

**BA in BIOLOGICAL and PHYSICAL SCIENCES ASSESSMENT PLAN**  
**March 30, 2007**  
**Plan for 2007 - 2008**

**I. Program Mission**

The mission the Biological and Physical Science (BIPH) program is to provide a broad background in the mathematical and natural sciences that is uniquely suited to a student's specific educational needs, and to prepare students for entrance/admission to professional programs (medicine, dentistry, optometry, etc.). The mission is consistent with the IU Kokomo Mission Statement.

**II. Program Goals/ Student Learning Outcomes/Components**

**Goal #1:** *Students will be able to reason scientifically.*

**Outcome #1. Understand the nature of scientific truth**

- Component #1. Explain the role of data collection and analysis in the development of scientific knowledge
- Component #2. Explain the self-correcting nature of science

**Outcome #2. Recognize relationships among variables tested in a scientific experiment**

- Component #1. Collect meaningful data from an experiment
- Component #2. Apply mathematical techniques to analyze collected data using current technology
- Component #3. Apply statistical methods to evaluate experimental data
- Component #4. Draw relevant conclusions from experimental results

**Goal #2:** *Students will communicate scientific ideas clearly and effectively.*

**Outcome #1. Communicate in the scientific tradition**

- Component #1. Utilize scientific terminology correctly
- Component #2. Express the results of scientific work clearly and concisely
- Component #3 Explain the solutions to problems using correct mathematical vocabulary and mathematical notation

**Goal #3:** *Students will understand the basic principles of the biological sciences OR the physical sciences OR the mathematical sciences.*

**Outcome for Biology. Students will be able to describe the unifying principles of biology**

- Component #1. Explain similar/identical features of living systems
- Component #2. Explain biodiversity
- Component #3. Describe the cellular and molecular basis of genetics

**Outcome for the Physical Sciences. Students will understand phenomena that govern the physical universe**

- Component #1. Explain the relationship between the structure of substances and their physical properties and reactivity at the molecular and atomic levels
- Component #2. Explain the interaction of the forces of nature, such as electromagnetism, gravity, and nuclear forces

Component #3. Explain the unifying principle of plate tectonics and how it relates to the origin of Earth's physical phenomena, including rocks, volcanoes, and earthquakes

**Outcome for the Mathematical Sciences. Students will be able to formulate and solve problems mathematically**

- Component #1. Perform algorithmic and logical procedures
- Component #2. Interpret the results of their computations
- Component #3. Use appropriate technology
- Component #4. Formulate an hypothesis and determine its validity

**III. Curriculum map** (where in curriculum student learning outcomes occur) [See attachment]

**IV. Assessment of student learning activities planned for the following academic year**

A. Learning outcome to be assessed.

The student learning outcome the faculty teaching students majoring in Biological and Physical Sciences plan to assess during the following academic year: **Goal # 1:** *Students will be able to reason scientifically*, **Outcome #2:** Apply mathematical techniques to analyze collected data using current technology.

B. Identify approximately when, where (e.g., in which courses), and how (i.e., through what activity) students will demonstrate their achievement of the outcome.

We will assess this outcome in three courses, BIOL-L 105, BIOL-L 364, and CHEM-C 125.

This will be assessed in Principles of Genetics (BIOL-L 364) and in Introduction to Biology (BIOL-L 105) during the spring 2007 semester. In L364, students will demonstrate their achievement of the outcome in a virtual exercise in which they will identify a DNA sequence through the online GENBANK database. In L105, student will demonstrate their achievement of the outcome in a laboratory experiment entitled "On DNA and Bacterial Plasmids." In both classes, students will have to submit a written report.

C. For each component of the outcome assessed, describe the performance characteristics or criteria necessary for successful achievement.

**Goal #1:** *Students will be able to reason scientifically.*

**Outcome #1. Understand the nature of scientific truth**

Component #1: Explain the role of data collection and analysis in the development of scientific knowledge.

Component	Performance criteria	Section of report
1. Collect meaningful data	Correct/incorrect	Results
2. Apply math techniques to analyze data...	Correct/incorrect	Results, Discussion
3. Apply statistical methods	Complete/incomplete	Results

Component #2: Explain the self-correcting nature of science.

Satisfactory

Unsatisfactory

**Outcome #2. Recognize relationships among variables tested in a scientific experiment**

Component #1. Collect meaningful data from an experiment

Satisfactory

Unsatisfactory

Component #2. Apply mathematical techniques to analyze collected data using current technology

Satisfactory

Unsatisfactory

Component #3. Apply statistical methods to evaluate experimental data

Satisfactory

Unsatisfactory

Component #4. Draw relevant conclusions from experimental results

Satisfactory

Unsatisfactory

**Goal #2:** *Students will communicate scientific ideas clearly and effectively.*

**Outcome #1. Communicate in the scientific tradition**

Component #1. Utilize scientific terminology correctly

Satisfactory

Unsatisfactory

Component #2. Express the results of scientific work clearly and concisely

Satisfactory

Unsatisfactory

Component #3. Explain the solutions to problems using correct mathematical vocabulary and mathematical notation

Satisfactory

Unsatisfactory

**Goal #3:** *Students will understand the basic principles of the biological sciences OR the physical sciences OR the mathematical sciences.*

