BIO 241: Cell Biology Fall 2012

Monday & Thursday 3:00-4:30pm, 303 Science Hall B
Thursday 12pm – 2:50pm, 301 Science Hall A

Instructor: Dr. Victoria Newton
Office: Perry Science Hall 213A
Office Phone: 704-378-1152
Emails: vnewton@jcsu.edu
Victoria_Newtpn@med.unc.edu

Office Hours:
M: 1:00pm–2:45pm,
4:45pm-6:00pm,
R: 4:45pm–6:00pm
Also by appointment

The best way to reach me is by coming to my office or emailing me. Reaching me by phone may only work when I am at JCSU on class days (Monday and Thursday).

Course Description and Goals
Cells are integral to the function of life on earth. Certain properties define a cell and are shared whether cells are working together to make a heart or redwood tree, or acting as a single unit, such as bacterium in a pond. In this course, we study in-depth the basic principles and concepts of life at its most basic unit—the cell. We will examine each cellular component and how these units act together to produce a living cell, and eventually, how cells act together to form tissues, organs and organisms. While this course will focus mainly on eukaryotic organisms, we will relate many of these same processes to prokaryotes as well. Students will also be expected to choose a specific cell-type (subject to instructor approval) and produce an in-depth study of it and its potential relation to disease in the form of a term paper.

Upon completion of this course, students will be able to complete the following goals…

- Define, compare, contrast and explain
  - Basic prokaryotic and eukaryotic biology
  - The components of the cell and their function
  - Cell reproduction: Mitosis vs. Meiosis
  - Processing of genetic information: DNA vs. RNA vs. Proteins
  - Mechanisms of energy utilization
- Recognize and apply/explain terminology used in the field of cell biology
- Relate concepts in this course to higher systems, such as physiology and diseases.
- Design an experiment using the scientific method
- Hypothesize, using knowledge in-class with additional information, the effect of fictional conditions on a given cell.
- Command use of precise scientific language in written and oral communication.

Prerequisites: Students taking this course should have taken both “Introduction to Biology” courses (BIO 143, BIO144) and General Chemistry I (CHE 131). Non-majors are welcome to take this course as long as the prerequisite courses have been met. Concepts in these courses are critical to fully understanding the information that will be covered in this course. The course survey you took today will allow me to evaluate your retention of these concepts from previous courses and evaluate whether I need to adjust my lesson plans.

Course Material
Required Text: Alberts, Bruce, et al. Essential Cell Biology. (2009) 3rd edition. There is a copy on reserve at the library and a copy of the 2nd edition in the STEM office. These are available for use if a book cannot be purchased. Be mindful of and be sure to share with other students if you are using these copies.
Other: Additional reading materials will include journal, magazine, audio files and newspaper articles needed to complete group assignments and may be required for particular lessons.
Course Website: All printed materials for this course can be found online at Moodle and will be distributed through this site. It is expected that you will check the website before class to gather materials and assignments and to check for class updates and news. Grades and attendance will also be recorded on Moodle and Jenzebar, http://hermes.jcsu.edu/moodle. The class page can also be found under Bio241 F12 in the Biology Courses section.

Course Requirements:

Grading

*Cell Biology Lecture (850 points / 85%)*

- Quizzes: 41 points
- Group Assignments: 64 points
- Preclass Assignments: 45 points
- Term Paper: 100 points
- Exams + Final: 600 points (150 points each)

*Cell Biology Lab (150 points or 15%)*

- Lab Notebooks: 20 points
- Lab Assignments: 20 points
- Lab Reports: 80 points
- Lab Practical: 30 points

**TOTAL 1000 points**

The following grading scheme will be used

<table>
<thead>
<tr>
<th>Grade</th>
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<tr>
<td>A</td>
<td>1000 – 900 pts</td>
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<td>B</td>
<td>899 – 800 pts</td>
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<td>799 – 700 pts</td>
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<td>D</td>
<td>699 – 600 pts</td>
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<td>F</td>
<td>≤ 599</td>
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*Lecture (890 points / 89%)*

The following is an explanation of the grading. Any further details will be given in class.

**Group Class Assignments: (8 x 8 points each = 64 points / 6.4%)**

Assignments will be given throughout the year, that will be worth 8 points each. These assignments will be inquiry-based assignments, requiring students to answer directed questions from the textbook or from reputable scientific sources, such as PubMed Central. These assignments are meant to push your understanding of cell biology and the topic at hand. Answers are expected to be typed, unless otherwise directed. Groups will be determined on the first day of class. Students in the group will have at least 1 week to complete each assignment. Please turn 1 set of answers per group. No Assignments will be dropped.

