INTRODUCTION TO OCEANOGRAPHY; BIOL 342
Syllabus
Fall Semester 2022

Class meetings: Tue. & Thu. 12:15 – 13:30 RITA 152
Laboratory (1) Fri. 10:30 – 13:30 GMLA 113/202
Laboratory (2) Fri. 14:00 - 17:00 GMLA 113/202

Lecture Instructor
Dr. Gorka Sancho
Grice Marine Laboratory
College of Charleston
205 Fort Johnson
Charleston, SC 29412
Telephone: (843) 953 9194
Fax: (843) 953 9199
Email: sanchog@cofc.edu
Office: GRICE Rm. 206
RITA Room 228

Lecture Office Hours
I will have in person office hours in RITA 228 on Tu & Th between 1:30PM and 3PM, but please give
me a heads up if you plan to attend in class. There are no excuses to not come by my office to discuss any
issues related with this course, and we can make individual appointments at other times through ZOOM.
I encourage all students to stop by and introduce yourself to me early in the course (and frequently
afterwards).

Course Description
This course will introduce you to all aspects of General Oceanography, including Geological, Physical,
Chemical and Biological Oceanography. This will be accomplished by combining a series of class lectures
and laboratory sessions, complemented with field trips on board a Charleston harbor cruise, primary
literature analyses, laboratory activities, public presentations and examinations.

Student Learning Outcomes
• Learn to think critically about ocean processes that influence your daily lives, which you might
need to understand and study in greater detail later in your careers.
• Learn to analyze different sources of oceanographic information to determine their usefulness for
your work.
• To understand key problems and processes studied by oceanographers today, analyze and describe
important processes in the ocean, compare and select sources of information useful for further
studies of oceanic processes and their influence on people.
• Identify policies and practices that have led to environmental change and unsustainability in
oceanic systems

Policies and Requirements
1. This course will be conducted strictly in accordance with the honor system of the College of Charleston
(http://www.cofc.edu/studentaffairs/HonorBoard.htm). All work that you turn in for this course (whether
for a paper, exam or quiz) must be your own, and have not been used, partially or totally, to fulfill
requirements for other classes. Any form of plagiarism (intentional and unintentional), cheating, or
presenting someone else's work as one's own will be treated as a serious academic transgression and will
be communicated accordingly by the instructor as an honor code violation to the Division of Student
Affairs.
2. You are expected to attend all meetings of the class, including all the laboratory sections, unless you have a legitimate excuse (symptomatic COVID, extreme illness or emergency), which should be approved if possible by the instructor in advance or providing an excuse afterwards. I will warn you that if you miss lecture classes you will have great difficulties passing this course due to the high level of critical thinking involved. Attendance will be recorded in all laboratory sessions. Students who need special accommodation to fully participate in this class are encouraged to speak to the instructors as soon as possible as well as to contact the Center for Disability Services (SNAP@cofc.edu)

3. All students are expected to turn in the papers and assignments by the beginning of the class period on the dates scheduled. Late papers will be marked down one full letter grade for every day of delay (so you receive an F for an assignment that is 4 days late!). You are expected to hold onto electronic and xeroxed copies of all assignments until the final grade for the class has been turned in. Again, communicate with the instructors if you are experiencing difficulties.

4. Basic class etiquette: during lectures the use of cell phones (major pet peeve of mine) for texting or laptops for emailing or checking Facebook/Messaging is not tolerated. Most electronic devices are a source of distractions from the lectures. You are strongly encouraged to ask questions, maintain conversations and establish constructive and inquisitive dialogue with the instructor during lectures and laboratory sessions, as well as after class hours. If you need a computer to take notes, ask permission to do so beforehand.

5. We will follow CofC COVID recommendations and listed in the Back on the Brick website (https://cofc.edu/back-on-the-bricks/).

Masks are not currently required on campus unless one of the following applies:
- You are on days 1-5 of isolation or required quarantine and have not yet left campus.
- You are on days 6-10 of your isolation and have returned to campus.
- You are unvaccinated or not current on your COVID-19 vaccines and are returning to campus on days 6-10 of your quarantine due to a close contact with a positive COVID-19 case.
- Those who are not vaccinated and/or those who wish to continue to wear high-quality, well-fitted masks such as a KN95 are encouraged to do so, especially in large indoor gatherings.
- Individuals who are vaccinated and boosted and who have had close contact with a positive case are not required to quarantine, but testing is strongly recommended at 5 days from exposure. Wear a high-quality mask such as a KN95 for 10 days following exposure while around others.

