

# The Governor's School for Science and Technology New Horizons Regional Education Center

## Dual-Enrolled at Thomas Nelson Community College

**Governor's School Course Information:** Advanced Biological Analysis (4371)

**Instructor:** Mary K. Patterson, Ph.D.  
Classroom & Office: A61

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email: [mary.patterson@nhrec.org](mailto:mary.patterson@nhrec.org)

**Communication with Instructor:** In addition to time in-class and the above contact information, the instructor can be reached via CANVAS [www.thehgsst.org](http://www.thehgsst.org), in which students are already enrolled. Use the InBox feature in Canvas.

**Advanced Biological Analysis (4371):** (2 weighted high school science credits) In the fall semester, topics in the field of cell and molecular biology will be addressed, some of which include the roles of biological macromolecules, cellular organization and metabolism, and cellular processes such as communication, reproduction, respiration, and photosynthesis. In addition, mechanisms of inheritance and control of gene expression will be examined, followed by a study of developments in biotechnology. In the spring semester, evolution, phylogeny, and the diversity of living things will be discussed, with a special focus on the anatomy and physiology of animals. The laboratory experience is a major component of the course, allowing students the opportunity to use technologies applied in research, medical, and forensic laboratories while designing their own experiments and analyzing and interpreting their results. The anatomy and physiology of various vertebrate organ systems will be compared while dissecting animals in the laboratory. *Advanced Biological Analysis is a college-level course that examines the topics typically studied during the first year of college by biology majors. Prerequisite Advanced Chemical Analysis.*

**College Credit:** Students may receive two semesters of college credit (8 credit hours) for this course by dual enrolling at Thomas Nelson Community College. Details will be provided during the first week of school. DE Chemistry is a prerequisite for this enrollment.

### Implications of Dual-Enrollment

Students must keep in mind that enrollment in a college class, including dual-enrollment while in high school, entails consequences that can be significant and permanent including, but not limited to, the following:

- Final course grades on college transcripts become a permanent part of a student's college record.
- Graduate-level education programs may consider DE grades equally with traditional college courses in calculating GPA for admission (E.g. graduate, medical, veterinary schools).
- Grades of D and F and course withdrawals can negatively affect scholarship and financial aid requests.
- Once the withdrawal date has passed, students cannot withdraw from a class, except in extraordinary circumstances such as a medical emergency.

**Textbook:** Biology, 11<sup>th</sup> Edition, Campbell and Reece, 2016. (Provided for student use)  
Access to [www.masteringbiology.com](http://www.masteringbiology.com) link provided via CANVAS

**Lab materials:** will be printed and distributed, or provided electronically via CANVAS, throughout the school year, as needed. Unique materials for at-home labs conducted during the pandemic will be supplied as lab kits, to be picked up by the student or parent at 2-4 specific times, dependent upon the duration of our virtual learning situation. From time-to-time, the student will be expected to supply items to be used for lab that will be common household items chosen from an array of suitable materials (for example, a small amount of sugar, corn syrup, maple syrup, or honey). If students are unable to supply any of the materials suggested, they should contact the instructor for assistance in acquiring suitable alternatives to complete the lab.

**Course Meetings:** AM Governor's School: 8:50 – 10:25 a.m., M, T, Th, F  
PM Governor's School: 11:20 a.m. – 12:55 p.m., M, T, Th, F

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**Grading Scale:** A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F = less than 60%

**First Quarter Grades:** (Note, distributions may change for Hybrid or Face-to-Face Learning Models)

60% of grade is determined by the content component of the class

- Tests – 15%
- Quizzes – 15%
- Homework & In-Class assignments – 20%
- Notes from videos/lectures/reading assignments – 10%

40% of grade is determined by all lab-related work

- Prelab Assignments – 15%
- Lab Assignments (Reports & Tests) – 25%

**Semester Grade Determination:** S1 Grade = 45% Q1 + 45% Q2 + 10% Semester Exam  
S2 Grade = TBA, depending upon virtual, hybrid, or face-to-face learning  
Yearlong Grade = 50%S1 + 50%S2

