

Spectrum Program

Session 1

Course Title: Introduction to Biomedicine Honors

Course Description

For millions of years the human body has been evolving, yet it still presents many challenges and mysteries. The industry of biomedicine is growing rapidly as scientists research how to understand disorders and cure diseases. Through laboratory work, readings and discussions, students are introduced to the fundamentals of this specialized branch of science and develop their laboratory techniques. Examination of essential biochemical reactions that occur in the body acquaint students with topics in chemistry, physics is included in the form of investigating biomechanics; and areas of biology such as cell biology are explored. This course is an excellent introduction for students interested in the study of medicine or advanced laboratory courses.

Essential Questions

*How do genes, cells, organs, and systems work in concert to keep the body working correctly?
What happens when there is a malfunction at one of the above levels?
How do researchers design studies to learn about how the body works? What questions do they ask?
How do medical professionals translate research study results into the medical practice?
What careers are available in biomedicine? How do you get there from here?
How does society decide what types of research and treatments are ethical?
How can you be an informed consumer of medical information and practices?*

Upon successful completion of this course, students will:

- Understand the connection between human disease and cell biology, genetics, and biochemistry
- Know how biotechnology is used to learn the mechanism of diseases and develop treatments
- Use the scientific method to perform experiments and write a comprehensive, analytical lab report
- Evaluate and analyze a peer-reviewed research study
- Be able to think critically, apply knowledge to new examples, and synthesize potential mechanisms, studies, and treatments
- Find and use reliable Internet sources for research purposes
- Know how to employ a variety of successful study skills
- Understand the subfields of biomedicine and the professional opportunities available in the field

Instructional Strategies

This course strives to give students with diverse learning styles multiple opportunities to access and demonstrate mastery of the material. Specific strategies include open answer tests (ie short answer), flexible groups, research projects, tiered assignments, creative projects, student-driven discussions, student-interest based teaching, in-class structured work time, primary document analysis, among others.

Resources and Materials

• Books

Exploring the Biomedical Revolution: A Look at the Work of Frontline Scientists and How they are Changing Medicine (Howard Hughes Medical Institute)
Genetics DeMystified, Edward Willett (McGraw Hill)
Inside the Cell (National Institutes of General Medical Sciences Publication)
The New Genetics (National Institutes of General Medical Sciences Publication)
Medicines by Design (National Institutes of General Medical Sciences Publication)

- **Web sites**

Introduction to Biomedicine EduBlog - -biomed.edublogs.org

This site will have posts about assignments, in-class activities, links to web pages for research, the syllabus, and other information.

- **Other Media**

Flash drive for saving information

- **Materials**

Notebook/loose leaf paper

Internet accessible computer

Binder/Folders (to organize Handouts)

Student Assessment

- **Pre-Assessment**

The pre-test is designed to gauge students' understanding of basic biology, chemistry, and physics principles as well as their ability to analyze, think critically, and express their thoughts in writing.

- **CTD Grading Scale**

A+	100-97%	A	96-93%	A-	92-90%
B+	89-87%	B	86-83%	B-	82-80%
C+	79-77%	C	76-73%	C-	72-70%
D+	69-67%	D	66-63%	D-	62-60%
F	below 60%				

- **Breakdown of Final Grade**

Participation – 10%, In-class work/Homework – 20%, Quizzes – 10%, Lab Reports/Writing – 20%, Final Project – 20%, Final Exam – 20%.

- **Post-Assessment**

The final exam will test the depth of students' understanding of the material presented and experienced over the three weeks. It will ask students think critically and apply their knowledge to solve new problem.

Schedule

Date	Topic(s)	In-class Activities	Assignments/Assessments
Monday, June 27	Pre-test Course Introduction What is Biomedicine? Scientific Method & Biomedical Research	Case Study: End to Ulcers? Experimental Design Cell Structure & Function	Experimental Design Practice Reading Cell Structure & Function Review
Tuesday, June 28	Homework Review & Quiz DNA & Genetics – The Basics Cancer: Mechanisms, Detection, & Treatments	Case Study: Baby Doe	Reading Prep for Field Trip Baby Doe Follow-Up Questions

Date	Topic(s)	In-class Activities	Assignments/Assessments
Wednesday, June 29	Homework Review & Quiz	Field Trip to Northwestern University Cancer Center – Sarah Jackson, Genetic Counselor	Reading Field Trip Follow Up Work
Thursday, June 30	Homework Review & Quiz DNA: Replication	Building DNA! Lab: DNA Microarrays Lab: Polymerase Chain Reaction (PCR)	Replication Follow-up PCR Methods Reading
Friday, July 1	Homework Review & Quiz DNA: Transcription & Translation Gene Therapy Writing Lab Reports	Case Study: Cystic Fibrosis Lab: Gel Electrophoresis	PCR Lab Report Genetics Follow-up Reading
Monday, July 4	Homework Review & Quiz Introduction to Final Project Infectious Disease & Immune System	Case Study: “Take Two and Call Me in the Morning” Immune System Activity	Bacteria vs Virus Follow Up Immune System Follow Up MRSA Reading
Tuesday, July 5	Homework Review & Quiz Bacteria & Antibiotic Resistance Polio Movie	Case Study: “Dr. Collins & the Case of the Mysterious Infection” Lab: Antibiotic Resistance I	Antibiotic Resistance Lab Introduction & Methods Reading
Wednesday, July 6	Homework Review & Quiz Viruses & Vaccines	Lab: Antibiotic Resistance II (bring digital camera if you have one) Lab: ELISA Test for Viral Antigen	Antibiotic Resistance Lab Results & Discussion ELISA Lab Follow Up
Thursday, July 7	Homework Review & Quiz Final Project Proposals Due	Field Trip: Body Worlds & The Cycle of Life (Museum of Science & Industry)	Museum Follow Up Work on Final Project - background
Friday, July 8	Homework Review & Quiz Biochemistry & Cellular Respiration	Case Study: The Mystery of the Seven Deaths	Work on Final Project
Monday, July 11	Homework Review & Quiz Systems Disease – Neurology, Cardiology	Case Study	Work on Final Project Study for Final Exam Systems Follow Up
Tuesday, July 12	Homework Review & Quiz Bioethics	Final Exam Review	Work on Final Project Selections from <i>The Immortal Life of Henrietta Lacks</i>
Wednesday, July 13	Homework Review & Quiz Bioethics	Final Exam	Work on Final Project
Thursday, July 14	Final Presentations	Final Presentations	Final Project Due

Date	Topic(s)	In-class Activities	Assignments/Assessments
Friday, July 15	Final Presentations	Parent Conferences	Have a great rest of the summer!

Instructor Biography

Kate Yohay is a graduate of Smith College (Northampton, MA) and holds a B.A. in Biological Sciences, with a concentration in developmental neurogenetics. She started her career in biomedical research and worked at the University of Michigan Medical School and Tufts University. Since leaving the lab, Kate has taught undergraduate genetics and developmental biology laboratory classes at Mount Holyoke College and taught math and humanities to Junior High students at Near North Montessori School in Chicago. She is thrilled to return to the Center for Talent Development Summer Program for a third summer after also teaching Cognitive Neuroscience with the Accelerated Weekend Experience program. Kate will be moving to the Boston area at the end of the summer to begin graduate studies in teaching students with moderate disabilities and educational neuroscience.

Contact Information

Kate can best be reach by email at kate.yohay@gmail.com

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

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