**Term Paper (1 x 100 points = 100 points / 10%)**

Students will be expected to choose an instructor-approved cell-type for in-depth study and typed report. Using reputable sources online and through the library, students will give a detailed analysis of the biology (structure, function, special features, etc) of their cell or cell-type of focus and how that cell type relates to biology as whole. Is it involved in a particular disease? Does it relate to ecology or the consumption energy? What is the current research? All these questions don’t have to be answered, but be creative and really connect what you are learning about your cell-type to current research, news and health in the world around you. Exact details for formatting and references will be given during the first 2 weeks of class. Periodic checkpoints are listed on the course calendar in this syllabus. If you have taken this class before, do not expect to use your same topic.
Pre-Class Assignments (9 x 5 each = 45 points / 4.5%)
A total of 9 pre-class assignments will be given. Pre-class assignments will cover basic material that will not be covered in class, but was covered in BIO143 and other pre-requisite courses. Topics covered in this course are designed to build upon this basic knowledge so it will be indispensable in your understanding this course. So don’t throw away those notes and powerpoints from the listed pre-requisite courses.

Quizzes (14 x 3-4 points each= 41 points / 4.1%):
There will be a quiz every day, worth 3 points each. The 16 quizzes will count towards your grade, with the 2 lowest quiz grades dropped. This leaves a total of 14 quizzes that will count toward your grade. Each quiz will be conducted in the very first minutes of class, so if you are late, you will only have the time remaining, if at all. Quizzes can be made up for ONLY for excused absences (not for tardiness). Quizzes will cover only material from the pre-class assignment given for the day.

Exams (4 x 150 points each = 600 points / 60%)
There will be 4 exams plus a final cumulative exam in this course that will account for a significant portion of the final grade. The second, third, and fourth exam will have small (15%) cumulative section, covering topics from all the lessons we have covered up to that point in the course. The lowest EXAM grade will be dropped and there are no make-up exams. THE FINAL EXAM CANNOT BE DROPPED! The final exam will be cumulative, testing all objectives for the course equally in order to demonstrate that you have met the course goals, in their entirety. As per University regulations, all students are required to take the final examination and mid-terms in each course for which he or she is properly enrolled.

Laboratory (110 points / 11%)
The labs meet every Thursday at 12:00pm – 2:50pm. The main purpose of the laboratory is to develop and hone your laboratory skills. Anyone with a science, and especially biology degree, must know their way around a lab. This lab will extend the information that we cover in lecture, but will not in most cases align with the topic at hand. Laboratory studies will be presented inquiry-based exercises that will extend the knowledge learned in class in order to develop proper lab technique and practice and learn how a scientist should think.

1) Lab Notebook (1 x 20 points = 20 points / 2%)
A vital skill in any laboratory is keeping a proper and informative lab notebook. It is the definitive record of your experiments and should include every aspect of a study. Further instructions for keeping lab notebooks will be given at the first lab. Notebooks will be collected at the end of the year for final grading. See grading rubric

2) Lab Assignments (4 x 5 points each = 20 points / 2%)
I will have assignments due for labs in the form of prepared questions to answer during and at the end of each lab. These worksheets are intended to guide you through the data collection and gain practice in analyzing and discussing scientific results.

3) Lab Reports (4 x 20 points each = 80 points / 6%)
Many of the labs we will use to hone your scientific writing skills. Communicating your studies through written word is key to informing the public of your research. While we may not be curing cancer, it is vital that any biology student know how to write a scientific paper.

4) Lab Practical (1 x 30 points = 30 points / 3%)
A lab practical is an exam in which you physically demonstrate the lab skills that you have learned over the course. This WILL include, but is not limited to, pipetting and measuring liquids and solids, making solutions, using a microscope, making a wet mount, counting and identifying cells, proficiency in the metric system. We will review these skills throughout the lab and will have a review session for you to practice. These are skills that are vital to any biologist.

Extra Credit work (grade to be determined)
An end-of-semester review assignment will be given before leaving for winter break. This assignment will cover all material covered in the final exam and it is your best interest to complete the assignment.

**Non-negotiable Safety and Lab Rules**

1. No eating or drinking in the lab. Eat food before or after lab. Drinks must be in re-sealable containers and not placed on the lab bench. A warning will be given for the first offense. Second offense will result in expulsion from the lab and a zero for the assignment.

