

**HONORS BIOLOGY**  
**1<sup>st</sup> Quarter**  
**Benchmark Blueprint**

**Strand 1: Inquiry Process**

Inquiry Process establishes the basis for students' learning in science. Students use scientific processes: questioning, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, and communicating results.

<b>CONCEPT</b>	<b>HONORS GOALS</b>	<b>PERFORMANCE OBJECTIVE</b>	<b>ASSESSMENT</b>
<p><b>Concept 1: Observations, Questions, and Hypotheses</b>            Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	PO 1. Evaluate scientific information for relevance to a given problem.	
		PO 2. Develop questions from observations that transition into testable hypotheses.	
		PO 3. Formulate a testable hypothesis.	
		PO 4. Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring).	

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CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<p><b>Concept 2: Scientific Testing (Investigating and Modeling)</b>            Design and conduct controlled investigations.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p> <p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.            B. Demonstrate care and use of appropriate technology and equipment.            C. Collaboration and Communication as applied to experimentation.</p>	<p>PO 1. Demonstrate safe and ethical procedures (e.g., use and care of technology, materials, organisms) and behavior in all science inquiry.</p> <p>PO 2. Identify the resources needed to conduct an investigation.</p> <p>PO 3. Design an appropriate protocol (written plan of action) for testing a hypothesis:</p> <ul style="list-style-type: none"> <li>• Identify dependent and independent variables in a controlled investigation.</li> <li>• Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes).</li> <li>• Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/calculators).</li> </ul>	

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		PO 4H. Present student research in a public format (i.e., science fair, symposium, classroom presentations)	
		PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.	

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<p><b>Concept 3: Analysis, Conclusions, and Refinements</b>            Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p>	<p>PO 1. Interpret data that show a variety of possible relationships between variables, including:</p> <ul style="list-style-type: none"> <li>• positive relationship</li> <li>• negative relationship</li> <li>• no relationship</li> </ul>	
	<p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.</p>	<p>PO 2. Evaluate whether investigational data support or do not support the proposed hypothesis.</p>	
	<p>B. Demonstrate care and use of appropriate technology and equipment.</p>	<p>PO 3. Critique reports of scientific studies (e.g., published papers, student reports).</p>	
	<p>C. Collaboration and Communication as applied to experimentation</p> <p><b>Goal 4: Scientific Reading and Research</b>            A. Use of scientific journals and articles to acquire content.</p>	<p>PO 4. Evaluate the design of an investigation to identify possible sources of procedural error, including:</p> <ul style="list-style-type: none"> <li>• sample size</li> <li>• trials</li> <li>• controls</li> <li>• analyses</li> </ul>	

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<p><b>Concept 3: Analysis, Conclusions, and Refinements</b>            Evaluate experimental design, analyze data to explain results and propose further investigations.            Design models.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 5. Design models (conceptual or physical) of the following to represent "real world" scenarios:</p> <ul style="list-style-type: none"> <li>• carbon cycle</li> <li>• water cycle</li> <li>• phase change</li> <li>• collisions</li> </ul>	
		<p>PO 5H. Design models (conceptual or physical) of the following to represent "real world" scenarios:</p> <ul style="list-style-type: none"> <li>• nitrogen cycle</li> </ul>	
		<p>PO 6. Use descriptive statistics to analyze data, including:</p> <ul style="list-style-type: none"> <li>• mean</li> <li>• frequency</li> <li>• range</li> </ul> <p>(See MHS-S2C1-10)</p>	
		<p>PO 7. Propose further investigations based on the findings of a conducted investigation.</p>	

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<p><b>Concept 4: Communication</b>            Communicate results of investigations.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p>	<p>PO 1. For a specific investigation, choose an appropriate method for communicating the results.</p>	
		<p>PO 2. Produce graphs that communicate data.            (See MHS-S2C1-02)</p>	
	<p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.</p>	<p>PO 2H. Produce graphs that communicate data in a lab report format aligned with AP College Board criteria.</p>	
	<p>B. Demonstrate care and use of appropriate technology and equipment.</p>	<p>PO 3. Communicate results clearly and logically.</p>	
	<p>C. Collaboration and Communication as applied to experimentation</p>	<p>PO 3H. Communicate results clearly and logically in a lab report format aligned with AP College Board criteria.</p>	
	<p><b>Goal 4: Scientific Reading and Research</b>            A. Use of scientific journals and articles to acquire content.</p>	<p>PO 4. Support conclusions with logical scientific arguments.</p>	
		<p>PO 4H Support conclusions with logical scientific arguments in a lab report format aligned with AP College Board criteria.</p>	

