**BROOKLYN COLLEGE**
**Of The City University of New York**
**Department of Biology**

**Biology 1002 Laboratory Course Outline and Objectives**

# Course Requirements and Policies

***Textbook***: *Biology by Brooker et al., McGraw Hill, Publishers*

***OUTCOMES ASSESSMENT***

**Course grading**

The final course grade will be based upon students' performance in lecture exams and lab.

**Lecture: 50%** **Laboratoory: 50%**

-The breakdown of both the lecture and the lab grades is provided in the Lecturer's and Instructor's personal syllabus

- **You must attend all labs and remain the entire time**. Labs will start on time and attendance will be taken at the beginning of lab. You may not leave the laboratory session at any time; to do so will mean you will be marked as absent.
- **Work that is submitted late will be penalized as described in your lab instructor's syllabus**.

***Make-up exams and quizzes: There are no make-up quizzes or other exams.***

***ATTENDANCE POLICY***

**Laboratory Attendanc**e – Attendance at every laboratory session of *your assigned section* is required. Because every lab is full, making up labs is very difficult and most likely impossible.

If you must miss a lab, you must provide documentation to your lab instructor that the absence was unavoidable. It is your responsibility to arrange to make up the missed laboratory with another instructor ***if*** (a) there is room in the laboratory and (b) the laboratory instructor agrees to allow you to attend the lab. Failure to provide documentation and/or failure to make up the lab will result in **one fourteenth (1/14)** of your lab grade being deducted. Thus, if your final lab average is 85 and you missed one lab **your grade will be deducted 3.6 points** to give you a final lab average of 81.4. **Failure to attend more than 2 of your assigned labs automatically results in an F for the course.**

**Bereavement Policy:** If you have a death in the family, please consult the Brooklyn College Student Bereavement Policy which can be found at: www.brooklyn.cuny.edu/web/about/initiatives/policies/bereavement.php

**THERE IS NO SWITCHING OF LABS!**
***If you cannot officially register for a lab section, you may not attend it.***

**PLEASE NOTE:**
***There are no negotiations for grades.*** Your grade is the sum of the

components listed above. There are no extra credit, make-up or "pity" points. It is expected that you give 100% effort in all your endeavors including this course. Therefore, there are no extra points for "working hard".

***Grade distribution (Please note: There is not curving of grades at the end of the semester)***

97.45–100 = A+
92.45–97.44 = A
89.45–92.44 = A-
87.45–89.44 = B+
82.45–87.44 = B
79.45–82.44 = B-
77.45–79.44 = C+
72.45–77.44 = C
64.45–72.44 = C-
<64.45 = F

**HOW TO SUCCEED IN BIOLOGY:**

- Attend all lectures, labs and review sessions.
- Read the text and laboratory handouts **BEFORE** class.
- Review your class notes as soon as possible after lecture and immediately before lecture.
- Complete all assignments and turn them in on time. **Late assignments are not accepted.**
- ***Participate in a study group on a weekly basis.***
- ***Know the vocabulary!*** The study of biology is like learning a new language. You need to know the vocabulary in order to understand the concepts. If you come across a word you don't know, look it up!
- Get a good night's sleep before an exam.

**ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**

In order to receive disability-related academic accommodations, students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Valerie Stewart-Lovell, at 718-951-5538. If you have already registered with the Center for Student Disability Services, please provide your professor with the course accommodation form and discuss your specific accommodation with him/her.

***ACADEMIC INTEGRITY POLICY***

Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion. Examples of academic dishonesty include cheating, plagiarism, internet plagiarism, obtaining unfair advantage, and falsification of records. A full definition of each form of academic dishonesty, as well as procedures for imposition of sanctions for violations of the CUNY Policy on Academic Integrity, may be accessed at:

*www.brooklyn.cuny.edu/pub/documents/**academicintegritypolicy**.pdf*
*pub/documents/**academicintegritypolicy**.pdf*

**Lab 1: Measurements and Measuring**
**Goal:** To learn and practice liquid measurement using pipets, graduated cylinders and micropipettes.
**Learning Objectives:**

1. Master reading 1, 5 and 10 ml pipets and how to use them.
2. Demonstrate facility of using pipets by doing serial dilutions.
3. Master the use of measuring liquids using a micropipetor.
4. Demonstrate a working understanding of basic laboratory equations by correctly completing problems.

**Handout**: **PDF**

**Lab 2: Biological Molecules**
**Goal:** To describe the major characteristics of the 4 biological macromolecules that are found in a cell.
**Learning Objectives:**

1. To describe the major characteristics of proteins, carbohydrates, nucleic acids and lipids.
2. To explain how different techniques can be used for isolating and identifying proteins, carbohydrates, nucleic acids and lipids.

**Handout: PDF** **Textbook:** Chapter 3

**Lab 3**: ***Cellular Respiration and Fermentation***
**Goal**: To describe the stages of cellular respiration and fermentation and their reactants and products.
**Learning Objectives:**

1. Explain oxidation/reduction reactions and identify redox reactions in respiration.
2. Explain the principles of spectrophotometry and demonstrate proper usage of a spectrophotometer.