2. Do no wear open-toed shoes or sandals. A warning will be given for the first offense. Second offense will result in expulsion from the lab and a zero for the assignment.

3. Wear gloves for protection against potentially dangerous materials. Please notify me if you have a latex allergy so that nitrile gloves may be procured.

4. Don’t mouth pipette

5. Pull back all hair so that it is away from the face and is constrained.

6. Clean up your workspace before and after each lab. Put away all materials. Throw away waste materials in appropriate containers. Put away microscopes. The workspace is your groups responsibility and any mess left behind will result in a 3 point deduction from the total grade for every member of the group.

**Course and University Policies (As per the Johnson C. Smith 2011-2012 Course Catalog)**

**Class Attendance**

“Class attendance is required for all JCSU students. Each students is allowed as many hours of absence per term as credit hours received (not to exceed 3) for the class. The policy does not apply to internships and student teaching. The offering department will determine attendance policies for these classes.

- A student is expected to attend all classes, complete all required work, and not be absent without adequate cause. Punctuality in attending classes is expected of all students. Regulations on class tardiness are determined by the instructor of the class.
- It is the responsibility of the student to know, at all times, the number of absences he/she has for each class. If a student exceeds the number of allowed absences for his/her class, the student may request an excused absence from his/her instructor.
- Students who exceed the maximum number of absences may receive a failing grade for the course.”

**Note that this is inclusive of both excused AND unexcused absences.** Therefore, if you anticipate absences due to athletics, chorus/band, etc, do not miss class otherwise. Absences from unannounced tests or other assignments may be made up at the discretion of the instructor. It is your responsibility to see me to determine if there are assignments you may have missed.

**What is an excused absence?** Below is a list of what I consider to be an excused absence. Any other excuse that does not meet the criteria below, will be considered an unexcused absence. Each one of these absences can be documented in some way. It is your responsibility to keep records accordingly.

1. Personal illness or attendance in school endangering a student’s health or the health of others;
2. A serious illness or death in a student’s immediate family necessitating absence from school;
3. A court order or any order by a governmental agency, including pre-induction physical examinations for service in the armed forces, mandating absence from school;
4. Celebrating religious holidays, necessitating absence from school;
5. Conditions rendering attendance impossible or hazardous to the student’s health or safety;
6. Field trips or attendance at events/functions representing the University or a school-related activity that conflicts.
Instructors are responsible for monitoring student attendance and participation in their classes. If you enter class late it is your responsibility to see me and ensure I recorded your presence, especially if there was a quiz that day.

**Late Assignments**

Late assignments and term-papers will be penalized! Each day late will result in a deduction of 10% of the grade until the grade is a zero. Once a zero is reached, a grade of zero will be the final recorded grade.

**Cheating and Plagiarism**

*Cheating in any form will result in a non-negotiable zero* for the assignment/quiz/exam in question on the first occurrence. A second instance will result in expulsion from the class with an automatic F plus disciplinary action. Allowing others to copy your work in any form or copying answers for assignments counts as cheating and will be treated as such.

*Plagiarism will not be tolerated.* Please see me or your English professor for clarification on when or how to use citations. **Plagiarized assignments will receive a non-negotiable zero grade and cannot be rewritten.** Plagiarism in any instance is where the work of others (other students, books, websites, etc) is presented as your own. Taking others students answers as your own without giving them credit is plagiarism. Using ideas or statements from websites or documents or paraphrasing them without any indication as to where and who the phrase or idea came from is plagiarism. Do not use extensive verbose quotations in place of plagiarizing. Paraphrase the statement and cite the source properly.

**Laptops and other Electronic Devices**

Computers can be a valuable resource for class, but can also be a major distraction. Laptops may be used for class work only. If I find that they are being used for anything other than class work, at the first offense, all laptops in class, regardless of the offender, must be closed immediately and put away. If this occurs a second time, this policy will change and laptops will not be allowed unless specifically directed by me. Any other electronic device (iPods, devices with earphones, etc) are not acceptable during class—especially during exams. See clarification for cell phone use under Policy on Disruptive Behavior.