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**Strand 3: Science in Personal and Social Perspectives**

Science in Personal and Social Perspectives emphasizes developing the ability to design a solution to a problem, to understand the relationship between science and technology, and the ways people are involved in both. Students understand the impact of science and technology on human activity and the environment. This strand affords students the opportunity to understand their place in the world – as living creatures, consumers, decision makers, problem solvers, managers, and planners.

<b>CONCEPT</b>	<b>HONORS GOALS</b>	<b>PERFORMANCE OBJECTIVE</b>	<b>ASSESSMENT</b>
<p><b>Concept 2: Science and Technology in Society</b>            Develop viable solutions to a need or problem.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 1. Analyze the costs, benefits, and risks of various ways of dealing with the following needs or problems:</p> <ul style="list-style-type: none"> <li>• various forms of alternative energy</li> <li>• storage of nuclear waste</li> <li>• abandoned mines</li> <li>• greenhouse gases</li> <li>• hazardous wastes</li> </ul>	
		<p>PO 2. Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology.</p>	
		<p>PO 3. Support a position on a science or technology issue.</p>	

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<p><b>Concept 2: Science and Technology in Society</b>            Develop viable solutions to a need or problem.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p>	<p>PO 4. Analyze the use of renewable and nonrenewable resources in Arizona:</p> <ul style="list-style-type: none"> <li>• water</li> <li>• land</li> <li>• soil</li> <li>• minerals</li> <li>• air</li> </ul>	
	<p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.             B. Demonstrate care and use of appropriate technology and equipment.             C. Collaboration and Communication as applied to experimentation</p>	<p>PO 5. Evaluate methods used to manage natural resources (e.g., reintroduction of wildlife, fire ecology).</p>	

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CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<b>Concept 1: The Cell</b> Understand the role of the cell and cellular processes.	<b>Goal 1: Problem Solving/Reasoning Skills</b> A. Predicting outcomes based on observed events, data analysis and/or background knowledge.  B. Formulating concepts based on observations, making distinctions, and forming generalizations  C. Making inferences based on data interpretation or observations to imply a given concept(s).  D. Analysis of events based on an examination of the data and application of background knowledge  E. Making connections between cause/effect variables.	PO 1. Describe the role of energy in cellular growth, development, and repair.	
		PO 2. Compare the form and function of prokaryotic and eukaryotic cells and their cellular components.	
		PO 3. Explain the importance of water to cells.	
		PO 4. Analyze mechanisms of transport of materials (e.g., water, ions, macromolecules) into and out of cells: <ul style="list-style-type: none"> <li>• passive transport</li> <li>• active transport</li> </ul>	
		PO 5. Describe the purposes and processes of cellular reproduction.	
		PO 5H Explain the role of protein pumps and ATP in active transport across membranes.	

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<b>CONCEPT</b>	<b>Honors Goals</b>	<b>PERFORMANCE OBJECTIVE</b>	<b>ASSESSMENT</b>
<p><b>Concept 1: Changes in Environments</b>  Describe the interactions between human populations, natural hazards, and the environment.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 1. Evaluate how the processes of natural ecosystems affect, and are affected by, humans.</p>	
		<p>PO 2. Describe the environmental effects of the following natural and/or human-caused hazards:</p> <ul style="list-style-type: none"> <li>• flooding</li> <li>• drought</li> <li>• earthquakes</li> <li>• fires</li> <li>• pollution</li> <li>• extreme weather</li> </ul>	
		<p>PO 3. Assess how human activities (e.g., clear cutting, water management, tree thinning) can affect the potential for hazards.</p>	
		<p>PO 4. Evaluate the following factors that affect the quality of the environment:</p> <ul style="list-style-type: none"> <li>• urban development</li> <li>• smoke</li> <li>• volcanic dust</li> </ul>	
		<p>PO 5. Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity.</p>	

