican.com/article.cfm?id=the-neuroscience-of-gut>
- Nilsson, D. E., 1989, Vision optics and evolution: Nature's engineering has produced astonishing diversity in eye design, BioSci., 39, 5, 298-307 <http://www.jstor.org/stable/1311112>
- Longcore, T. and Rich, C., 2004, Ecological light pollution, Frontiers in Ecology and the Environment, 2, 4, 191-198 [http://dx.doi.org/10.1890/1540-9295\(2004\)002\[0191:ELP\]2.0.CO;2](http://dx.doi.org/10.1890/1540-9295(2004)002[0191:ELP]2.0.CO;2)
- Ditchkoff, S., Saalfeld, S. and Gibson, C., 2006, Animal behavior in urban ecosystems: Modifications due to human-induced stress, Urban Ecosystems, 9, 1, 5-12 <http://dx.doi.org/10.1007/s11252-006-3262-3>
- Dixson, D, Munday, P, Jones, G., 2010, Ocean acidification disrupts the innate ability of fish to detect predator olfactory cues. Ecology Letters. 13:68-75 <http://onlinelibrary.wiley.com/doi/10.1111/j.1461-0248.2009.01400.x/pdf>
- Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C. and Popper, A. N., 2010, A noisy spring: the impact of globally rising underwater sound levels on fish, Trends in Ecology & Evolution, 25, 7, 419-427 <http://www.sciencedirect.com/science/article/pii/S0169534710000832>

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Optional Text: Biology: Concepts and Applications 9<sup>th</sup> edition. This text is optional, though I think it is a very good text to use. There are options for purchasing. The full paperback is over \$266, you can get a loose leaf version (in a binder) for \$173.95. There are also rental options and e.book options that are significantly less expensive (<http://www.cengagebrain.com/shop/search/9781285427812>). You may also order by chapter. The chapters that will be relevant are the ones physiology. Finally, there is a version that includes online supplemental material for \$102 (<http://www.cengagebrain.com/shop/isbn/978-1-305-07264-0>) but is only available for one term (includes ebook).

### Resources:

Don't forget to check out the ESM webpage for all sorts of info on what the department is doing...

**Advising & Career Services:** <https://www.pdx.edu/careers/> and

<https://www.pdx.edu/careers/what-can-i-do-degree-environmental-studiesenvironmental-sciences>

**Library Research Tutorials:** <http://guides.library.pdx.edu/home/howto> and <http://guides.library.pdx.edu/biology>

**Safe Campus:** If you have not done so already, please complete the [Safe Campus Module in D2L](#). The module should take approximately 30 to 40 minutes to complete and contains important information and resources. If you are uncomfortable completing the module, please send an email to [saveact@pdx.edu](mailto:saveact@pdx.edu) to request an exemption. If you or someone you know has been harassed or assaulted, you can find the appropriate resources at Sexual Misconduct Prevention & Response: [www.pdx.edu/sexual-assault/](http://www.pdx.edu/sexual-assault/). PSU's Student Code of Conduct makes it clear that violence and harassment based on sex and gender are strictly prohibited and offenses are subject to the full realm of sanctions, up to and including suspension and expulsion. <http://www.pdx.edu/sexual-assault/safe-campus-module>

**Learning Center/Free Tutoring...:** <http://www.pdx.edu/tutoring/> PSU library rm 245

**Writing Center:** for class assignments, resumes... <http://www.writingcenter.pdx.edu/> Cramer rm 188

**Math** <https://www.pdx.edu/math/math-resource-lab>; Department of Mathematics and Statistics provides free tutors for lower division algebra, calculus and statistics: <https://www.pdx.edu/math/resources>

**Disability Resource Center** If you are a student with a documented disability and are registered with the Disability Resource Center, please contact me so that we can arrange whatever academic accommodations you need.

**Veterans** If you are a Veteran and have questions about University services or need assistance with your transition from military to campus life, please contact Chris Goodrich, Coordinator of Veterans Services at the Office of Veterans' Services, SMSU room 425.

**Multicultural Centers:** <https://www.pdx.edu/dmss/multicultural-student-center> ; <https://www.pdx.edu/dmss/native-american-student-community-center> ; <https://www.pdx.edu/dmss/la-casa-latina-student-center>

Queer Resource Center: [www.pdx.edu/queer](http://www.pdx.edu/queer)

LSAMP (Louise Stokes Alliance for Minority Participation) is dedicated to enhancing the undergraduate experience for underrepresented students in Science, Technology, Engineering, and Mathematics. Funded by the National Science Foundation, our LSAMP program focuses on: Creating a community among LSAMP scholars that values excellence, diversity, and persistence; and Expanding opportunities for LSAMP scholars through participation in undergraduate research experiences and leadership initiatives. If you're interested in finding out more, visit our LSAMP center [in 103 Epler Hall](#), talk to ESM-LSAMP faculty advisory member Cat de Rivera <[derivera@pdx.edu](mailto:derivera@pdx.edu)>, SRTC 238e, or check out: <http://www.pdx.edu/lsamp/home>

McNair Fellows program - for first-generation to college students as well as students from backgrounds underrepresented in the sciences.

