CHILLICOTHE
HIGH SCHOOL

AP Biology Syllabus
CHS Science Department

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Teacher Contact Websites:

- Google Classroom
- Remind
- Socrative
- Google Forms

CCSD Vision Statement: The Chillicothe City School District will provide tomorrow's leaders with a high quality education by developing high expectations and positive personal relationships among students, staff, and community members.

CCSD Mission Statement: The Chillicothe City School District empowers students to learn, to lead, and to serve.

Course Description and Prerequisite(s) from Course Handbook:
AP Biology - 314
State Course #: 132330
Prerequisite: Student must have a 3.40 or better GPA, Biology I and Chemistry, and be recommended by science teachers who have taught the student. If a student does not meet the criteria, a letter from the parent/guardian and approval of the principal after conferring with the student's science teachers are required.
Elective Grade: 11-12
Weighted Grade Credit: 1
Course Description:

The course is designed around the four Big Ideas and seven science practices put forth by the College Board. The four Big Ideas include Evolution, Cellular Processes, Genetics and Information Transfer, and Interactions. The course prepares students for the required AP examination provided by the College Board.

Students are expected to take and pay for the AP exam. If the student fails to take the exam, a 4.5 point grading scale will be applied to the course. The course is designed to prepare students to perform well on the examination. A student who earns a 3 or above on the exam will be granted college credit at most colleges and universities throughout the United States.

There is a $20 lab fee.

Learning Targets: Defined below for clarity are the Unit Titles, Big Ideas of every Unit taught during this course, and the Essential Questions to be answered to better understand the Big Ideas. A student's ability to grasp and answer the Essential Questions will define whether or not he or she adequately learns and can apply the skills found in Big Ideas. This will ultimately define whether or not a student scores well on assessments administered for this course.

- **1st Quarter**
  - **Unit I Title: Chemistry of Life**
    - **Big Idea #1:** I can explain the essential nature of water in living organisms.
      - *Essential Question #1: How can I can describe and model the polar bonding structure of water?*
      - *Essential Question #2: How can I explain how the unique properties of water make life on earth possible?*
    - **Big Idea #2:** I can I can explain how biological systems use molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.
      - *Essential Question #1: How can I explain the roles of carbon, hydrogen, oxygen, nitrogen, and phosphorus in formation of cell structures?*
      - *Essential Question #2: How can I explain the structure and formation of macromolecules and how these are used by the cell to grow and reproduce?*
  - **Unit II Title: Cell Structure and Function**
    - **Big Idea #1:** I can explain how the size of a cell is limited to enhance its efficiency.
      - *Essential Question #1: How can I explain how cell size and shape affect the overall rates of nutrient intake and waste elimination?*
      - *Essential Question #2: How can I use calculated surface area to volume rations to predict which cells might eliminate waste or obtain nutrients by diffusion?*
      - *Essential Question #3: How can I describe several mechanisms of active transport and how they differ from diffusion?*
    - **Big Idea #2:** I can I can explain how cells consist of specialized structures called organelles.
      - *Essential Question #1: How can I explain how internal membranes, specialized organelles, and their interactions provide essential cell functions?*
      - *Essential Question #2: How can I construct models that connect the movement of molecules across membranes with membrane structure and function?*
    - **Big Idea #3:** I can explain how osmoregulation and excretion depend on the processes of osmosis, diffusion, and active transport.
      - *Essential Question #1: How can I explain how diffusion, osmosis, and active transport are involved in nephron functioning in the kidneys of multicellular organisms?*
- **2nd Quarter**
  - **Unit III Title: Cellular Energetics**

- **Big Idea #1:** I can explain how all organisms require constant energy input to maintain organization to grow and to reproduce
    - *Essential Question #1: How can I describe/define Gibbs free energy and mathematically determine whether a reaction is exergonic or endergonic?*
    - *Essential Question #2: How can I explain that biological systems require constant free energy and that multiple strategies exist in different systems for obtaining free energy?*
    - *Essential Question #3: How can I predict how changes in the availability of free energy affects organisms, populations, and ecosystems?*
- **Big Idea #2:** I can explain how organisms have specific structural features that allow them to capture, store, and release free energy
    - *Essential Question #1: How can I describe and explain how these structural features capture, store, and release free energy?*
    - *Essential Question #2: How can I use representations to pose questions about what mechanisms and structures allow organisms to capture, store, and release free energy?*

