

Kolbe Academy Home School

HIGH SCHOOL BIOLOGY WITH LAB (HONORS)

TABLE OF CONTENTS

SYLLABUS	2
Diploma Requirements	3
Semester Reporting Requirements	4
Scope And Sequence	4
Course Plan Methodology	5
COURSE PLAN	7
First Semester.....	7
Second Semester.....	39
EXAMS	64
First Semester.....	64
Second semester	90
ANSWER KEYS	117
First Semester.....	117
Second Semester.....	134

Resale & Copying Policy: This course plan and all accompanying materials are not intended for resale or copying. Copying represents copyright infringement, which is illegal. Regarding reselling the materials, Kolbe Academy relies upon the continued purchase of our course plans for financial stability. As a Catholic Apostolate, we ask you to refrain from reselling Kolbe’s course plans. While we cannot stop you from copying or reselling this course plan, we do strongly implore you not to do so.

COURSE TITLE: Biology (Honors)

COURSE TEXTS AND MATERIALS:

Miller, Kenneth R. and Joseph S. Levine. *Biology*. Boston: Pearson Education, 2014.

Miller, Kenneth R. and Joseph S. Levine. *Biology: Study Workbook A*. Boston: Pearson Education, 2014.
(optional)

Miller, Kenneth R. and Joseph S. Levine. *Biology: Study Workbook A*. Annotated teacher's edition. Boston:
Pearson Education, 2014. (optional)

Virtual Biology Lab. Boston: Pearson Education. (digital)

Hoxie, Elizabeth. *Biology: Quizzes (Kolbe Core)*. Napa, CA: Kolbe Academy Press, 2016. (digital,
recommended)

Hoxie, Elizabeth. *Biology Answer Key and Online Student Access*. Napa, CA: Kolbe Academy Press, 2016.
(optional)

Lab Report Writing Guide. Napa, CA: Kolbe Academy Press, 2008. (optional)

Church Teaching Materials:

Pope Pius XII. *Humani Generis*. Vatican: The Holy See, 1950.

Jay, Joan. *Humani Generis: Encyclical Letter of Pope Pius XII, with questions and answers*. Maria Amorose, ed.
Napa, CA: Kolbe Academy Press, 2000.

Christoph, Cardinal Schonbörn. *Chance or Purpose?: Creation, Evolution and a Rational Faith*. Hubert Philip
Weber, ed. Henry Taylor, trans. San Francisco: Ignatius Press, 2007.

Catechism of the Catholic Church. 2nd edition revised. Vatican: Libreria Editrice Vaticana, 2000.

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 honors course (H) in Biology. The “Honors Biology” track will outline the more in-depth 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 a “Biology & Society” 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.

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.

SEMESTER REPORTING REQUIREMENTS:

Designation*	H
Course Title	Biology w/ Lab
Semester 1	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. 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 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 or by email at advisors@kolbe.org.

SCOPE AND SEQUENCE:

1. The Nature of Life
2. Cells
3. Genetics
4. Evolution

5. Ecology
6. From Microorganisms to Plants
7. Animals
8. The Human Body

The honors track, although up to the parent's discretion, is aimed for students who have 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.

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. 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 the (H) 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) designation on the transcript.

Short quizzes are provided for each chapter in a separate publication. While not mandatory, completing the quizzes will help student prepare for the exams. They are available as a digital download. Please see the course text list.

Lab work is suggested throughout the lesson plan through the use of the Virtual Lab and labs in the textbook that do not require extensive materials. 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.

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. 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: Several project ideas are suggested for each semester. Some deal with moral or ethical concepts which the student may wish to understand better. The projects may be submitted to fulfill the "written work" requirement.

Key Terms: This is a list of important vocabulary terms to look out for as the student reads the chapter.

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 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. Pay special attention to the key in the Course Plan Methodology 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	Pay 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		
Reading	Chapter 1	Sections 1-3
Section Assessment	1.1 Assessment 1(a), 2(a)(b) 1.2 Assessment 1(b), 2(a), 3(a), 4(b) 1.3 Assessment 1(a)(b), 2(b), 4(a)	
Chapter Assessment	1-5, 9, 10, 15-17, 19, 23-24	
Quiz	Chapter 1 Quiz	
Go Online	Art in Motion Art Review Chapter Mystery	
Lab Work	Students should familiarize themselves with the scientific method and the basics of science writing. This can be done independently, or using <i>The Kolbe Academy Lab Report Guide</i> . 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	
Reading	Chapter 2
Section Assessment	2.1 Assessment 1(a)(b), 2(b), 3(a), 4(a)(b) 2.2 Assessment 1(b)(c), 2(b), 3(a)(c) 2.3 Assessment 1(a)(b), 2(b), 3(a)(b) 2.4 Assessment 1(b), 2(a)(b), 3(b)
Chapter Assessment	1-3, 10-12, 13, 15, 18-20, 25-28
Quiz	Chapter 2 Quiz
Go Online	Art Review Visual Analogy
Lab Work	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 2.4 chemical reaction, reactant, product, activation energy, catalyst, enzyme, substrate
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. The four macromolecules – the "stuff" of which living things are made – are introduced in this chapter. Students should know the monomers of each of the four macromolecules, but is not required to understand the levels of organization for proteins (page 49). They should understand the importance of enzymes as biological catalysts and should be able to describe the enzyme substrate complex and factors which affect enzyme function (pages 52-53).
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Notes</div>	

WEEK 3		
Reading	Chapter 7	Sections 1-4
Section Assessment	7.1 Assessment 1(b), 3(a)(b), 4 7.2 Assessment 1(a), 2(a), 3(b), 4(b), 5(a) 7.3 Assessment 1(a)(b)(c), 2(a)(b)(c) 7.4 Assessment 1(c), 2(a)(b)(c)	
Chapter Assessment	1-4, 6-10, 15, 16, 19, 23-26	
Quiz	Chapter 7 Quiz	
Go Online	Chapter Mystery	
Lab Work	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 7.4 homeostasis, tissue, organ, organ system, receptor	
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 <i>Summa Theologica</i> (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. Draw and label a diagram of the nucleus (page 197). Differentiate between microtubules and microfilaments and give examples of how each are used (page 199). Explain how cells "talk" to each other (page 217).	
<div style="border: 1px solid black; padding: 5px; width: fit-content;">Notes</div>		