### Desire 2 Learn:

The class will use D2L to share readings, handouts, asking questions of fellow students. It will be our primary contact outside of class, so please check it at least every other day. To access D2L you must have an ODIN account. If you do not have one, please get one as soon as possible. Access to D2L is a privilege. Please do not abuse it as a forum for putting others down or communicating offensive material to the rest of the class. More extensive information on the protocols that we will be following can be found at The Core Rules of Netiquette: <http://www.albion.com/netiquette/corerules.html> Failure to use D2L in a respectful way and to treat all class participants with respect will result in a loss of access to D2L and

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potentially a failing grade for this course.

**Midterm & Final:** The exams will be primarily short-answer; 1 word – 1 paragraph responses will be required to be written legibly and reflect the information that you have learned in class. All information presented during class and in homework may be addressed in the exams.

**PROJECT AND PAPER: We will be focusing on how anthropogenic contaminants in the environment impact humans and other species.**

- **objective: demonstrate an ability to collect and evaluate data and to gain information by going to primary references to determine scientific accuracy.**

This will be a short, 6-8 pg (1.5 spaced, plus references) paper.

### **Part I: Inventory**

You will be conducting a self-inventory of chemicals that you are subject to on a regular basis. Create and maintain a list of everything you consume/apply to yourself within 24 hours. How big is that list? Once you have the inventory, evaluate the products for known concerns.

Enter these into excel to aid in sorting and categorizing of the various ingredients and consolidating later with your group results. Make one column with the product and the next column for each ingredient in that product and a third column to note whether you use the product internally or externally. You will individually turn in these lists.

Once you have your individual lists, we will be categorizing the toxicity of different ingredients. This may be done as a group. Categorize the top 20 most commonly encountered ingredients for your group. Add columns in your database for toxicity level if we can determine it (Use the skin deep cosmetics database or MSDS.com (user name BioConcepts pwd bca), the next column for what sort of toxin or contaminant it is (e.g. carcinogen, endocrine disruptor etc..) and a final column for any additional resources you may be able to reference these can be primary references OR *reliable* websites. These results will be turned in as a group. You will need to find at least three primary references at this point (as a group) to begin your exploration of the current knowledge of your topics.

Based on your inventory and your evaluation of the ingredients you encountered, you will develop a proposal for your research (see below). You will turn in a written copy (individually, 2 pgs) and propose your work to the class (as a group).

### **Part II: Proposal and Research**

As a group, select a research topic based on the information you have gathered. Develop a broad topic that clearly relates to your findings from the inventory. Within that topic, focus on answering particular questions; for example a general topic on a particular group of toxins could be subdivided into environmental impacts, human health and impacts on other species. Use your data from your inventory and your research from primary literature to drive your selection of topics for your groups and your individual research.

Your individual project will be an experiment or a survey of your choice but you must (a) design an excellent study, (b) collect and (c) analyze interesting data that works towards answering your research question.

### **Part III: Results and Presentation:**

**As individuals,** you will write a paper (6-8 pgs) that addresses your particular research question. It should include at least 3 primary references from scientific journals (6 if you are conducting a literature survey). Your paper should relate your findings from your inventory to current knowledge on the topic you are researching.

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**As a group**, you will put together a comprehensive presentation on your topic. Each person will have an opportunity to speak. Your role will be **to instruct** the class on your topic. Presentations will be 20 minutes, with 5 minutes for questions. You should introduce your broad topic, explain why you selected it and why it is generally interesting / important to know and give important background information about the topic. Each person should then explain their individual contributions to the project, including major findings. Finally, the group should synthesize the individuals' findings and explain the lessons learned.

### Rubric for Individual Inventory:

\_\_\_\_\_/10 Assignment was complete, on time, clearly and completely entered into an Excel spreadsheet  
\_\_\_\_\_/10 Format is standardized and includes a column for Product, Ingredient, Internal/external.

### Rubric for Inventory Summary:

\_\_\_\_\_/5 Assignment was complete, on time and represents all of the members of the group.  
\_\_\_\_\_/5 Sorted properly to accurately represent the top 20 ingredients that are used by the group.  
\_\_\_\_\_/5 Toxicity level and type noted for all of the top 20 ingredients  
\_\_\_\_\_/5 one external source for each toxicity estimate.