**Policy on Disruptive Behavior**

Academic excellence demands that appropriate behavior and decorum be maintained by students at all times in the classroom. Johnson C. Smith University will not tolerate disruptive behavior by students or condone any behavior by students or teachers which incites such behavior. Disruptive behavior is defined here as any behavior which causes disorder or turmoil to exist in the classroom. When the student is judged to have engaged in disruptive behavior, the instructor shall initiate the following procedures:

1. Instructor will request the student to discontinue the disruptive action
2. If the behavior continues, the instructor will instruct the student to leave the classroom. Security will be called to remove the student if he or she does not leave when requested.
3. An incident report will then be completed by the instructor and filed with the Council of Deans. Copies will be sent to the student, advisor, Office of Enrollment Services and Student Success, and the Teaching and Learning Center.
4. After the completion of an incident report, including the student’s comments, the student must secure the written permission of the Council of Deans in order to return to class. The student will be held responsible for all absences incurred between the time of suspension from class and his or her return.
5. Any recurrence of disruptive behavior on the part of the student cited will result in expulsion from the class and a grade of “F” recorded in the semester in which the offense occurred.

**Cell Phones:**


1. **During all exams and the final**, cell phones should be on silent and placed in a bookbag or purse.
2. Class Rule 2:
3. Class Rule 3:
4. Class Rule 4:
5. Punishment 1:
6. Punishment 2:
7. Punishment 3:

**Johnson C Smith Honor Code**

The following University approved Honor Code is enforced by the Office of Academic Affairs and the University Judiciary Board:

_**I pledge that this work is my own and I will not cheat, or represent the words, ideas or projects of others as my own. I further pledge that I will not engage in academic dishonesty, which includes lying, stealing, or assisting others in misrepresenting their work. As a member of the student body of Johnson C. Smith University, I also pledge to report all violations of the Honor Code that I observe in others. I understand that violations of the Honor Code are subject to disciplinary procedures by the University.**_

**By signing your name on your exam/assignments/papers, etc, you pledge that you have abided by the University Honor code.**
## Lecture Schedule
(May be subject to small changes)

### Week 1
- **Sep 17**
  - **Introduction, Review Syllabus:** What is a cell and its structure?
  - Assignment 1: Chemistry Review.
  - Preclass assignment 1: Make organelles Table by next class. Use BIO143 notes and book.
- **Sep 20**
  - **How are prokaryotic and Eukaryotic cells identified? How are organelles identified?**
  - Preclass assignment 1 Due
  - **LAB 1:** Introduction to lab and basic lab skills – lab notebooks, pipetting, making solutions, and microscopy

### Week 2
- **Sep 24**
  - **How do proteins form their shape? Why is shape important to protein function?**
  - Group Assignment 1 Chemistry Review Due
  - Preclass assignment 2: Questions
  - Group Assignment 2: FOLD-IT
- **Sep 27**
  - **What is the chemistry behind the plasma membrane? What determines membrane fluidity?**
  - Preclass assignment 2 Due
  - **LAB 2:** Measuring Plasmolysis in Elodea
  - Lab Assignment 1 Due

### Week 3
- **Oct 1**
  - **How does plasma membrane chemistry regulate transport? Quiz Bowl**
  - Group Assignment 2 FOLD-IT Due
  - Group Assignment 3 BadFish Hand-Out
- **Oct 4**
  - **EXAM 1- Term Paper Topic Due**
- **Oct 4**
  - **LAB 3:** Graphing and data analysis / writing a lab report – BRING YOUR LAPTOP!

### Week 4
- **Oct 8**
  - **What determines whether active or passive transport is used in a cell? Why is membrane transport important for nerve cells?**
  - Preclass assignment 3: Questions
  - Group Assignment 3 BadFish Due
  - Group Assignment 4: Tylenol-Case-study Hand-Out
- **Oct 11**
  - **How are food molecules converted to energy I? Glycolysis and Fermentation.**
  - Preclass assignment 3: Due
  - **LAB 4:** Fermentation I
  - LAB REPORT 1 Assignment DUE – Elodea Lab

### Week 5
- **Oct 15**
  - **How are food molecules converted to energy II? The Electron Transport Chain and Proton Motive Force**
  - Preclass assignment 4: Questions
- **Oct 18**
  - **How do plant cells convert light energy to chemical energy?**
  - Preclass assignment 4: Due
  - Group Assignment 4: Tylenol-Case-study Due
- **Oct 22**
  - **What are the stages of the cell cycle? Quiz Bowl**
  - Group Assignment 5: Cell Cycle Regulation Chemoprevention in p53 KO mice Hand-Out
- **Oct 25**
  - **EXAM 2**
  - **LAB 6:** Enzyme Function I
Week 7
Oct 29
How is the cell cycle regulated? How does loss of cell-cycle control lead to cancer?
Preclass assignment 5: Questions