- **Unit IV Title: Cell Communication and Cell Cycle**
    - **Big Idea #1:** I can explain how both unicellular and multicellular organisms share common cell communication processes.
        - *Essential Question #1: How can I describe/create diagrams/give examples of both direct contact and long distance (hormonal and immune system) cell signaling?*
        - *Essential Question #2: How can I describe models of signal transduction pathways through which signals are converted to cell responses?*
        - *Essential Question #3: How can I explain how certain drugs affect signal reception, and, thereby, signal transduction pathways?*
    - **Big Idea #2:** I can explain how nervous systems, endocrine systems, and immune systems use cell signaling mechanisms.
        - *Essential Question #1: How can I explain/create a visual depiction of how nervous systems (and in particular, the vertebrate nervous system) detect external and internal signals, transmit and integrate information, and produce responses?*
        - *Essential Question #2: How can I create diagrams/models to describe immune responses?*
        - *Essential Question #3: How can I describe several examples of how hormones elicit responses to maintain homeostasis using long-distance signaling?*
    - **Big Idea #3:** I can explain how the life cycle of the cell has subdivisions that are regulated by both internal and external controls.
        - *Essential Question #1: How can I describe the various subdivisions of the cell cycle and the internal regulatory proteins involved in its control?*
        - *Essential Question #2: How can I describe the role of apoptosis in development and differentiation as well as in the reuse of molecules and maintaining dynamic equilibrium?*

        - *Essential Question #3: How can I describe the consequences of cell cycle regulation gone awry?*
    - **Big Idea #4:** I can explain the process of the division of sex cells, called meiosis.
        - *Essential Question #1: How can I construct a representation that connects the process of meiosis to the passage of traits from parent to offspring?*

- **MID-TERM EXAM**

- **3rd Quarter**
    - **Unit V Title: Heredity**
        - **Big Idea #1:** I can describe how life is specified by the information found in genomes.
            - *Essential Question #1: How can I apply mathematical routines to determine Mendelian inheritance patterns from sets of data?*
            - *Essential Question #2: How can I recognize and describe the inheritance of traits that are not explained by Mendel's model of inheritance?*
        - **Big Idea #2:** I can explain that alternations of the genome can occur at the chromosome level.
            - *Essential Question #1: How can I identify and describe the effects of various chromosomal aberrations?*
            - *Essential Question #2: How can I pose questions about ethical, social, or medical issues related to human genetic disorders?*
        - **Big Idea #3:** I can explain how normal embryonic development is a process that involves timing and coordination of several events that are regulated by multiple mechanisms, including genes.
            - *Essential Question #1: How can I explain that development is a sequential process that involves control of the timing and order of events?*
            - *Essential Question #2: How can I describe some of the general regulatory mechanisms involved in development (Ch 50, only)?*
    - **Unit VI Title: Gene Expression and Regulation**
        - **Big Idea #1:** I can explain how DNA and sometimes, RNA, are the primary sources of genetic information.
            - *Essential Question #1:* How can I describe/explain the various historical investigations *that led to the claim that DNA is the source of genetic information?*
            - *Essential Question #2: How can I describe that models that show how genetic material is copies for transmission between generations?*
            - *Essential Question #3: How can I describe how the genetic information is translated into proteins?*
            - *Essential Question #4: How can I describe two common biotechnologies used to manipulate genetic material?*
        - **Big Idea #2:** I can explain how gene regulation is essential for the proper functioning of a cell.

- *Essential Question #1: How can I connect gene regulation with both differences between individuals in a population and between different types of organisms?*
- *Essential Question #2: How can I use diagrams/models to explain how gene regulation influences cell products and function (including how signal pathways mediate gene expression)?*
- *Essential Question #3: How can I compare and contrast gene regulation models between prokaryotes and eukaryotes?*

