Kolbe Academy
Home School

HIGH SCHOOL
BIOLOGY WITH LAB
Prentice Hall Biology

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COURSE TITLE: Biology

COURSE TEXTS AND MATERIALS:

- *Biology* by Miller and Levine (2006), Prentice Hall, (T5153)
- Prentice Hall *Biology Virtual Labs* CD-ROM (T5153A)
- Kolbe Academy Biology Answer Key and Online Student Access (T5153B), Optional
- *Kolbe Academy Lab Report Writing Guide,* (T5140), Optional

Church Teaching Materials:

- *Humani Generis*, an Encyclical Letter of Pius XII (1950) (Available for free online)
- *Kolbe Academy Humani Generis* Study Guide (T5150A)
- *Chance or Purpose?* by Christoph Cardinal Schonbörn(T5154)
- *Catechism of the Catholic Church* (T2243A)

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. The honors track should be followed if students wish to have the opportunity to take the AP test in Biology as most of the topics needed to be successful on the Biology AP exam are covered. Since this book is NOT a college text, it is important to study for the AP with an AP specified study guide for Biology. To see the AP Biology requirements, go to www.collegeboard.com.

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, quarterly reporting requirements and transcript designations for biology.

REQUIRED SAMPLE WORK:

Designation*			**K**	**K**	**H**
Course Title	**Biology**	**Biology w/ Lab**	**Biology**	**Biology w/ Lab**	**Biology w/ Lab**
Quarter 1	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam I with "Core" sections answered fully	1. Exam I with "Core" sections answered fully 2. 1 lab report	1. Exam I with "Honors" sections fully answered 2. Any project 3. 1 lab report
Quarter 2	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam II 2. Exam III Each with "Core" sections answered fully	1. Exam II 2. Exam III Each with "Core" sections answered fully 3. 1 lab report	1. Exam II 2. Exam III Each with "Honors" sections answered fully 3. Any project 4. 1 lab report
Quarter 3	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam IV with "Core" sections fully answered	1. Exam IV with "Core" sections answered fully 2. 1 lab report	1. Exam IV with "Honors" sections answered fully 2. Any project 3. 1 lab report
Quarter 4	1. Any written sample work.	1. Any written sample work. 2. Any sample lab work	1. Exam V 2. Exam VI Each with "Core" sections fully answered	1. Exam V 2. Exam VI Each with "Core" sections fully answered 3. 1 lab report	1. Exam V 2. Exam VI Each with "Honors" sections answered fully 3. Any project 4. 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 quarter 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 quarter. 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.

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 PLAN "AT A GLANCE" OUTLINE:

Core Biology (K)

Quarter 1
- Weeks 1-6: Chapters 1, 2, 7-10
- Week 7: Exam I
- Week 8-9: Chapters11-13

Quarter 2
- Week 1: Chapter 13 (cont), 14
- Week 2: Exam II
- Week 3-8: Chapters 15-18, 3-5, *Chance or Purpose?*
- Week 9: Exam III

Quarter 3
- Week 1-5: Chapters 19-24, 26, 29
- Week 6: Exam IV
- Week 7-9: Chapters 30-32

Quarter 4
- Week 1-2: Chapters 34-35
- Week 3: Exam V
- Week 4-8: Chapters 36-40
- Week 9: Exam VI

Honors Biology (H)

Quarter 1
- Weeks 1-5: Chapters 1, 2, 7-10
- Week 6: Exam I
- Week 7-9: Chapters 11-14

Quarter 2
- Week 1: Exam II
- Week 2-8: Chapters 15-18, 3-5
- Week 9: Exam III

Quarter 3
- Week 1-6: Chapters 19-24, 26-28
- Week 7: Exam IV
- Week 8-9: Chapters 30-32

Quarter 4
- Week 1-2: Chapters 34-35
- Week 3: Exam V
- Week 4-8: Chapters 36-40
- Week 9: Exam VI

Please note that many chapters are not covered in their entirety. Be sure to refer to the course plan that follows for specific guidance.

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.

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.