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<p><b>Concept 3: Human Population Characteristics</b>            Analyze factors that affect human populations.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p>	<p>PO 1. Analyze social factors that limit the growth of a human population, including:</p> <ul style="list-style-type: none"> <li>• affluence</li> <li>• education</li> <li>• access to health care</li> <li>• cultural influences</li> </ul>	
	<p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.</p>	<p>PO 2. Describe biotic (living) and abiotic (nonliving) factors that affect human populations.</p>	
	<p>B. Demonstrate care and use of appropriate technology and equipment.</p>	<p>PO 3. Predict the effect of a change in a specific factor on a human population.</p>	
	<p>PO 3H. Draw a graph showing exponential growth, S-shaped growth or J-shaped growth.</p>		

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CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<p><b>Concept 2: Molecular Basis of Heredity</b>            Understand the molecular basis of heredity and resulting genetic diversity.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p> <p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.            B. Demonstrate care and use of appropriate technology and equipment.</p>	PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes.	
		PO 2. Describe the molecular basis of heredity, in viruses and living things, including DNA replication and protein synthesis.	
		PO 3. Explain how genotypic variation occurs and results in phenotypic diversity.	
		PO 4. Describe how meiosis and fertilization maintain genetic variation.	
		PO 4H. Conduct a biotechnology lab that will analyze DNA to determine evolutionary relationships	

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<p><b>Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems)</b>            Understand the organization of living systems, and the role of energy within those systems.</p>	<p><b>Goal 4: Scientific Reading and Research</b>            A. Use of scientific journals and articles to acquire content.</p>	PO 1. Compare the processes of photosynthesis and cellular respiration in terms of energy flow, reactants, and products.	
		PO 2. Describe the role of organic and inorganic chemicals (e.g., carbohydrates, proteins, lipids, nucleic acids, water, ATP) important to living things.	
		PO 3. Diagram the following biogeochemical cycles in an ecosystem: <ul style="list-style-type: none"> <li>• water</li> <li>• carbon</li> <li>• nitrogen</li> </ul>	
		PO 4. Diagram the energy flow in an ecosystem through a food chain.	
		PO 5. Describe the levels of organization of living things from cells, through tissues, organs, organ systems, organisms, populations, and communities to ecosystems.	

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**Strand 2: History and Nature of Science**

Scientific investigation grows from the contributions of many people. History and Nature of Science emphasizes the importance of the inclusion of historical perspectives and the advances that each new development brings to technology and human knowledge. This strand focuses on the human aspects of science and the role that scientists play in the development of various cultures.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<p><b>Concept 1: History of Science as a Human Endeavor</b> Identify individual, cultural, and technological contributions to scientific knowledge.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 1. Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.</p>	
		<p><i>PO 2. Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.</i></p>	
		<p>PO 3. Analyze how specific changes in science have affected society.</p>	
		<p>PO 4. Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.</p>	

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CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<p><b>Concept 2: Nature of Scientific Knowledge</b>            Understand how science is a process for generating knowledge.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p>	<p>PO 1. Specify the requirements of a valid, scientific explanation (theory), including that it be:</p> <ul style="list-style-type: none"> <li>• logical</li> <li>• subject to peer review</li> <li>• public</li> <li>• respectful of rules of evidence</li> </ul>	
		<p>PO 2. Explain the process by which accepted ideas are challenged or extended by scientific innovation.</p>	
	<p><b>Goal 3: Laboratory and Field Skills</b></p>	<p>PO 3. Distinguish between pure and applied science.</p>	
	<p>A. Actively design, implement and analyze information gained through laboratory experiments.</p> <p>B. Demonstrate care and use of appropriate technology and equipment.</p>	<p>PO 4. Describe how scientists continue to investigate and critically analyze aspects of theories.</p>	