### Rubric for written Proposal:

\_\_\_\_\_/10 Assignment was complete, on time and clearly typed and printed (10). Late (5)  
\_\_\_\_\_/10 Includes full worksheet for 20 ingredients (to include columns for the product, ingredient, use, toxicity, concern, resources) printed onto one page (10), incomplete worksheet  
\_\_\_\_\_/10 Includes summary of results (10)  
\_\_\_\_\_/10 Includes rationale for group topic, with clear links to data and supporting information (references) as to why this topic is interesting, definitions clearly explained, specific numbers (from data or literature) used to support claims (all (10), Some (7), none (0)).  
\_\_\_\_\_/10 Purpose of individual research explained, question clearly stated, supporting information provided (references) and specific impacts or predicted impacts discussed. (all (10), some (7), none (0)).  
\_\_\_\_\_/10 Methods for completing individual research clearly outlined (10).  
\_\_\_\_\_/5 Statement of what you expect to find (predictions). (5)  
\_\_\_\_\_/10 Includes at least three academic articles, clearly referenced (10), Articles not from scientific literature, not clearly discussed in text (7), Inadequate references (3)

### RUBRIC FOR INDIVIDUAL PAPER:

\_\_\_\_\_/5: Project was completed on time, typed, in paragraph form with full and complete sentences (5 pts)  
\_\_\_\_\_/5: Project was completed in full, well and clearly written without grammatical or spelling errors. (5 pts). Paper contains some spelling and grammatical errors, though mostly readable, (3 pts). Project not complete, contains serious grammatical errors, contains sentence fragments, difficult to read (1 pts).  
\_\_\_\_\_/10: Project was insightful and carefully executed with clarity in a professional and very scientific manner (10 pts). Project was fine, they did a good job (8 pts), Project lacked context, missing interesting analyses, executed adequately, but could have done much more (7 pts). Poor job, unscientific, unsupported, inadequate (5pts) Student did not understand the assignment (2)  
\_\_\_\_\_/10: All Statements and reasoning were well supported (with academic citations) and properly defined, any references in the text are in the literature cited section and vice versa. (10pts) They supported most of their statements, but still had some unsupported statements of fact, (8 pts), background research mostly (>50%) from unscientific sources (6 pts), Statements were unsupported by scientific citations, statements were vague, reasoning was fairly logical (4 pts), no support or context for their work (3pts)  
\_\_\_\_\_/5 pts: **Title Authorship and affiliation:** Is the title short and descriptive? Authorship should include all three authors, but the person writing the paper should be first author.



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**Abstract:** Does the abstract cover the entire paper, ideas flow well, introduces the problem, explains methods and results briefly and gives a concise take-home message.

### \_\_\_\_\_/20 **Introduction:**

- Clear description of the nature of the problem (what issue(s) is (are) the paper addressing?).
- Summary of your findings from the inventory you conducted.
- Clear statement of your group research question.
- Description of the type of compound or additive you are investigating.
- Includes a History and rationale of its use in products.
- General concerns and appropriate interest groups (and why)
- Known health impacts (with citations).
- Includes appropriate definitions and a numeric description of trends and prevalence
- Scientific background information is provided about this research and to place this work within the body of similar work done by others.
- Explicit statement of study hypothesis (if, then)
- Appropriate background information as applied to specific research question
- No excessive use of quoted material (should be in own words... with citations)

Contains ALL key ideas above (20 pts), MOST of the key ideas above (17pts), HALF of the key ideas above (10 pts), NONE of the above (1pt)

Comments \_\_\_\_\_

### \_\_\_\_\_/10 **Methods:**

- They are explicit and thorough, so that the reader understands the methods enough to replicate the study.
- Includes relevant information on study location or definitions necessary to understand the topic.
- Clearly addresses research question
- Includes predictions or outcomes of your hypotheses.
- Methods are in narrative format and written in past-tense

Contains ALL key ideas above (10 pts), MOST of the key ideas above (7pts), HALF of the key ideas above (5pts), NONE of the above (1pt)

Comments \_\_\_\_\_

### \_\_\_\_\_/10 **Results:**

- Graphs and tables must be titled with numerically sequenced tags, e.g. Figure 1, Figure 2, with clear and descriptive figure captions,
- Figures are all well labeled; all axes are labeled and legible. Where appropriate (where there is replication), error bars (st.dev) are used
- ALL figures must be referenced within the narrative document -- no figure "orphans"!
- The narrative document in this section DESCRIBES THE PATTERN of what is presented in graphical or tabular form, connects results together and points out trends.
- Patterns supported with statistics and analyses.
- Results presented clearly without interpretation, though areas of uncertainty should be pointed out.