Chapter Assessment: Suggested questions from the Prentice Hall *Biology* 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.phschool.com. Web codes are included for the "Self-Tests," self -grading quizzes that can help students to identify problem areas from each chapter, and "Active Art," materials that offer interactive activities to students to emphasize the concepts presented in the chapter. Parents have access to the Teacher version of the website to access answers to the "Active Art" activities. (See the user's manual provided in the Kolbe Academy answer key for step by step instructions on accessing these materials for teacher and student.) Students following the Kolbe "Core Biology"

course of study will not always have covered the information in the self-tests and should take this into account when completing them. 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: Suggested labs described on either the Prentice Hall *Biology Virtual Labs* CD-ROM, or throughout the Prentice Hall *Biology* text. The labs chosen need little or no equipment to be completed at home. Since the labs help the student understand the more complex ideas, these are more significant for the Honors Biology student. If you have equipment available to complete the labs that are outlined in the book, this would add a very good component to the course, and is a superior way to fulfill the lab requirement. When a Virtual Lab is listed, an *alternate* lab is assigned for students who would prefer to do hands-on experiments for lab credit.

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.

♦♦♦ FIRST QUARTER ♦♦♦

KOLBE ACADEMY WELCOME 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	If you haven't already done so, **send in your Online Access Code Release Form** located in the beginning of the *Kolbe Academy Answer Key for Biology*. You can email, fax, or mail this form in. Email to homeinfo@kolbe.org or fax to 707-255-1581. If your answer key did not come with a form, please email Kolbe for a copy right away. **Read pages 1 – 4** of the Kolbe Academy **Syllabus** for biology. Open the textbook to the table of contents. Compare the **Course "At A Glance" Outline** on page 4 of this syllabus to the table of contents in the text to see the titles of the chapters you will be covering this year. Decide with your parents, which course outline you prefer to cover: the Core Biology or Honors Biology, or another modified form of the course.
TUES	If you are using the virtual lab software, **install** it on your computer. Click on Lab #1. Print the lab worksheet or find a way to save the lab worksheet on your computer. To get a feel for how the

	software works, complete Lab #1. Do not answer any questions, just go through the simulation.
WED	Using the *Kolbe Academy Answer Key for Biology*, open to **Part II**: Using other Online Support materials. Go through the entirety of Part II so that you will know what kind of supplemental materials are available to you should you hit a road block. Pay special attention to Part A so that you will know how to access the Active-Art and Self-Tests using the web codes. Parents should pay special attention to Part B so they know how to find answers to the Active Art questions.
THUR	If you have already received your **online access code** from Kolbe Academy, you will be able to complete today's assignment. Otherwise, wait to do today's assignment until a later time. Using the *Kolbe Academy Answer Key for Biology*, open to ***Part I**: Using the Pearson/Prentice Hall Successnet Online Access*. Begin with "Creating a student username and password." Please take time to go through Part I in its entirety so that you will understand what is available to you in the Interactive Textbook.
FRI	Read 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 1-1 to 1-4	Chapter 1	Sections 1-1 to 1-4
	Appendix A	Pages 1062-1065	Appendix A	Pages 1062-1065
	Appendix C	Page 1069	Appendix C	Page 1069
Chapter Assessment	Chapter 1: 1-10, 12-13, 15-17, 32-33		Chapter 1: 1-10, 12-13, 15-17, 32-33	
Go Online	Active Art (Web Code: cbp-1012) Chapter 1 Self-Test (Web Code: cba-1010)		Active Art (Web Code: cbp-1012) Chapter 1 Self-Test (Web Code: cba-1010)	
Lab Work	Students should investigate the way in which to write a proper lab report using the scientific method. This can be done independently, or using *The Kolbe Academy Lab Report Writing Guide*.			
Key Terms	**Core Biology (K) Student Key Terms**			
	Observation Data Inference Hypothesis	Types of Variables Controlled Experiment Theory	Metabolism Homeostasis Evolution	Levels of Organization Metric System Types of Microscopes
	Honors Biology (H) Student Key Terms			
	Same as above			
Biological Issues & Church Teaching	In *Fides et Ratio* (On The Relationship Between Faith And Reason), Pope John Paul II said, "Faith and reason are like two wings on which the human spirit rises to the contemplation of truth; and God has placed in the human heart a desire to know the truth—in a word, to know Himself—so that, by knowing and loving God, men and women may also come to the fullness of truth about themselves." Read especially sections 19, 45, 88, 101 and 106 and compare with the text's discussion on page 7 on *Science and Human Values* and that on *Biology in*			

	Everyday Life on page 22.
Important Concepts	Biology is the scientific study of life. In this course, we will explore what living things are made of, how they function, and how they changed over time. Since biology is a science, our study of the subject will employ the scientific method.