Regarding quarantines due to COVID:
- Individuals who are vaccinated but not boosted and who have had close contact with a positive case must quarantine for a minimum of 5 days away from campus and are strongly recommended to test on day 5. Wear a high-quality mask such as a KN95 while on campus or around others on days 6-10 of quarantine.
- Individuals who are unvaccinated and have had close contact with a positive case must quarantine for a minimum of 5 days away from campus and are strongly recommended to test on day 5. Wear a high-quality mask such as a KN95 while on campus or around others on days 6-10 of quarantine.
- All campus community members must self-report their positive tests using the self-report form located at the top of the Back on the Bricks website.

Required Textbook:
There is a link for User donations. Please contribute some money to help cover the labor and editorial costs that make this resource available. The donation link can be found at the bottom of the webpage. There are many similar textbooks out there that cover the same topics, but this is among the
most comprehensive oceanographic textbook in the market in my opinion. It is really helpful for understanding many critical concepts. If you already have a different general Oceanography Textbook, please show it to us since it is probably an acceptable substitute. But I strongly recommend you download the Segar textbook right away. **PLEASE DONATE** a few dollars right after reading this, it will greatly help Doug Seager and his wife, who are both now retired oceanographers. **Do not forget.**

**Classroom activities**

Lectures in class will provide you with basic information regarding Oceanographic Sciences. I expect you to read the assigned chapters from the textbook before each class, and on occasions I will expect students to study independently certain materials from the textbook. It is also recommended that you read the Critical Concepts sections used in each chapter, since they are very useful and will help bridge the gaps between your different backgrounds. I will also suggest that during lectures you take your own notes. Take notes when the course becomes interesting, when it is dull and when pictures of oceanographic boats are being shown (basically, always take notes). I will make all the Powerpoint lecture slides available to you through OAKS. If you have any questions regarding the material covered or in the textbook, **please interrupt** me in class to ask questions or demand further explanations. I would really appreciate having an INTERACTIVE class, with a solid bi-directional communication with students. Chances are you aren’t the only one wondering what I just said! Also come to talk with me in my office or after laboratories to receive more in-depth explanations if you need them to master any specific concept. If you miss classes, you will likely do poorly in the exams, a lot of the materials presented are not found in the textbook and many oceanographic concepts can be very abstract.

The written exercises will help you become familiar with scientific primary literature, oceanographic techniques and allow you to explore in depth some recent oceanographic discoveries.

**Oceanographic literature exercise:**

One review written exercise will help you learn how to read and analyze scientific publications in different oceanographic fields. I will provide in due time a guideline and present an example in order to insure that students know the expectations for this exercise. For this written review exercise students must choose a specific oceanographic primary literature publication to review as if you were doing a peer-review for a scientific journal. You are expected to review the paper, write a small summary of the paper, and then proceed to critically evaluate the science, the methods and the conclusions of the paper (maximum of 4 pages). I will provide with a list of possible papers (boring!), but will also accept (and much prefer) that you find on your own (Fun!). This review exercise can be used to help with the independent research project by reading a paper on the topic of your laboratory research (see next) or to further investigate an oceanographic topic of your interest (i.e. fisheries oceanography, importance of oceans in global warming and climate, effects of whales on ocean productivity, etc.). Papers to be reviewed **must** be approved by the instructor beforehand, and it is encouraged that students establish a communication with the instructor about choosing an appropriate paper well before the deadline. These are links to help you find the right journals: [https://libguides.library.cofc.edu/marinebiology](https://libguides.library.cofc.edu/marinebiology); [https://libguides.library.cofc.edu/c.php?g=525746&p=3596939](https://libguides.library.cofc.edu/c.php?g=525746&p=3596939)

I strongly recommend that you restrict yourself to articles published in the last 4 years and that are biological in nature.

**Tests/Exams:** They will take place during class hours. The in-class exams will consist mostly of short essay questions and graphic exercises.

**Exam 1:** Will include all the lecture material covered in the first third of the course, including the lecture right before the exam date.

**Exam 2:** Will include all the lecture material covered in the second third of the course, including the lecture right before the exam date.

