Kolbe Academy
Home School

HIGH SCHOOL
BIOLOGY WITH LAB
Prentice Hall Biology

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Home School

♦ SYLLABUS ♦

Biology
High School

COURSE TITLE: Biology

COURSE TEXTS AND MATERIALS:

- *Biology* by Miller and Levine (2014), Prentice Hall, etext (6015E) or textbook (6015)
- Pearson *Virtual Biology Lab* (6015D)
- Kolbe Academy Biology Answer Key and Online Student Access (6015A), Optional
- *Kolbe Academy Lab Report Writing Guide,* (6018), Optional

Church Teaching Materials:

- *Humani Generis*, an Encyclical Letter of Pius XII (1950) (Available for free online)
- *Kolbe Academy Humani Generis* Study Guide (6017)
- *Chance or Purpose?* by Christoph Cardinal Schonbörn(6016)
- *Catechism of the Catholic Church* (9116)

SCOPE AND SEQUENCE:

1. The Nature of Life
2. Ecology
3. Cells
4. Genetics
5. Evolutionary Theory
6. Microorganisms and Fungi
7. Plants
8. Invertebrates
9. Chordates
10. The Human Body

COURSE DESCRIPTION:

This course is designed to give students an appreciation of creation and of the order and complexity of living things. The course plans outline a track for a Kolbe Academy Core course (K) and a Kolbe Academy honors course (H) in Biology. The "Core Biology" track will emphasize the basic biological processes of how life systems work while the "Honors Biology" track will outline the more in depth physiological processes of life systems.

The science of biology presents the student with some of the bioethical issues that exist in today's world, such as stem cell research, genetic engineering, and cloning. It is the role of the parent to discuss these issues with the student and instruct the student in Church Teaching. We have done our best to point out these controversial issues and to provide guidance on how to address them. For example, the topic of evolution is studied alongside the Church's teaching in *Humani Generis*. Miller and Levine's *Biology* book periodically includes an "Issues in Biology" segment which should be used as points of discussion between the student and parent. It is important to bring in the Church's teaching on moral and bioethical issues during these discussions. Projects have been assigned during some weeks so that the student can explore the Church's teachings on controversial topics on their own.

The honors track, although up to the parent's discretion, is aimed for students who have previously had a solid background in physical science. A student who still wishes to pursue this course as an honors course that did not follow the recommended course of study for physical science, may find the pace of the course challenging. These students should be sure to allot extra time for their studies.

DIPLOMA REQUIREMENTS:

Summa Cum Laude diploma candidates are required to follow either the Kolbe Core course (K) or Kolbe Honors course (H) track outlined in the course plan, and are required to fulfill the laboratory component with this biology course (see page 5). ***Magna Cum Laude*** and ***Standard*** diploma candidates may choose to pursue the (H) or (K) designation, but are not required to do so, and instead have the option of altering the course plan as they choose. ***Summa*** students must complete 4 years of science during their high school course of study including Biology with Lab, Chemistry with Lab, Physics with Lab, and a pre-approved science elective. ***Magna*** students must complete 3 years of science during their high school course of study including Biology, Chemistry, and a physical science. ***Standard*** diploma students must complete 2 years of science including a biological and physical science. For a student pursuing the ***Magna Cum Laude*** diploma, the science requirement dictates that lab work is incorporated into two of the following three courses: Biology, Chemistry or Physics. There is no lab requirement for the ***Standard*** diploma. Please see below for specific course titles, semester reporting requirements and transcript designations for biology.

KOLBE CORE (K) HIGH SCHOOL COURSES:

- Students pursuing the Kolbe Core (K) designation should do the readings. Kolbe Core students need to complete at least 2 of the 14 weekly papers each semester. Further, they should have discussions or write informal essays in response to the rest of the weekly paper topics as these are major themes and will appear in some way on the exams.

- Students pursuing the Kolbe Core (K) designation should be sure to complete the additional Kolbe Core sections included in the exams.

- To receive the Kolbe Core (K) designation on the high school transcript, be sure to turn in the appropriate sample work, as outlined below.

SEMESTER REPORTING REQUIREMENTS:

Designation*			**K**	**K**	**H**
Course Title	**Biology**	**Biology w/ Lab**	**Biology**	**Biology w/ Lab**	**Biology w/ Lab**
Semester 1	1. Any two written samples of work.	1. Any two written samples of work. 2. Any two samples of lab work	1. Exam I with "Core" sections answered fully 2. Exam II 3. Exam III Each with "Core" sections answered fully	1. Exam I with "Core" sections answered fully 2. 1 lab report 3. Exam II 4. Exam III Each with "Core" sections answered fully 5. 1 lab report	1. Exam I with "Honors" sections fully answered 2. Any project 3. 1 lab report 4. Exam II 5. Exam III Each with "Honors" sections answered fully 6. Any project 7. 1 lab report
Semester 2	1. Any two written samples of work.	1. Any two written samples of work. 2. Any two samples of lab work	1. Exam IV with "Core" sections fully answered 2. Exam V 3. Exam VI Each with "Core" sections fully answered	1. Exam IV with "Core" sections answered fully 2. 1 lab report 3. Exam V 4. Exam VI Each with "Core" sections fully answered 5. 1 lab report	1. Exam IV with "Honors" sections answered fully 2. Any project 3. 1 lab report 4. Exam V 5. Exam VI Each with "Honors" sections answered fully 6. Any project 7. 1 lab report