Notes

WEEK 2

	Core Biology		Honors Biology	
Reading	Chapter 2	Sections 2-1 to 2-4	Chapter 2	Sections 2-1 to 2-4
Chapter Assessment	Chapter 2: 1-5, 7-10, 17, 21-22, 32, 34, 38 (use 32 and 34 as lab work)		Chapter 2: 1-10, 17, 21-22, 32, 34, 38 (use 32 and 34 as lab work)	
Go Online	Chapter 2 Self-Test (Web Code: cba-1020)		Chapter 2 Self-Test (Web Code: cba-1020)	
Lab Work	Virtual Lab CD **(or)** Design an Experiment	Lab 1 Page 54	Virtual Lab CD **(or)** Design an Experiment	Lab 1 Page 54

Key Terms	**Core Biology Student Key Terms**			
	Atom	Element	Molecule	Chemical Reaction
	Nucleus	Isotope	Acid	Macromolecules
	Electron	Ionic Bond, Covalent Bond	Base	Enzymes
	Proton		Nucleic Acid (DNA, RNA)	Catalyst
	Neutron			
	Honors Biology Student Key Terms			
	Same as above			
Important Concepts	Since all living things are made of chemicals and follow chemical rules, mastering the chemistry behind biology is pivotal for success in this course. One of the most basic but most important molecules for life is water. Finally, we learn that all living things are composed of atoms, which are organized into macromolecules. The four major macromolecules are carbohydrates, lipids, proteins, and nucleic acids.			

Notes

WEEK 3

	Core Biology		Honors Biology	
Reading	Chapter 7	Section 7-1, 7-2, 7-4	Chapter 7	Sections 7-1 to 7-4
Chapter Assessment	Chapter 7: 1-5, 9,10, 12, 29, 32		Chapter 7: 1-8, 10, 12, 14-19, 22, 26, 30	

The following week from Quarter 2 is included so that a sample of Catholic Church teaching is included in this sample course plan.

WEEK 2				
	Core Biology		**Honors Biology**	
Reading	**REVIEW** AND **EXAM II** Chapters 11 – 14 Students may want to begin reading *Chance or Purpose?* after their exam this week.		Chapter 15	Section 15-1 to 15-3
			Chance or Purpose?- Forward, Chapters I-V	
			Read Quarter 2, Week 2 Biological Issues & Church Teaching (below)	
Chapter Assessment			Chapter 15: 1-10, 13, 18, 20, 21, 23	
Go Online			Chapter 15 Self-test (cba-5150)	
Lab Work			Quick Lab	Page 379
Key Terms	**Honors Biology Student Key Terms**			
	Evolution Fossil Charles Darwin James Hutton Charles Lyell	Jean-Baptiste Lamarck Natural selection Artificial selection Struggle for existence	Fitness Adaptation Survival of the fittest Descent with modification	Common descent The fossil record Homologous structures Vestigial organs