**Final Examination: Cumulative** – Will have 2 sections: one including the last third of the course material, and a second cumulative section including all the topics covered during the course.
Extra Credit Exercise – In each of the examinations there will be 2 extra credit questions regarding the two extra credit books that I would like you to read for the course. The first is the book “Mapping the Deep”, by Robert Kunzig (ISBN 0-393-32063-4). The second book is “Fixing Climate: What Past Climate Changes Reveal About the Current Threat-and How to Counter it” by Wallace S. Broecker and Robert Kunzig (ISBN 0-8090-4502-8; 2008, 272 pp.) They are both great books describing historic and recent oceanographic discoveries and I highly recommend that you purchase them right away and read them (each is less than 10$ at www.amazon.com, cheaper if bought used). From each book, Chapters 1-5 will be in the Exam 1; Ch 6-11 in Exam 2; the whole book for the Final Exam. The books are great, they complement the class. READ THEM, they will greatly boost your exam grades.

Grading:
Lecture Section
Exam 1 18%
Exam 2 18%
Final Examination 25%
Oceanographic Literature Review Paper- 14%

Laboratory Section
Lab Attendance and Participation: 6%
Lab Assignments: 9%
ODV Presentation: 5%
Charleston Harbor Report and Presentation: 5%

Grading scale:
93-100 = A Superb
90-92 = A- Excellent
87-89 = B+ Very good
83-86 = B Good
80-82 = B- Just good
77-79 = C+ Above average
73-76 = C Average
70-72 = C- Below average
67-69 = D+ Acceptable
63-66 = D Barely acceptable
62-60 = D- Almost acceptable
<60 = F Failing
# LECTURE CALENDAR
(All dates are approximate, and will likely be subject to changes as the course progresses)

<table>
<thead>
<tr>
<th>Date</th>
<th>LECTURE TOPIC</th>
<th>Readings</th>
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<tbody>
<tr>
<td>August</td>
<td></td>
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<tr>
<td>Tu 23</td>
<td>Course Introduction &amp; Goals</td>
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<tr>
<td>Th 25</td>
<td>History of Oceanography</td>
<td>Ch 1-2</td>
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<tr>
<td>Tu 30</td>
<td>Ocean Floors &amp; Margins – Geological Oceanography</td>
<td>Ch 3-4</td>
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<tr>
<td>September</td>
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<tr>
<td>Th 1</td>
<td>Plate Tectonics</td>
<td>Ch 4</td>
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<td>Tu 6</td>
<td>Ocean Water Chemistry – Chemical Oceanography</td>
<td>Ch 5</td>
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<td>Th 8</td>
<td>Marine Sediments</td>
<td>Ch 6</td>
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<tr>
<td>Tu 13</td>
<td>Ocean – Atmosphere Interactions – Physical Oceanography</td>
<td>Ch 7</td>
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<tr>
<td>Th 15</td>
<td>Ocean Circulation - surface 1</td>
<td>Ch 8</td>
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<td>Tu 20</td>
<td>Ocean Circulation - surface 2. <strong>Deadline to choose Paper for Review Exercise</strong></td>
<td>Ch 8</td>
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<tr>
<td>Th 22</td>
<td>Ocean Circulation - surface 3</td>
<td>Ch 8</td>
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<tr>
<td>Tu 27</td>
<td>Ocean Circulation - Deep Ocean Circulation</td>
<td>Ch 8</td>
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<tr>
<td>Th 29</td>
<td><strong>EXAM 1</strong></td>
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<td>October</td>
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<td>Tu 4</td>
<td>Waves &amp; Tides</td>
<td>Ch 9, 10</td>
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<td>Th 6</td>
<td>El Niño Southern Oscillation</td>
<td>Ch 7, 8</td>
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<td>Tu 11</td>
<td>Biological Productivity</td>
<td>Ch12, 13</td>
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<td>Th 13</td>
<td>Phytoplankton</td>
<td>Ch12, 13</td>
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<tr>
<td>Tu 18</td>
<td>Zooplankton -</td>
<td>Ch12, 13</td>
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<td>Th 20</td>
<td>Nekton</td>
<td>Ch12, 13, 14, 15</td>
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<td>Tu 25</td>
<td>Benthos - <strong>Review Exercise Due in class</strong></td>
<td>Ch12, 13, 15</td>
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<td>Th 27</td>
<td>Hydrothermal Vents</td>
<td>Ch 15</td>
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<td>November</td>
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<tr>
<td>Tu 1</td>
<td>Microplastic Contamination Today</td>
<td>Ch 16</td>
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<td>Th 3</td>
<td><strong>EXAM 2</strong></td>
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<tr>
<td>Tu 8</td>
<td><strong>Fall Break &amp; Election Day – No Classes</strong></td>
<td><strong>Vote!</strong></td>
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<tr>
<td>Th 10</td>
<td>Ocean Acidification &amp; Global Warming</td>
<td>Ch 9, 16</td>
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<tr>
<td>Tu 15</td>
<td>Coral Reefs - 1</td>
<td>Ch 15</td>
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<tr>
<td>Th 17</td>
<td>Coral Reefs - 2</td>
<td>Ch 15</td>
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<tr>
<td>Tu 22</td>
<td><strong>Remote Movie Day - No Lecture</strong></td>
<td><strong>Travel!</strong></td>
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<td>Th 24</td>
<td><strong>Thanksgiving – No Classes</strong></td>
<td><strong>Eat!</strong></td>
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<tr>
<td>Tu 29</td>
<td>Fisheries Oceanography</td>
<td>Ch 13, 14, 15</td>
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<td>December</td>
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<tr>
<td>Dec 1</td>
<td>Marine Conservation</td>
<td>Ch 15, 16</td>
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<td>Sa 10</td>
<td><strong>FINAL EXAM (13:00-15:00)</strong></td>
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Oceanography Lab
Biology 342L, Fall 2022
Lab Instructor: Nicole Schanke (schanken@cofc.edu)
Location: GML 202/113
Time: Fridays at 10:30am-1:30pm (Biol 342L-03) and 2:00-5:00pm (Biol 342L-04)
Office Hours: Fridays 8:30-10:00am, Grice 113 or by appointment