***Designation refers to designation type on transcript. K designates a Kolbe Academy Core course. H designates a Kolbe Academy Honors course.**

If the student wishes to have the course distinguished on the transcript with a (K) as a Kolbe Academy Core course or with an (H) as a Kolbe Academy Honors course, please be sure to send the correct exams and components each semester for verification as specified above. **If no designation on the transcript is desired, parents may alter the lesson plan and any written sample work is acceptable to receive credit for the course each semester.** If you have any questions regarding what is required for the (K) or (H) designations or diploma type status, please contact the academic advisory department at 707-255-6499 ext. 5 or by email at advisors@kolbe.org.

COURSE PLAN METHODOLOGY:

There are 6 exams incorporated into the biology course. These exams reflect the content of what was assigned in the weekly course plans. If students do the work assigned during the week, they should be adequately prepared for any question that arrives on the exams. The exams consist of many different types of questions including matching, multiple choice, and essays. In order to receive the Kolbe Honors course designation (H) on their transcript, students must complete all the sections on the exams that are labeled "Honors Biology". Students wishing to receive the Kolbe Core course designation (K) must complete all the sections that are labeled "Core Biology". Students may not skip or alter questions on the exams except when specified by the directions within the exam itself if they wish to receive either the (H) or (K) designation for this course. As parents are the primary educator, they may alter the course plan or exams as needed if the student does not desire the (H) or (K) designation on the transcript.

Lab work is suggested throughout the lesson plan through the use of the Virtual Lab CD and labs in the textbook that do not require extensive materials. Alternate labs are suggested with every Virtual Lab assignment for students who wish to complete a hands-on lab using this text. To qualify the course as a lab science, students should spend an average of one hour per week doing some type of lab work. This may include field observation, dissection, work with a microscope, or using the virtual laboratory CD. Students may receive lab credit by other means than following the course plan suggestions such as a home school co-op, hands-on lab at home, college lab course etc. A separate grade should NOT be given for the lab work, but should be incorporated into the overall grade given for the course. Parents may determine the weight the lab component will have on the final grade, but typical values ranges from 15-25% of the total grade. Two written lab reports (formal or informal) are needed per semester for lab credit on the transcript; however, students are encouraged to write an informal lab report for the majority of the labs in this course.

If this text is being used in preparation for the AP Biology exam, students should complete assignments under the Honors Biology heading. Since this book is NOT a college text, it is important to study for the AP with an AP specified study guide for Biology. Most of the topics needed to be successful on the Biology AP exam are covered in the honors course of study. To see the AP biology requirements, go to www.collegeboard.com. AP is a registered trademark of the College Board.

The following key will help the parent and student understand how each week's assignments are laid out.

Reading: Includes pages from the specified chapter in the Prentice Hall *Biology* textbook or other specified outside reading.

Section Assessment: Suggested questions from the text at the end of each section. The suggested questions will help the student prepare well for each exam provided by Kolbe Academy. Answers to these questions are provided in the Kolbe Academy Answer Key to the Prentice Hall Biology text.

Chapter Assessment: Suggested questions from the text at the end of each chapter. The suggested questions will help the student prepare well for each exam provided by Kolbe Academy. Answers to these questions are provided in the Kolbe Academy Answer Key to the Prentice Hall Biology text.

Go Online: The text has a supplemental website provided by Prentice Hall at www.biology.com. The material assigned in the "Go Online" is meant to be supplemental in nature and is not absolutely necessary to do well on the exams. However, it does provide additional assessment and demonstration of the concepts in the text.

Lab Work: The lab work assignments come from either the Virtual Biology Labs or from the *Biology* text itself. The labs chosen from the text need little or no equipment to be completed at home (like the Quick Labs or Inquiry activities), and all Virtual Biology Lab assignments use just computer software. Any Quick Labs or Inquiry activities listed in the course plan are optional for lab credit but do allow students using the Virtual Biolab software to get some occasional hands-on lab experience. If you have equipment available to complete the more complex labs that are outlined in the book, these could be done in lieu of the virtual lab, and is a superior way to fulfill the lab requirement. When a Virtual Lab is listed, **an *alternate* lab** is usually assigned for students who would prefer to do these more complex labs for credit and has the equipment at home to do so. Note that virtual labs have been placed in the most relevant week possible, but sometimes a lab covering a certain topic is postponed to a later week so as not to overwhelm the student.