Contains ALL key ideas above (10 pts), MOST of the key ideas above (7pts), HALF of the key ideas above (5pts), NONE of the above (1 pt)

Comments \_\_\_\_\_

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### \_\_\_\_\_/20: **Discussion:**

- Scientific evaluation and analysis of the results... what do the results mean?
- Related results to the problems introduced in the introduction.
- Results placed in context of a summary of other relevant studies; (with Citations)
- Discussion of the real-world significance of the results... did they corroborate or deviate from the expected patterns? If there is an effect, how strong is it?
- No unsupported claims
- Makes specific, realistic recommendations of further work.
- Makes specific suggestions as to what, if any, action needs to be taken.
- Generalization to the "big picture" without being overly speculative.

Contains ALL key ideas above (20 pts), MOST of the key ideas above (17pts), HALF of the key ideas above (10pts), NONE of the above (1pt)

Comments \_\_\_\_\_

\_\_\_\_\_/5: **References:** At the end of the paper, references cited in the text of the report are listed (usually alphabetically) with full and consistent citations (5 pts), Contains extraneous information, such as irrelevant web information (3).

### **RUBRIC FOR FINAL PRESENTATION:**

\_\_\_\_\_/5 **Descriptive Title and Authorship** (5)

\_\_\_\_\_/5 **Engaging** (5): Slides were clearly presented, font was large and readable, bullet points, good contrast, effective use of images and graphs, paced well, within time limits

\_\_\_\_\_/10 **Effectiveness as a teaching tool:** Cohesive, logical progression of information, Statements supported by cited facts, Interesting and engaging presentation (10).

\_\_\_\_\_/5 **Turned in exam questions:** Turn-in three questions (with answers) that address the big-picture ideas from your presentation (5 pts)

\_\_\_\_\_/25 **Introduction:** Completely effective and all aspects clearly, scientifically and professionally addressed (25 pts), Most aspects of the section addressed, done very well (20), Addressed adequately, but not supported or incomplete (17). Not addressed adequately, briefly mentioned but not developed (12). Missing (0)

- Clear description of the nature of the problem (what issue(s) is (are) you addressing?).
- Summary of your findings from the inventory you conducted.
- Clear statement of your group research question.
- Description of the type of compound or additive you are investigating.
- Includes a History and rationale of its use in products.
- General concerns and appropriate interest groups (and why)
- Known environmental/health impacts (with citations) clearly described with context
- Includes appropriate definitions and a numeric description of trends and prevalence
- Scientific background information is provided about this research and to place this work within the body of similar work done by others.
- Explicit statement of study hypothesis (if, then)

\_\_\_\_\_/10 **Methods** Completely effective and all aspects clearly, scientifically and professionally addressed (10 pts), Most aspects of the section addressed, done very well (8), Addressed adequately, but not supported or incomplete (7). Not addressed adequately, briefly mentioned but not developed (5). Missing (0)

- Clearly addresses research question
- Clear diagram/description of study design includes replicates, randomization, treatments

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- Includes explanation of appropriate control selection
- Includes relevant information on study organisms or location
- Includes relevant information on appropriate dosages
- Includes predictions or outcomes of your hypotheses and explanations

\_\_\_\_\_/20 **Results** Completely effective and all aspects clearly, scientifically and professionally addressed (20 pts), Most aspects of the section addressed, done very well (16), Addressed adequately, but not supported or incomplete (14). Not addressed adequately, briefly mentioned but not developed (10). Missing (0)

- Graphs and tables must be titled and clearly presented
- Figures are all well labeled; all axes are labeled and legible. Where appropriate (where there is replication), error bars (st.dev) are used
- Presenters take time to DESCRIBES THE PATTERN of what is presented in graphical or tabular form, connects results together and points out trends.
- Patterns supported with statistics and analyses.
- Results presented clearly without interpretation, though areas of uncertainty should be pointed out.

\_\_\_\_\_/ 20 **Discussion** Completely effective and all aspects clearly, scientifically and professionally addressed (20 pts), Most aspects of the section addressed, done very well (16), Addressed adequately, but not supported or incomplete (14). Not addressed adequately, briefly mentioned but not developed (10). Missing (0)

- Scientific evaluation and analysis of the results... what do the results mean?
- Related results to the problems introduced in the introduction.
- Results placed in context of a summary of at least three other relevant studies; (with Citations)
- Discussion of the real-world significance of the results... did they corroborate or deviate from the expected patterns? If there is an effect, how strong is it?
- No unsupported claims
- Makes specific, realistic recommendations of further work.
- Makes specific suggestions as to what, if any, action needs to be taken.
- Generalization to the “big picture” without being overly speculative.