Nov 1
How is cell division in prokaryotic and eukaryotic organisms different? Mitosis and binary fission.
Preclass assignment 5: Due

LAB 7: Enzyme Function II
LAB REPORT 2 DUE – Fermentation Lab

Week 8
Nov 5
FALL SEMESTER BREAK

Nov 8
Why is sexual reproduction important? How does the cell accomplish this task?
Group Assignment 6: Sexual Reproduction in Diatoms Hand-Out

LAB 7: Enzyme Function II
LAB REPORT 2 DUE – Fermentation Lab

Week 9
Nov 12
How do cells communicate and regulate cell function?
Preclass assignment 6: Questions
Group Assignment 6: Sexual Reproduction in Diatoms Due

Nov 15
How does the genetic code instruct transcription? Quiz Bowl
Preclass assignment 6: Due

Nov 15
LAB 8: Mitosis and Root Tips Assignment 2

Nov 9
List of References and Outline Due by midnight. 12am.

Week 10
Nov 19
EXAM 3

Nov 22
THANKSGIVING BREAK

Nov 22
THANKSGIVING DAY! Enjoy your Turkey!

Week 11
Nov 26
How is transcription different between prokaryotes and eukaryotes?
Preclass assignment 7: Questions
Group Assignment 7: Prokaryotic Eukaryotic Polymerase Comparison Review Hand-Out

Nov 29
How does RNA regulate the translation process?
Preclass assignment 7: Due

Nov 29
LAB 9: Take-home BLAST lab – Computer Lab Assignment 3
LAB REPORT 3 DUE – Enzyme Lab

Week 12
Dec 3
What are the mechanisms that determine whether a gene is expressed?
Preclass assignment 8. Questions
Group Assignment 7: Prokaryotic Eukaryotic Polymerase Comparison Review Due
Group Assignment 8: Myosin X filopodia paper Hand-Out

Dec 6
How does the cell move organelles and itself? What determines the shape of a cell?
Preclass assignment 8: Due

Dec 6
LAB 10: Temperature Lab 1 - S. Cerivisae kit Carolina Biologicals – set up
Lab Assignment 4 Due

Week 13
Dec 10
What are Stem Cells and how to they generate tissues and organisms? Quiz Bowl
Group Assignment 8: Myosin X filopodia paper Due
Group Assignment 9: PCR paper Hand-Out

Dec 13
EXAM 4
Preclass assignment 9: Questions
Dec 13   LAB 12: Nuclear and cell staining of tissues and cells.-Lab Assignment 4

Week 14
Dec 17   Why are enzymes important for DNA replication I?
         Preclass assignment 9: Due
Dec 20   Why are enzymes important for DNA replication II?
         Group Assignment 9: Due
Dec 20   LAB 13: Cell culture techniques and principles.-Lab Assignment - Graded in Notebook
         LAB REPORT 4 DUE

Week 15 & 16
         HAVE A MERRY CHRISTMAS AND A HAPPY NEW YEAR

Jan 3   LAB 14: Lab Practical Practice Session

Week 17
Jan 7   Catch-up and Review
Jan 10  LAST CLASS. Review for Final Exam – Bring questions
Jan 10  LAB 15: LAB PRACTICAL. Turn in Lab Notebooks at the end of the practical.
         Lab Notebooks Due
Jan 11  Term Paper Due by midnight.

Week 18
Jan 14  READING DAY
Jan 15 – Jan 19  CUMULATIVE FINAL EXAM
**Cell Biology Term Paper Grading Rubric**

**Instructions that were given**  
Students will be expected to choose an instructor-approved cell-type for in-depth study and typed report. Using reputable sources online and through the library, students will give a detailed analysis of the biology (structure, function, special features, etc) of their cell or cell-type of focus and how that cell type relates to biology as whole. Is it involved in a particular disease? Does it relate to ecology or the consumption energy? What is the current research? All these questions don’t have to be answered, but **be creative and really connect what you are learning about your cell-type to current research, news and health in the world around you.**