**Instructional Methods:** AT MINIMUM, THE FIRST NINE WEEKS OF THE FALL TERM, 2020, GSST COURSES WILL BE ENTIRELY VIA REMOTE LEARNING. The Biology Class will meet via \*Live\* class conferences daily, except as indicated by the instructor, for 30-60 minutes every weekday except Wednesday. During these \*Live\* sessions, students should expect mini-lectures, large- and small-group discussions, small-group projects, and presenting to the whole class. In addition, brief quizzes, in the form of polls or games may be expected. **ATTENDANCE AND PARTICIPATION (in polls, games, discussions, and project work) IS MANDATORY.** Upon our return to Hybrid or Face-to-face instruction, the course will be a blended, flipped course. Students will take notes and interact with new instruction via videos, reading assignments and tutorials at home, submitting notes or other assignment work for a grade and instructor feedback. In-class sessions, which are 90 minutes or longer in length, will incorporate laboratory experimentation and analysis, class discussions, reading and discussing contemporary scientific literature, and projects.

**Homework & In-class Assignments:** In addition to note-taking from videos or readings, students will be responsible for making progress on assignments. However, much of the work will be completed in class where the student can get assistance from the instructor as well as peers.

**Tests & Quizzes:** All quizzes and tests may include free response questions in addition to multiple choice questions. Tests and quizzes will cover information covered in assigned videos/text readings as well as information discussed in class and content learned through class activities and lab experiments.

**Laboratory:** Generally, three to four hours per week will be spent in class doing experiments and other lab activities that correspond with chapter/lecture topics. A lab report will be turned in for most lab activities. Some will be formal lab reports while others will be less formal or involve answering specific questions about the lab. In most cases, either a prelab quiz will be given or a prelab assignment will be due on lab day to show that the student is prepared for lab. When given, laboratory practical exams will test the lab skills and knowledge acquired during lab activities or may require students to identify animal or plant structures and the function of each structure.

**Late Assignments:** Assignments should be turned in on their due dates at the beginning of class, within the first few minutes of entering the classroom, unless otherwise specified (e.g. Due at the end of class, or as assigned in Canvas, for virtual learning). Each student is responsible for checking Canvas Gradebook or PowerSchool frequently to see that work has been received by the instructor, graded, and recorded. Late work will be accepted, and **may** receive no penalty if the

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student has contacted the instructor and a **mutual agreement has been reached in advance**. However, unexcused submissions will incur a penalty of 10% per calendar day the assignment is late. **ASSIGNMENTS WILL NOT BE ACCEPTED MORE THAN 10 CALENDAR DAYS AFTER THE DUE DATE, except under the most critical of situations and only by advance agreement with the instructor**. Under such conditions, alternative assignments may be made by the instructor to accommodate extenuating circumstances. Since prelab assignments are done to prepare the student for the day's in-class lab activity, prelab assignments are not accepted late unless the student is absent on lab day, in which case, they are due on the first day of return.

**Absences:** Missing class is strongly discouraged! A great deal of learning occurs during each class period, whether we are meeting face-to-face or virtually.

- If an absence is unexpected (i.e., due to illness, family emergency, etc.) parent/guardian communication is expected within a day of the absence to explain the absence. Subsequent communication between the instructor and student will allow for mutual agreement for the terms of make-up work.
- Given both the virtual learning format of some portion of academic year 2020-21, planned absences due to doctor's appointments, taking care of family obligations, etc. will not greatly disrupt learning as the student has access, by agreement with the instructor, to attend the day's alternate live class session or to view the recording when it is available. When only the recording is viewed, a follow-up assignment will be given to make up for small group discussions, mid-session polling, etc. As missing classes deprives peers of the experience of the missing student's contributions, defaulting to viewing recordings is to be considered only as a last resort and will negatively impact the student's grade if done often without extenuating circumstances.
- Upon return to face-to-face learning and laboratories, the availability of laboratory materials (often LIVE organisms, enzymes with brief functional time-frames, etc.) will dictate whether or not make-up laboratory experience can occur. Under the circumstances that this is not possible, the instructor will provide the student data and expect a formal lab report (format to be discussed as needed to the topic) with background research citations in order to make up for the missed experience.

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**Academic Integrity Guidelines:** All students are required to take responsibility for upholding everyone's honesty in the classroom. All students will sign a copy of the GSST Honor Pledge during the first week of school.