Project: The project will generally be given to the student in order for him to further pursue a topic in biology. Though several are optional for Kolbe Core biology students, all students will benefit from further exploration of the ideas presented in the week's reading. These topics are required for Kolbe Honors biology students.

Key Terms: This is a list of important vocabulary terms to look out for as the student reads the chapter. Vocabulary words for both the Kolbe Core and Kolbe Honors biology students are listed separately.

Biological Issues & Church Teaching: References that can be used to incorporate Church Teaching alongside the study of biology are provided in this section. Many of the references are to documents easily found on the Internet, such as *Fides et Ratio*, *Humani Generis*, and the *Summa Theologica*. These references are by no means exhaustive and not every chapter will have references to Church Teaching, depending on the subject matter being covered.

Important Concepts: The most important concepts for the student to understand are described in this section.

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Important Concepts: The most important concepts for the student to understand are described in this section.

♦♦♦ FIRST SEMESTER ♦♦♦

KOLBE ACADEMY ORIENTATION WEEK	
This week will be strictly dedicated to learning about the set up of the course and textbook, the virtual lab software, and all supplemental online materials.	
MON	**Read pages 1 – 7** of the Kolbe Academy **Syllabus** for biology. Open the textbook to the table of contents. Decide with your parents, which course outline you prefer to cover: the Core Biology or Honors Biology, or another modified form of the course. Read pages 5-6 of the course plan, paying special attention to the key that explains how each week's assignments are laid out.
TUES	1) If you are using the virtual lab, **make sure you have been given access**. Login is at www.pearsonsuccessnet.com. A username and password must be generated by Kolbe and emailed to you. 2) Login to the Online Virtual lab. Go over the Help Tutorials located in the virtual lab environment.
WED	TBD
THUR	TBD
FRI	Reread pages 5-6 of the course plan, paying special attention to the key that explains how each week's assignments are laid out. Compare the key with a few weeks in the course-plan since not every component appears in each week. Look ahead to Week 1. Take stock of the material you will be covering. Make sure you understand what each assignment is and whether it pertains to the course of study you will be following. You are now ready to begin your biology adventure!

WEEK 1				
	Core Biology (K)		**Honors Biology (H)**	
Reading	Chapter 1	Sections 1-3	Chapter 1	Sections 1-3
Section Assessment	1.1 1.2 1.3	1(a) and 2(a)(b) 1(b), 2(a), 3(a), 4(b) 1(a)(b), 2(b), 4(a)	1.1 1.2 1.3	1(a) and 2(a)(b) 1(b), 2(a), 3(a), 4(b) 1(a)(b), 2(b), 4(a)
Chapter Assessment	1-5, 9, 10, 15-17, 19, 23-24		1-5, 9, 10, 15-17, 19, 23-24	
Go Online	Art in Motion Art Review		Art in Motion Art Review Chapter Mystery (pages 3, 11, 29, and questions 1-3 on page 29)	
Lab Work	Students should familiarize themselves with the scientific method and the basics of science writing. This can be done independently, or using *The Kolbe Academy Lab Report Guide*. Honors biology students should read the section on formal lab reports. There is no formal lab assignment this week. **Optional:** Quick Lab, page 13			
Key Terms	**1.1** science, observation, inference, hypothesis, controlled experiment, independent variable, dependent variable, control group, data **1.2** theory, bias **1.3** biology, DNA, stimulus, sexual reproduction, asexual reproduction, homeostasis, metabolism, biosphere			
Biological Issues & Church Teaching	The Catechism states that: "Though faith is above reason, there can never be any real discrepancy between faith and reason. Since the same God who reveals mysteries and infuses faith has bestowed the light of reason on the human mind, God cannot deny himself, nor can truth ever contradict truth."[37] "Consequently, methodical research in all branches of knowledge, provided it is carried out in a truly scientific manner and does not override moral laws, can never conflict with the faith, because the things of the world and the things of faith derive from the same God. The humble and persevering investigator of the secrets of nature is being led, as it were, by the hand of God in spite of himself, for it is God, the conserver of all things, who made them what they are" (para 159). Chapter 1 discusses what science is and is not. The authors state that "Scientific endeavors never concern, in any way, supernatural phenomena of any kind." Science looks for natural explanations based on evidence, not belief. Although science is concerned only with the natural world, the pursuit of scientific truth will not create any conflict for the believer. As the Catechism explains, a scientist who submits himself to the boundaries of morality, will discover nothing that opposes the truth of faith because faith and the natural world have the same Divine origin.			
Important Concepts	Biology is the study of life. In this course, we will explore what living things are made of, how they function and relate to each other, and how they change over time. It is important that students understand the scientific method and how to design a controlled experiment before proceeding to the next chapter.			
Notes				