Course Objective: To introduce the student to analytical oceanographic techniques while working in a laboratory setting. This will include sample processing for a variety of analyses. The student will also analyze global oceanographic datasets and present relevant findings.

Student Learning Outcomes (Lab):

- Students will gain field experience in collecting oceanographic samples and data using a CTD system in Charleston Harbor.
- Students will learn how to analyze seawater for various chemical components including nutrients such as nitrate, phosphate and ammonia.
- Students will learn how to measure acidification of seawater by determining various components of the carbonate system (e.g. alkalinity, pH and carbonate concentration)
- Students will gain experience in identifying live plankton species from Charleston Harbor.
- Students will demonstrate an ability to interpret and synthesize oceanographic datasets and present analytical results in a Power Point presentation.

Course Grading: Lab assignments are due the following week, unless stated otherwise. Late assignments will be penalized 10% per week and no late assignments will be accepted after two weeks. Due to the nature of this course, labs cannot be made up, so attendance is required and contributes toward the lab attendance and participation portion of the course grade. A group presentation exploring oceanographic data using the ODV software will be due on October 14th. A brief presentation and discussion of the data collected from the Charleston Harbor sampling will be on December 2nd.

Lab Attendance and Participation: 60 points
Lab Assignments: 90 points
ODV Presentation: 50 points
Charleston Harbor Report and Presentation: 50 points
**Lab Schedule:** The schedule below is subject to change depending on boat availability and weather. Closed-toe shoes are required for all lab work.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Aug. 26</td>
<td>Lab Intro; Bathymetry</td>
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<td>Ocean Data View (ODV) Intro</td>
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<td>Sept. 09</td>
<td>ODV Workday</td>
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<td>Total CO₂ &amp; the Carbonate Buffering System in Seawater</td>
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<td></td>
<td>Measurement of Phosphate in Seawater</td>
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<td>Charleston Harbor Cruise</td>
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<td>Oct. 07</td>
<td>Charleston Harbor Sample Analysis</td>
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<td></td>
<td>ODV Presentations</td>
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<td></td>
<td>Measurement of Nitrate/Ammonia in Seawater</td>
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<td>Spectrophotometric and Fluorometric Algal Pigment Analyses</td>
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<td>Nov. 04</td>
<td>Oxidative Stress Week 1</td>
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<td>Oxidative Stress Week 2</td>
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<td></td>
<td>Plankton Tow and Microscopy</td>
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<td></td>
<td>No Lab--- Thanksgiving Break</td>
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<tr>
<td></td>
<td>Charleston Harbor Presentations</td>
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</tbody>
</table>

**College Policies:**

1. **Center for Student Learning:** I encourage you to utilize the Center for Student Learning’s (CSL) academic support services for assistance in study strategies, speaking & writing strategies, and course content. They offer tutoring, Supplemental Instruction, study strategy appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at [http://csl.cofc.edu](http://csl.cofc.edu) or call (843)953-5635.