*The Pledge: "I pledge to support the Governor's School for Science and Technology (GSST) Code for Academic Work. I will refrain from any dishonesty or deception, such as cheating or plagiarizing, which are honor code violations, on any and all academic work. I am further aware that as a member of the academic community, I should report any suspected violations to an instructor."*

No form of cheating, copying, or plagiarizing will be tolerated. Homework and class assignments are independent work and should not be copied. Students may share lab data collected by members of their group, however lab reports and all other written assignments are to be done independently unless the assignment clearly states that it is group work. The level of collaboration allowed between students will be indicated on each assignment. In addition, students will read and sign the Appropriate Collaboration form to clarify types of assistance that are encouraged vs. not tolerated in this course.

In the case of copying, there will be **no determination of who copied from whom; all students involved will receive no credit for the assignment and the students involved may be referred to the GSST administration for disciplinary action.** Regarding tests and quizzes, if students share information during an assessment or look at notes or other written materials during the assessment, all students involved will receive no credit for the assessment and the students will be referred to the school's administration for disciplinary action.

To avoid plagiarism, all sources of literature and website research must be cited properly to give the author(s) credit. In addition, **such information will be summarized or paraphrased, never just copied from its source.**

Clearly, the virtual learning environment is one that presents many challenges to those checks on student self-discipline and integrity. The goal of the Governor's School is not only to help you to gain entry into top colleges and access learning and career opportunities, but to thrive and excel once you have gained that entry. To this end, we take the academic integrity of each of our students very seriously.

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### **Student Learning Outcome 1**

Students will be able to explain the processes by which energy enters living organisms and what happens as it passes between and through all levels of the biological hierarchy. Students will also be able to compare and contrast the processes by which matter moves through and between organisms/levels of organisms.

### **Student Learning Outcome 2**

Students will be able explain how information is stored in biological systems, how it is accurately replicated, and how the information is processed and used by individual cells/organisms. Students should also be able to explain how that information flows between generations and the patterns of inheritance that result. Students should also be able to describe the application of these concepts.

### **Student Learning Outcome 3**

Students will be able to explain the process of evolution by natural selection, including molecular influences and how that process has affected all life forms in the past and continues to do so today. Students should also be able to explain historical examples and current examples. Students should be able to summarize the evidence for evolution and modifications made to the basic Darwinian explanation.

### **Student Learning Outcome 4**

Given different the levels within the hierarchy of science in general and biology in particular, students will be able to analyze the interrelationships between structural elements at that level and the functions performed. Students will also be able predict the resulting changes that may occur when a structural element of a hierarchy is changed.

### **Student Learning Outcome 5**

Given any biological system, students should be able explain how the parts of the system interact to make the functioning system a whole entity. Students should also be able to describe the emergent properties at any level within a biological system. Students should have experience applying the scientific process by using a model or simulation to describe a system and predict/demonstrate how changes in the model affect the system.

### **Student Learning Outcome 6**

Students will be able to explain the process by which science seeks to understand the world around us. This area should include the design of a hypothetical experiment to test a hypothesis either given to the student or derived by the student from observations provided. Students should be able to identify the role of observation in this process.

### **Student Learning Outcome 7**

Complete a dissection of a laboratory mammal and demonstrate knowledge of the anatomy and function of its systems.

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**Animal Dissections:** During the second semester, assuming we have initiated some face-to-face instruction, a variety of preserved animals will be dissected. This is a highly valuable learning experience that is strongly recommended. If a student prefers not to dissect, or if we find ourselves limited to virtual learning, comparative anatomy will be addressed via virtual dissection using software, internet videos and tutorials, as well as diagrams and photos from previously dissected organisms.