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<thead>
<tr>
<th>Format/Layout/Mechanics</th>
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<tr>
<td>Formatting directions completely disregarded. Layout of paper or figures is hindrance to reader. Either many mechanical errors or few errors that may hinder the reader’s understanding</td>
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<td>All formatting directions followed. Layout of term paper and figures makes information easy to read. Almost entirely free of spelling and grammatical errors.</td>
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<table>
<thead>
<tr>
<th>Content/Information</th>
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<tr>
<td>Simple restatement of basic material without further in-depth research. Does not connect to larger questions in biology. No effort made to present any critical discussion. Sources are misinterpreted.</td>
<td>Specific cell-type discussed, but does not appear to be focus of the paper. Some connection to larger biology. Some effort made to critically analyze research, but either incoherent or not properly developed.</td>
<td>Interesting and manageable topic. In-depth review of specific cell type and connects to larger questions in biology. Content and discussion goes beyond basic information. Effort made to critically analyze research in discussion form.</td>
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<th>Scientific writing style</th>
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<tr>
<td>Random placement of topics. Paragraphs and sentences are incoherent and vague. Jargon is used frequently. Paragraphs do not show separate main idea.</td>
<td>Ideas are mostly coherent and logical. Some ideas are vague or not correctly presented. Figures used but are not referenced in text or identified.</td>
<td>Ideas are presented clearly and coherently. Paragraphs and paper show logical thought. Scientific term and language are used appropriately. Smooth transition between paragraphs. Any figures are properly addressed in text. Each paragraph has distinct main idea.</td>
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<tr>
<th>References and use of references</th>
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<td>Minimum number of references not met. Many references are not from reputable sources. Most references are not properly cited in either text or reference page. References just give basic information.</td>
<td>References were used but did not meet minimum. Most references from reputable sources. Some references not properly cited in the text. References but with minor errors. Some quality references, though basic information is a bit overused.</td>
<td>At least 10 references were used for the paper. All references come from reputable sources. All the references are used effectively and are important. References are correctly cited in the text and correctly listed in the reference page. Quality references that show in-depth study beyond basic information.</td>
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# Cell Biology Lab Report

For this assignment you will need to summarize experiments from this unit in a lab-report format. The idea is to write clearly and succinctly in order to get the ideas of the experiment across to your readers. One-2 well-written paragraphs are sufficient for each section. 20 Points total.

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<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>Provided little-no background information. No context for study.</td>
<td>The background information is little more than restatement of material. Context given has major flow in logic. Hypothesis is stated but is unclear or imprecise</td>
<td>Background information provides appropriate experiment context. Hypothesis is clearly stated and explained how hypothesis is tested.</td>
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<td>Hypothesis/Purpose is not mentioned/is vague</td>
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<td><strong>Methods</strong></td>
<td>Protocol and materials are incomplete. Key steps/details are missing. Controls are not mentioned.</td>
<td>Procedure and materials are almost complete. Some minor steps or details are missing. Unclear what samples are controls.</td>
<td>Methods are clearly written in sufficient detail for the experiment to be repeated. All steps and materials are included. Controls are explicitly stated.</td>
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<td><strong>Results</strong></td>
<td>Results are incomplete or include significant interpretation. Results are not stated, only data shown OR no figures or tables.</td>
<td>All results are included but are not clearly stated or minor interpretation is included. Results from only part of study included. Data is presented in a table or figure, but the representation is incorrect.</td>
<td>Student clearly states the findings of each experiment without discussion or interpretation. Data is presented in either tables or figures that best illustrate the results.</td>
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<td><strong>Discussion</strong></td>
<td>Results are simply restated without interpretation. Significant portions of the initial question or hypothesis are not addressed. Results are not addressed.</td>
<td>Interpretations of all results are provided, but they are not clearly related to hypothesis. Results may be stated but analysis has major logical error.</td>
<td>Student interprets results in relation to the hypothesis/purpose. Each portion of results was used to address aspects of the question(s).</td>
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<td><strong>Writing and Organization</strong></td>
<td>Sections are not labeled or labeled incorrectly. Absent or unrelated title. No citations included where clearly should be. Imprecise writing with jargon. Multiple grammar/spelling errors.</td>
<td>Some, but not all, sections are labeled. 1-2 formatting errors. Some jargon or laymen’s* terms used. Some writing demonstrates clear thoughts.</td>
<td>All directions were completed. Each sections is correctly labeled. Title clearly describes study. Citations and references properly used. Scientific writing style with no jargon or laymen’s terms. No grammatical or spelling errors.</td>
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* A laymen is someone who is not an expert in the given field or knowledge. Scientific writing should address a scientific audience and not the general public.