2. **Center for Disability Services** ([http://disabiliyservices.cofc.edu/for-faculty/faqs.php](http://disabilityservices.cofc.edu/for-faculty/faqs.php))
   - Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged.
   - The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.
   - This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, 843.953.1431 or me so that such accommodation may be arranged.
3. College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating. Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the Student Handbook at: http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php

4. SAFETY POLICY AND PROCEDURES

The School of Sciences and Mathematics of the College of Charleston understands that the safety of our students, staff and faculty is of paramount importance. Engendering a safety culture is an important part of our mission in teaching and doing science. Each department, course of instruction, or research lab may require higher standards or procedures. The policies and procedures set forth below are understood to be minimum requirements across our departments.

In this document, the term “laboratory” is meant for a work space/facility where chemicals, biological agents, or equipment is used for research and/or instruction. No one (student, staff, faculty, or visitor) will be allowed in a laboratory (teaching or research) to perform experiments or where experiments may be in progress unless these regulations are followed. Students dismissed from a teaching lab due to violations of the safety procedures will not be allowed to re-enter the laboratory until authorized to do so by their supervisor (instructor) and, in the case of research laboratories, by the department chair or designee. Any course work missed because of a violation of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand.
2. Know the location of safety equipment: telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull. 3. Know the appropriate emergency response procedures. If there is
an injury or emergency, call 953-5611.

4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Use hazardous chemicals, equipment, and biological agents only as directed and for their intended purpose.
6. Do not engage in horseplay, pranks or other acts of mischief while in lab.
7. Drinking, eating, and application of cosmetics is forbidden in laboratories where chemicals or biohazards are present. Smoking is forbidden in all College buildings.
8. Appropriate personal protective equipment shall be worn. The dress code for laboratory work when using chemicals, biological or physical hazards, or when instructed to do so by the laboratory supervisor is as follows:
   a) Wear safety glasses or goggles at all times.
   b) No exposed skin on arms, legs or torso.
   c) Wear lab coats or other approved protective garments.
   d) Wear gloves or other personal protective equipment (PPE) as directed by the instructor or mandated by prudent practices based on the chemicals being handled. If in doubt, wear appropriate gloves. Latex is not permitted. Avoid cross-contamination.
   e) Remove PPE (gloves and lab coat) when exiting the laboratory.
   f) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.
   g) Closed toe shoes are required. The heel and top of foot must be covered. High heeled shoes, sandals, and perforated shoes are not permitted.
   h) Confine long hair and loose clothing.
9. Inspect equipment or apparatus for damage before adding chemical reagents or biological samples or energizing electrical equipment. Do not use damaged equipment.
10. Never remove chemicals, biological samples, or laboratory equipment from a lab without proper authorization.
11. Presume that all chemicals and biological samples used in the laboratory are hazardous for you and the environment, unless instructed otherwise.
12. Never leave an experiment unattended unless proper safety precautions are in place.
13. Read all labels on chemicals twice before using them in the lab. Read all instructions twice for the operation of any equipment or machinery.
14. Properly and safely dispose of all waste materials.
15. Treat sharps and broken glassware containers carefully.
   a) Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers.
   b) Do not place contaminated glass in the broken glassware container. Consult your supervisor.
   c) Waste chemicals and contaminated PPE should be discarded as directed.
16. When using a reagent, replace the lid immediately. Never return unused reagents to stock bottles. Take only the amount needed for your experiment.
17. All chemicals and biological samples/media are to be disposed of in appropriately labeled containers. Specific instructions for each material will be provided. Pay attention to waste container labels before adding the material to be discarded.
18. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.
19. Keep the work area clean and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.
20. Never store a chemical or biological specimen in an unlabeled container.
20. Always have your College of Charleston identification and insurance information with you when working in a laboratory. MedicAlert identification must be worn if you have any potential
life-threatening chemical sensitivities or medical conditions.
21. Report any accident or injury, however minor, to your teaching assistant, instructor, or lab supervisor immediately. An accident report form must be completed and forwarded to the department chair, dean and to the Director of Environmental Health and Safety.

If you have questions/concerns about safety in the lab please first consult your instructor. If these are not answered, please see the department chair. Finally, you may consult the director of Environmental Health and Safety at 3-6802.