### **Classroom Expectations: *These will change to reflect the learning format (virtual, hybrid, face-to-face)***

1. Be on time and be prepared to engage in the class! When class begins, 3-4 minutes after the start time, students are expected to have appropriate materials, be focused, ready to begin the day's activities.
2. During this academic year, while we are distance learning, attendance will be recorded as a function of participation in live sessions and group meetings, measured through real-time oral or written responses to discussion questions when students will be called upon by name to contribute, in-session polls, and immediate follow-up assignments.
3. Distance learning requires some shared etiquette. As you prepare to "join" the class conference, allow your microphone to be functional, but mute your microphone to prevent feedback. There will be times when students will be asked to have video ON, and it is hoped that students will comply with this request. Respectful dialogue, whether written in the Chat or stated aloud, is expected.
4. Each student is expected to pay attention and participate in class in a meaningful way. Students should take notes during lecture and class discussions, so they can track conversations and respond appropriately.
5. Inappropriate conduct will not be permitted. Your teacher will warn you if inappropriate conduct is observed. If a few verbal warnings are not effective at correcting an inappropriate behavior, a student's parent/guardian will be contacted and the GSST administration will be notified.
6. **Biology is a fascinating subject! It is expected that every member of the class will make a concerted effort to learn by working through lessons and assignments, delving into assigned readings and videos with a curious mind-set, and attempting to make connections between new and previous information.** The instructor will provide feedback to students in writing or verbally after assignments have been submitted and it is expected that the students will review and consider the feedback, to help the student improve in understanding and application.
7. For the duration of virtual learning, all assignments will be submitted and evaluated electronically. Due dates are posted for each assignment and late penalties apply. If a student has accommodations for extra time, the student must let the instructor know and have a guidance counselor provide documentation. Assignments will include lab activities and answers to thought questions, tutorials and quizzes in MasteringBiology (linked to our Canvas course), assignments that are uploaded as documents, pdf, videos, and photos as jpeg. Because photos of written assignments are generally illegible, it is required that these assignments are done electronically and submitted, or scanned (table-top scanner or scanning app on personal device) and uploaded. **Office Lens for Android and Genius Scan for iPhone are two quality free scanning apps.**
8. The instructor can only be an advocate for the student if the student communicates with the instructor. Every effort to coach and guide students to their highest success will be made. However, expectations will not be lowered.

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**Topic Schedule for 2020-2021.**

Please note that this schedule may change. Topics may be rearranged, added, or eliminated.

**FALL SEMESTER:**

**Chemical Basis of Life**

Properties of Water (Chapter 3)

Chemical Bonds, Uniqueness of Carbon, Functional Groups (Chapter 4)

Biological Macromolecules (Chapter 5)

**Cell Structure**

The Anatomy and Physiology of the Cell and the Importance of the Cell Membrane (Chapters 6 & 7)

**Metabolism**

Mechanisms of Cell Communication and the Roles of Enzymes in Cells (Chapters 8 & 11)

**Photosynthesis & Release of Energy**

Important Biochemical reactions: Cellular Respiration and Fermentation (Chapter 9)

Photosynthesis (Chapter 10)

**Cell Reproduction, Mitosis and Meiosis**

The Cell Cycle, Regulation of the Cell Cycle, and Cancer (Chapter 12)

Meiosis & Gamete Production (Chapter 13)

**Inheritance Patterns and Role of Chromosomes**

Mendelian Genetics and the Role of Chromosomes in Inheritance (Chapters 14 & 15)

**Evidence and Processes of Evolution**

Population Genetics, Natural Selection, and Evolution (Chapters 22-24)

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### Topic Schedule for 2020-2021 (continued)

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#### SPRING SEMESTER:

##### **DNA Structure and Function**

DNA Structure and Gene Expression (Chapters 16 & 17)

Uses of DNA Technology in the World Today (Portions of Chapters 20 & 21)

##### **DNA Structure and Function**

Regulation of Gene Expression (Chapter 18)

Uses of DNA Technology in the World Today (Portions of Chapters 20 & 21)

##### **Noncellular Pathogens**

Viruses, Viroids, & Prions (Chapter 19)

##### **Diversity of Life**

Phylogeny and the Diversity Prokaryotes, Protists, Fungi, and Plants (Chapters 26-31)

Plant Diversity (Chapters 29, 30)

Fungi (Chapter 31)

Animal Development and Diversity: Invertebrates and Vertebrates (Chapters 32-34)

##### **Plant Anatomy and Physiology**

Plant Structure, Growth & Development, How Plants Obtain and Transport Resources, and Plant Reproduction (Chapters 35, 36, 38)

##### **Animal Anatomy and Physiology**

Animal Form and Function: Nutrition, Circulation and Gas Exchange, Immune System (Chapters 40, 41, 42, 43)

##### **Ecology**

Population, Community, and Ecosystem Ecology (Chapters 52-55)