**Handout: PDF** **Textbook**: Chapter 7

**Lab 4**: ***Photosynthesis***
**Goal**: To describe how photosynthesis converts light energy to chemical energy.
**Learning Objectives:**

1. Describe the roles of the following in photosynthesis: Chloroplasts, chlorophyll, light reactions, Calvin cycle, ATP, NADPH, light, photosystem I, photosystem II and light-harvesting complex.
2. Explain the use of paper chromatography to separate pigments found in chloroplasts.
3. Continue mastering the use of a spectrophotometer.

**Handout: PDF** **Textbook**: Chapter 8

**Lab 5: *Bacterial transformation***
**Goal**: To describe the process of bacterial transformation and the uses of bacterial transformation in biotechnology.
**Learning Objectives**:

1. Define bacterial transformation.
2. Describe in detail how *E. coli* is transformed with pGLO plasmid DNA.
3. Determine transformation frequency.

**Handout: PDF** **Textbook**: Pgs. 415, 420, 445-446

**Lab 6:** ***Isolating Plasmid DNA from Transformed E. coli and DNA Restriction Digests***
**Goal**: To describe in detail how plasmid DNA is isolated from *E. coli* and to describe how restriction endonuclease digestion can be used for mapping DNA of organisms.
**Learning Objectives**

1. Mini prep of plasmid DNA.
2. Define the following: restriction endonuclease, RFLPs, DNA methylation, agarose, buffer.
3. Restriction digestion of plasmid DNA.

**Handout: PDF** **Textbook**: Pgs. 446-450,

**Lab 7**: ***Agarose Gel Electrophoresis of Plasmid DNA and CRISPR***
**Goal**: To describe the theory behind agarose gel electrophoresis and master the technique of running DNA gels.
**Learning objectives:**

1. Describe a protocol for using agarose gel electrophoresis to separate DNA fragments which were cut with DNA restriction endonucleases.
2. Determine the approximate molecular weight of the DNA fragments separated by agarose gel electrophoresis.

**Handout: PDF** **Textbook**: Pgs. 450

**Lab 8**: ***PCR of DNA Polymorphisms and DNA Fingerprinting of the Human ALU Sequences***
**Goal**: To describe the principles behind PCR and list possible uses for PCR.
**Learning Objectives**:

1. Focusing on the human D1S80 locus outline a protocol for using PCR to amplify and DNA polymorphisms. The protocol will include the following:
   -Extracting DNA from cheek cells
   -Setting up and running PCR reactions
   -DNA agarose gel electrophoresis of PCR products
2. Outline the steps involved in PCR.
3. Set up and run PCR reactions on Cheek cell DNA.
4. Explain the use of all reagents required for PCR.

**Handout: PDF**

**Lab 9:** ***Purification of GFP by Hydrophobic Interaction Chromatography***
**Goal**: To explain the principle behind hydrophobic interaction chromatography and describe other means of purifying protein from whole cell extracts.
**Learning Objectives**:

1. Gel electrophoresis of PCR products from Week 9 and determination of DNA polymorphisms among members of the class.
2. Describe the principle behind hydrophobic interaction chromatography.
3. Outline the protocol for purifying GFP from *E. coli*
4. Explain the function of equilibration buffer, binding buffer, wash buffer and elution buffer.
5. Discuss the general principles behind other means of isolating protein
6. Prepare protein samples from fish for Lab 10. *

*Each group must bring in a small piece of fish for protein extraction.
**Handouts: PDF**

**Lab 10/11:** ***Comparative Proteomics with Western Blotting***

Goal: (1) To examine muscle proteins from closely and distantly related species of fish by protein gel electrophoresis and identify similarities and differences in their protein profiles and (2) to identify a subunit of the myosin light chain by western blotting and compare the myosin subunit from the different fish species for variation, commonality or evolutionary divergence.

**Learning Objectives:**

1. Describe the protocol for protein extraction from fish muscle and follow the protocol to isolate fish protein.
2. Describe the principles behind polyacrylimide gel electrophoresis. (PAGE).
3. Separate fish muscle proteins by PAGE and analyze the protein patterns from different fish.
4. Transfer fish muscle proteins from the protein gels to nitrocellulose in order to do a western blot
5. Describe the procedure for western blotting and do a western blot.
6. Analyze the western blot data to determine if the light myosin chain examined among the different fish species shows any variation.

*Two gels will be run. One for transfer and the other for staining/destaining in order to do analysis of myosin light chains and doing a cladogram.

**Handout: PDF**

**Lab 12/13:** ***Biotechnology: Detecting GMOs***

**Goal**: To collect foods from the grocery store and test them to determine if they have been genetically modified (GMO).

**Learning Objectives:**

1. Describe and execute a protocol for DNA extraction of vegetable-based food samples.
2. Using appropriate primers, set up and run PCR reactions using the isolated DNA from food samples.
3. DNA agarose electrophoresis of PCR products.
4. Identification of GMOs through PCR.
5. List commercial usage of GMOs in agriculture.

**Handout: PDF**

**Lab 14: Final Quiz and Student Presentations**

***Make-up exams and assignments: <u>There are no make-up exams.</u> If you miss one quiz or practical it will be entered as a 0. Failure to take 2 quizzes constitutes an F for the course. All assignments must be turned in on time. <u>Late assignments are not accepted</u>.***

***Attendance and Policies***

-It is expected that students will attend every lab.

-Tardiness is not a socially acceptable practice. You should be in your seat and set up before the instructor begins.

- Consult your Laboratory Rules and Regulations sheet regarding all attendance policies and other lab policies.