- **4th Quarter**
  - **Unit VII Title: Natural Selection**
    - **Big Idea #1:** I can explain how natural selection is a major mechanism behind the changes in the genetic makeup of a population.
      - *Essential Question #1:* How can I evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time?
      - *Essential Question #2: How can I apply mathematical methods to calculate frequencies of genes in populations providing evidence for the occurrence of evolution?*
      - *Essential Question #3: How can I describe specific examples of phenotypic variations that significantly increase or decrease the fitness of the organism and the population as well as how random changes in the environment impact evolution?*
      - *Essential Question #4: How can I evaluate scientific evidence from different disciplines that support evolution?*
    - **Big Idea #2:** I can **e**xplain that in addition to natural selection, other processes affect the evolution of populations.
      - *Essential Question #1: How can I interpret, given data, and/or explain how mutation, genetic drift, sexual selection, artificial selection, inbreeding, and human endeavors such as genetic engineering, contribute to the loss or gain of variation in populations?*
    - **Big Idea #3:** I can describe how organisms are linked by lines of descent from common ancestry.
      - *Essential Question #1: How can I describe examples of molecules, structures, and metabolic pathways common to all domains of organisms as evidence that all organisms are linked through a common ancestor?*
      - *Essential Question #2: How can I interpret and/or construct phylogenetic trees and cladograms that represent the history of the appearance or loss of a trait and/or speciation?*
    - **Big Idea #4:** I can describe how life continues to evolve within a changing environment.
      - *Essential Question #1: How can I analyze data related to questions of speciation and extinction throughout Earth's history?*
      - *Essential Question #2: How can I describe/identify mechanisms of speciation?*

        - *Essential Question #3: How can I describe/explain examples of evolution that have occurred in the past and evidence that evolution continues today?*
    - **Big Idea #5:** I can explain how the origin of living systems is explained by natural processes and is supported by evidence from many different disciplines.
        - *Essential Question #1: How can I describe a scientific hypothesis about the origin of life on earth?*
        - *Essential Question #2: How can I explain why revisions occur in hypotheses about the origin of life on earth?*
        - *Essential Question #3: How can I justify the selection of geological, physical, and chemical data that reveal early Earth conditions?*
- **Unit VIII Title: Ecology**
    - **Big Idea #1:** I can explain how Science is a process of inquiry, observation, experimentation, analysis, and further extensions.
        - *Essential Question #1: How can I design and complete an experiment, analyze my data, draw conclusions, connect to broad ideas, and extend my thinking for future experiments*?
        - *Essential Question #2: How can I use representations, models, and mathematics to solve scientific problems and communicate scientific phenomena?*
    - **Big Idea #2:** I can explain how communities are composed of organisms that interact in complex ways with both biotic and abiotic components.
        - *Essential Question #1: How can I explain the structure of a community in terms of its species composition, diversity, and interactions?*
        - *Essential Question #2: How can I use mathematical and graphical representations to illustrate both exponential and logistic population growth patterns?*
        - *Essential Question #3: How can I interpret age distribution tables used to study human populations?*
    - **Big Idea #3:** I can explain how interactions among living systems and their environment result in the movement of matter and energy.
        - *Essential Question #1: How can I compare and contrast the movement of matter and energy through an ecosystem?*
        - *Essential Question #2: How can I illustrate the dependence of food chains/webs on primary productivity?*
        - *Essential Question #3: How can I use the logistic model of population growth to describe the effects of competition for resources and other factors on population growth?*
    - **Big Idea #4:** I can explain how naturally occurring diversity among and between components within biological systems affects interactions with the environment.
        - *Essential Question #1: How can I contrast the fitness of a population with little genomic diversity to one with robust fitness?*

- *Essential Question #2: How can I explain the contribution of keystone species, predators, and essential abiotic and biotic factors to the maintenance of ecosystem diversity?*

- **END OF COURSE EXAM**

Course Materials:

- Google Chromebook

Textbook:

- Campbell Biology: by Lisa Urry, Michael Cain, Steven Wasserman, Peter Minorsky, Jane Russell. Eleventh edition, 2016. Pearson Higher Education.

Supplemental Textbook(s):

- Pearson Education Test Prep Series: AP Biology. Publisher: Pearson Higher Education, 2016

Electronic Resources:

- Google Classroom
- Socrative
- Kahoot

Course Expectations:

- Summer work will be given at the end of May to all students. All summer work WILL BE COMPLETED by the end of the first week of classes or the instructor reserves the right to drop a student from the course roster.
- Students are expected to have materials every day: Chromebook, textbook, paper, notebook, pencil or pen. Students will be expected to complete all assignments on time. Students will participate in classroom discussion/activities.
- Students will check their individual Progress Book grades regularly.
- The course is designed around the four Big Ideas of Biology and The Seven Science Practices put forth by the College Board in the revised AP Biology Curriculum that became effective in August 2012. The four Big Ideas are: Evolution, Cellular Processes, Genetics and Information Transfer, and Interactions. The course is based on the current program syllabus for AP Biology and prepares students for the required AP examination provided by the College Board.
- The student takes the AP Biology exam on the second Monday in May for possible full year college credit for general biology. The student pays all fees associated with the test.
- There is a $20 lab fee.
- In order to receive AP credit with a 5 point on grading systems, the student must take and pay for the AP exam. If the student fails to take the exam, a 4.5 point grading scale will be applied.
- Further description of the four Big Ideas and the seven Science Practices set forth by the College Board are as follows:

The four Big Ideas are:
1. The process of Evolution drives the unity and diversity of life
2. Biological systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain homeostasis. (Cell Processes)
3. Living systems store, retrieve, transmit, and respond to information essential to life processes. (Genetics and information transfer)
4. Biological systems interact, and these interactions possess complex properties.

The seven science practices are:
1. The student can use representations and models to communicate scientific phenomena and solve scientific problems.
2. The student can use mathematics appropriately.
3. The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the course.
4. That student can plan and implement data collection strategies appropriate to a particular scientific question.
5. The student can perform data analysis and evaluation of evidence.
6. The student can work with scientific explanations and theories.
7. The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

The course material is divided into eight instructional units with the applicable Big Ideas woven into each unit. Chapters from the textbook are grouped according to Unit Topic. Four units will be presented each semester. Students are assigned all the textbook chapter readings for the Ecology unit as a summer project in order to free up time for group and lab work. Investigative Projects Investigative projects will be used to create opportunities for students to extend the learning objectives from the Big Ideas outside of the laboratory investigations. The projects will allow students to both deepen their understanding within each of the four Big Ideas and make connections between each one of the Big Ideas and at least one other. Students will be required to identify which of the Big Ideas are connected through each assignment. The projects will be given to the students in the form of a choice board. One of the options in the choice board will be the format of the project. Students may develop projects in the any of the following formats: written report, poster presentation, PowerPoint or Prezi presentation, informational pamphlet, or oral presentation. One of the options in the choice board will be for students to connect their biological and scientific knowledge to major social issues. The topics offered in the choice board are anticipated to change especially as new subject or current events emerge in the field of Biology. Students will be required to complete one investigative project per content unit for a total of eight total projects. At least two projects over the year must be related to a major social issue. The choice board will be posted on Google Classroom for the students' reference as they conduct their unit investigations.

Grading:

Unit Exams	50%
Assessments (Including: Quizzes, Essays, Labs, and Projects)	30%

Class work/Homework 20%

- Each nine week's grade comprises 20% of a student's final grade.
- The Mid-Term Exam and End of Course Exam each comprise 10% of a student's final grade.

Grading Scale:
The grading scale for Chillicothe High School can be found in the student handbook or online at http://www.chillicothe.k12.oh.us/1/Content2/studenthandboook.

Late Work: Late work will be subject to the Board-adopted policy on assignments that are submitted late (to be reviewed in class).

- Regardless of the absence type (excused, unexcused, OSS, etc.), students are expected to make up work and be held accountable for learning all material they missed.
- Any student who is absent from school will receive one (1) additional day for every day he/she missed to make up his/her work for full credit (100%).
- Any student who exceeds the allotted time to turn in an assignment for full credit may still submit work late for partial credit.
    - Any student who turns in work up to 1 week late must at least be given the opportunity to earn 75% on that assignment.
    - Any student who turns in work between 1 and 2 weeks late must at least be given the opportunity to earn 60% on that assignment.
- The end of the 9 weeks is the cut off point for teachers to accept late work from students for full or partial credit unless the teacher decides to give the student an incomplete for the 9 weeks due to extenuating circumstances.

Performance Based Section: Writing Assignments/Exams/Presentations/Technology
One or more of the End of Unit Exams may be Performance Based. According to the Ohio Department of Education, "Performance Based Assessments (PBA) provides authentic ways for students to demonstrate and apply their understanding of the content and skills within the standards. The performance based assessments will provide formative and summative information to inform instructional decision-making and help students move forward on their trajectory of learning." Some examples of Performance Based Assessments include but are not limited to portfolios, experiments, group projects, demonstrations, essays, and presentations.

CHS AP Biology Course Syllabus

After you have reviewed the preceding packet of information with your parent(s) or guardian(s), please sign this sheet and return it to me so that I can verify you understand what I expect out of each and every one of my students.

Student Name (please print): _____

Student Signature: _____

Parent/Guardian Name (please print): _____

Parent/Guardian Signature: _____

Date: _____