WEEK 2				
	Core Biology (K)		**Honors Biology (H)**	
Reading	Chapter 2	Sections 1-4	Chapter 2	Sections 1-4
Section Assessment	2.1 2.2 2.3 2.4	1(a)(b), 2(b), 3(a), 4(a)(b) 1(b)(c), 2(b), 3(a)(c) 1(a)(b), 2(b), 3(a)(b) 1(b), 2(a)(b), 3(b)	2.1 2.2 2.3 2.4	1(a)(b), 2(b), 3(a), 4(a)(b) 1(b)(c), 2(b), 3(a)(c) 1(a)(b), 2(b), 3(a)(b) 1(b), 2(a)(b), 3(b)
Chapter Assessment	1-3, 10-12, 13, 15, 18-20, 25-28		1-3, 10-12, 13, 15, 18-20, 25-28	
Go Online	Art Review Visual Analogy		Art Review Visual Analogy	
Lab Work	Virtual BioLab		Introduction to Microscopy	
	Access the virtual lab via www.pearsonsuccessnet.com. Lab worksheets can be found in the lab manual. Student should enter the "Virtual Lab" room to complete the worksheet. Intro to Microscopy is found in the "Organisms and Natural History" folder.			
Key Terms	**2.1** atom, nucleus, electron, element, isotope, compound, ionic bond, ion, covalent bond, molecule, van der Waals force **2.2** hydrogen bond, cohesion, adhesion, mixture, solution, solute, solvent, suspension, pH scale, acid, base, buffer **2.3** monomer, polymer, carbohydrate, monosaccharide, lipid, nucleic acid, nucleotide, protein, amino acid			
Important Concepts	Since millions of chemical reactions happen in the cells and body of living organisms, understanding the fundamentals of chemistry is critical for success in biology. Chapter 2 discusses the nature of matter, the primary types of chemical bonds, and the pH scale. Students should understand the chemical properties of water that make it necessary for life on Earth. Finally, the four macromolecules – the "stuff" of which living things are made – are introduced in this chapter.			
Notes				

WEEK 3				
	Core Biology (K)		**Honors Biology (H)**	
Reading	Chapter 7	Sections 1-4	Chapter 7	Sections 1-4 Chapter Mystery (pages 189, 193, 221)
Section Assessment	7.1 7.2 7.3 7.4	1(b), 3(a)(b), 4 1(a), 2(a), 3(b), 4(b), 5(a) 1(a)(b)(c), 2(a)(b)(c) 1(c), 2(a)(b)(c)	7.1 7.2 7.3 7.4 Chapter Mystery	1(b), 3(a)(b), 4 1(a), 2(a), 3(b), 4(b), 5(a) 1(a)(b)(c), 2(a)(b)(c) 1(c), 2(a)(b)(c) Questions 1-4 (page 221)
Chapter Assessment	1-4, 6-10, 15, 16, 19, 23-26		1-4, 6-10, 15, 16, 19, 23-26	
Go Online	Visual Analogy Art Review Art in Motion		Chapter Mystery	
Lab Work (Honors & Core)	Virtual BioLab	Unicellular Eukaryotic Life lab and worksheet (in the "Organisms and Natural History" folder)		
	Optional: Quick Lab (page 203)			
Key Terms	**7.1** cell, cell theory, cell membrane, nucleus, eukaryote, prokaryote **7.2** cytoplasm, organelle, vacuole, lysosome, cytoskeleton, centriole, ribosome, endoplasmic reticulum, Golgi apparatus, chloroplast, mitochondrion, cell wall, lipid bilayer, selectively permeable **7.3** diffusion, facilitate diffusion, aquaporin, osmosis, isotonic, hypertonic, hypotonic, osmotic pressure			
Biological Issues & Church Teaching	Watch the "Inner Life of the Cell" animations created by Harvard University (http://multimedia.mcb.harvard.edu/). Studying the intricacy of cell structure is an opportunity to meditate on the way in which the complexity and orderliness of the natural world reflects the glory of God. In the *Summa Theologica* (First part, Question 2, Article 3), St. Thomas Aquinas presents five proofs for God's existence – all of which involve observations about the natural world.			
Important Concepts	The cell is the basic unit of life. Differentiate between prokaryotic and eukaryotic cells. Draw and label diagrams of plant and animal cells and describe the function of each organelle. Refer to the chart on page 207. Cells need to move nutrients, waste, and other materials in and out to maintain homeostasis. Review the types of cell transport described in section 3. Finally, discuss the relationship between homeostasis, cell specialization, and the organization of multicellular bodies.			
Notes				