**Outcome for Biology. Students will be able to describe the unifying principles of biology**

Component #1. Explain similar/identical features of living systems

Satisfactory

Unsatisfactory

Component #2. Explain biodiversity

Satisfactory

Unsatisfactory

Component #3. Describe the cellular and molecular basis of genetics

Satisfactory

Unsatisfactory

**Outcome for the Physical Sciences. Students will understand phenomena that govern the physical universe**

Component #1. Explain the relationship between the structure of substances and their physical properties and reactivity at the molecular and atomic levels

Satisfactory

Unsatisfactory

Component #2. Explain the interaction of the forces of nature, such as electromagnetism, gravity, and nuclear forces

Satisfactory

Unsatisfactory

Component #3. Explain the unifying principle of plate tectonics and how it relates to the origin of Earth's physical phenomena, including rocks, volcanoes, and earthquakes

Satisfactory

Unsatisfactory

**Outcome for the Mathematical Sciences. Students will be able to formulate and solve problems mathematically**

Component #1. Perform algorithmic and logical procedures

Satisfactory

Unsatisfactory

Component #2. Interpret the results of their computations

Satisfactory

Unsatisfactory

Component #3. Use appropriate technology

Satisfactory

Unsatisfactory

Component #4. Formulate an hypothesis and determine its validity

Satisfactory

Unsatisfactory

D. Indicate a benchmark, that is what level of performance will be considered acceptable (e.g., 85% of students will demonstrate satisfactory achievement of this outcome).

Our benchmark for acceptable achievement of these outcome components is that 70% of the students will perform satisfactorily.

**V. Ongoing Assessment**

A. Describe the status of your larger program assessment plan (primarily sections II and III)

The assessment plan is complete but has not been implemented.

B. If incomplete, give an estimated time line for completing the plan.

Not applicable

C. Describe any resources (e.g., training materials) that would be helpful to you in carrying out your planned assessment activities.

Monies to pay for standardized testing (Major Field Assessment Test in Biology, American Chemical Society standardized exams for CHEM-C 106 and CHEM-C 101) would be helpful.

**Curriculum Map**  
**12/01/06**

<i>Goal</i>	<i>Outcome</i>	<i>Component</i>	<i>Courses in which Outcome is INTRODUCED</i>	<i>Courses in which Outcome is EXPANDED</i>	<i>Courses in which Outcome is REINFORCED</i>
#1: Students will be able to reason scientifically	#1. Understand the nature of scientific truth	#1. Explain the role of data collection and analysis in the development of scientific knowledge	CHEM-C 105 PHYS-P 100 PHYS-P 201	CHEM-C 106 PHYS-P 202	
		#2. Explain the self-correcting nature of science	CHEM-C 105	CHEM-C 106	
	#2. Recognize relationships among variables tested in a scientific experiment	#1. Collect meaningful data from an experiment	CHEM-C 125 PHYS-P 100 PHYS-P 201	CHEM-C 126 PHYS-P 202	
		#2. Apply mathematical techniques to analyze collected data using current technology	CHEM-C 211		
		#3. Apply statistical methods to evaluate experimental data	CHEM-C 211		
		#4. Draw relevant conclusions from experimental results	CHEM-C 125	CHEM-C 126	
#2: Students will communicate scientific ideas clearly and effectively.	#1. Communicate in the scientific tradition	#1: Utilize scientific terminology correctly	CHEM-C 105	CHEM-C 126	
		#2: Express the results of scientific work clearly and concisely	CHEM-C 125	CHEM-C 126	
#3: Students will understand the basic principles of the biological sciences <b>OR</b> the physical sciences <b>OR</b> the mathematical sciences.	Biological Sciences: Describe the unifying principles of biology	#1. Explain similar/identical features of living systems	BIOL-L 105; ZOOL-Z 315		
		#2. Explain biodiversity	BIOL-L 105	ZOOL-Z 315	
		#3. Describe the cellular and molecular basis of genetics	BIOL-L 105		
	Physical Sciences: Understand phenomena that govern the physical universe	#1. Explain the relationship between the structure of substances and their physical properties and reactivity at the molecular and atomic levels	CHEM-C 105 PHYS-P 100, 202	CHEM-C 106, 210	
		#2. Explain the interaction of the forces of nature, such as electromagnetism, gravity, and nuclear forces	PHYS-P 100	PHYS-P 201/202	
		#3. Explain the unifying principle of plate tectonics and how it relates to the origin			

		of Earth's physical phenomena, including rocks, volcanoes, and earthquakes			
	Mathematical Sciences: Formulate and solve problems mathematically	#1. Perform algorithmic and logical procedures	MATH-M 215	MATH-M216, M311, M303, M313, M360, M366, T336, M403, M413, M415, M447, M471	MATH-M414, M448, M472
		#2. Interpret the results of their computations			
		#3. Use appropriate technology	MATH-M215	MATH-M216, M311, M303, M313, M360, M447, M471	MATH-M366, M448, M472
		#4. Formulate an hypothesis and determine its validity	MATH-M303, T336	MATH-M402, M413, M447	MATH-M404, M414, N448