Biological Issues & Church Teaching	(Core biology students please refer to this section next week). The authors explain that evolution is a theory, "a well-supported testable explanation of phenomena that have occurred in the natural world." Given that it is a theory blindly accepted as fact by many, it is important to explore, question, and understand the science underpinning it and to grasp the Church's stance on evolution as outlined below, regardless of whether you accept or reject evolutionary theory. The Church has thus far not made any definitive statement whether or not evolution is true, considering the *mechanism* of origins to be a matter for scientific inquiry. Thus, the Church does allow speculation on various areas of evolution. According to Pope Pius XII's declaration of 11/30/1941, there are three essential elements that must be held (found in the 9th grade 1st quarter Week 3 Theology reading from Fr. Hardon's Catechism on *The Origin and Nature of Man*): 1. The essential superiority of man in relation to other animals, by reason of his spiritual soul. 2. The derivation in some way of the first woman from the first man. 3. The impossibility that the immediate father or progenitor of man could have been other than a human being. According to Fr. Hardon, this last point still allows for "transformism, or the evolution of the first man's body from a lower species," provided "that the soul was immediately created by God out of nothing, and that somehow God exercised a special providence over whatever process preceded the origin of man's body, so that the first man was not literally generated by a brute beast." Some elements of the various theories of evolution have been condemned. Next week, you will read *Humani Generis (Concerning Some False Opinions Threatening to Undermine the Foundations of Catholic Doctrine)*, the seminal papal encyclical of Pope Pius XII addressing evolution (among other things). Pay special attention to paragraphs 5, 9, 25, 29-31, and 35-38. In particular, the encyclical emphasizes that "Some however rashly transgress this liberty of discussion, when they act as if the origin of the human body from pre-existing and living matter were already completely certain and proved by the facts which have been discovered up to now and by reasoning on those facts, and as if there were nothing in the sources of divine revelation which demands the greatest moderation and caution in this question." Paragraph 37 specifically condemns polygenism, which states either that, after Adam, there lived true men who did not descend from Adam or that Adam represented a number of individuals, sometimes referred to as the "tribe of Adam." Furthermore, in his Message to the Pontifical Academy of Sciences dated October 22, 1996, and entitled *Truth Cannot Contradict Truth*, Pope John Paul II stated the following: "Taking into account the state of scientific research at the time as well as of the requirements of theology, the Encyclical *Humani Generis* considered the doctrine of 'evolutionism' a serious hypothesis, worthy of investigation and in-depth study equal to that of the opposing

	hypothesis. Pius XII added two methodological conditions: that this opinion should not be adopted as though it were a certain, proven doctrine and as though one could totally prescind from Revelation with regard to the questions it raises. He also spelled out the condition on which this opinion would be compatible with the Christian faith… …It is by virtue of his spiritual soul that the whole person possesses such a dignity even in his body. Pius XII stressed this essential point: if the human body takes its origin from pre-existent living matter the spiritual soul is immediately created by God (…Encyclical Humani generis, AAS 42 [1950], p. 575). Consequently, theories of evolution which, in accordance with the philosophies inspiring them, consider the mind as emerging from the forces of living matter, or as a mere epiphenomenon of this matter, are incompatible with the truth about man. Nor are they able to ground the dignity of the person." The International Theological Commission, headed by then Cardinal Ratzinger, released a document in July, 2004, entitled *Communion and Stewardship: Human Persons Created in the Image of God* that stated, "God is...the cause of causes." Thus, "Through the activity of natural causes, God causes to arise those conditions required for the emergence and support of living organisms, and, furthermore, for their reproduction and differentiation." Finally, referring to evolution as a "radically contingent materialistic process driven by natural selection and random genetic variation," the commission nevertheless concluded that "even the outcome of a truly contingent natural process can nonetheless fall within God's providential plan for creation." In other words, God is not limited by <u>our</u> understanding. What we must believe is that He indeed has a plan for us—how He chooses to accomplish this plan could utilize whatever means He sees fit to use. The theory of Thomas Malthus (p. 377) regarding population growth, still cited by population control groups, is presented as "somewhat pessimistic" by the authors and is cited primarily to illustrate its influence on the development of Darwin's concepts of natural selection, the struggle for existence, and survival of the fittest. When similarities in embryology are presented (p. 385), the authors point out that "This does not mean that a human embryo is ever identical to a fish or a bird embryo…" but that they reveal similarities that produce homologous structures. They specifically debunk the work of those such as Haeckel who tried to say that an embryo went through prior stages of evolution while developing. Finally, the authors address the "Strengths and Weaknesses of Evolutionary Theory" on p. 386, as a prelude to the next chapter.
Important Concepts	This chapter is a basic introduction to one of the fundamental theories behind the study of biology. It is important for the High School biology student to examine Darwin's theory of evolution by natural selection, the evidence on which he based this theory, and how and why this theory has withstood the test of time. Next week's readings will help the student critique Darwin's theory through an investigation of the Church's stance on this issue.