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CONCEPT	Honors Goals	PERFORMANCE OBJECTIVE	ASSESSMENT
<b>Concept 3: Interdependence of Organisms</b> Analyze the relationships among various organisms and their environment.	<b>Goal 1: Problem Solving/Reasoning Skills</b> A. Predicting outcomes based on observed events, data analysis and/or background knowledge.  B. Formulating concepts based on observations, making distinctions, and forming generalizations  C. Making inferences based on data interpretation or observations to imply a given concept(s)	PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes.	
		PO 2. Describe how organisms are influenced by a particular combination of biotic (living) and abiotic (nonliving) factors in an environment.	
		PO 3. Assess how the size and the rate of growth of a population are determined by birth rate, death rate, immigration, emigration, and carrying capacity of the environment.	

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	<p>concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 3H. Perform one method of random sampling used to compare the population numbers of two plant species, based on quadratic methods.</p>	
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<p><b>Concept 4: Biological Evolution</b>            Understand the scientific principles and processes involved in biological evolution.</p>	<p><b>Goal 2: Mastery of Mathematical Skills</b>            A. Construct and interpret graphs related to data collected and analyzed.</p> <p><b>Goal 3: Laboratory and Field Skills</b>            A. Actively design, implement and analyze information gained through laboratory experiments.</p> <p>B. Demonstrate care and use of appropriate technology and equipment.</p>	<p>PO 1. Identify the following components of natural selection, which can lead to speciation:</p> <ul style="list-style-type: none"> <li>• potential for a species to increase its numbers</li> <li>• genetic variability and inheritance of offspring due to mutation and recombination of genes</li> <li>• finite supply of resources required for life</li> <li>• selection by the environment of those offspring better able to survive and produce offspring</li> </ul>	
		<p>PO 2. Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.</p>	
		<p>PO 3. Describe how the continuing operation of natural selection underlies a population's ability to adapt to changes in the environment and leads to biodiversity and the origin of new species.</p>	

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<p><b>Concept 4: Biological Evolution</b> Understand the scientific principles and processes involved in biological evolution.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	<p>PO 4. Predict how a change in an environmental factor (e.g., rainfall, habitat loss, non-native species) can affect the number and diversity of species in an ecosystem.</p>	
		<p>PO 5. Analyze how patterns in the fossil record, nuclear chemistry, geology, molecular biology, and geographical distribution give support to the theory of organic evolution through natural selection over billions of years and the resulting present day biodiversity.</p>	
		<p>PO 6. Analyze, using a biological classification system (i.e., cladistics, phylogeny, morphology, DNA analysis), the degree of relatedness among various species.</p>	

**HONORS BIOLOGY**  
**4<sup>th</sup> Quarter**  
**Benchmark Blueprint**

**Strand 4: Life Science**

Life Science expands students' biological understanding of life by focusing on the characteristics of living things, the diversity of life, and how organisms and populations change over time in terms of biological adaptation and genetics. This understanding includes the relationship of structures to their functions and life cycles, interrelationships of matter and energy in living organisms, and the interactions of living organisms with their environment.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<p><b>Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems)</b>            Understand the organization of living systems, and the role of energy within those systems.</p>	<p><b>Goal 1: Problem Solving/Reasoning Skills</b></p> <p>A. Predicting outcomes based on observed events, data analysis and/or background knowledge.</p> <p>B. Formulating concepts based on observations, making distinctions, and forming generalizations</p> <p>C. Making inferences based on data interpretation or observations to imply a given concept(s).</p> <p>D. Analysis of events based on an examination of the data and application of background knowledge</p> <p>E. Making connections between cause/effect variables.</p>	PO 1H. Identify major vertebrate anatomical systems via dissection (Systems of focus: digestive, excretory, cardiovascular, respiratory and reproductive)	
		PO 2H. Describe structure and function relationships for the following stages of food processing: <ul style="list-style-type: none"> <li>• Ingestion</li> <li>• Digestion</li> <li>• Absorption</li> <li>• Elimination</li> </ul>	
		PO 3H. Identify the structure and function of each part of the kidney in relation to regulating blood osmolarity.	
		PO 4H. Evaluate Loop of Henle adaptations in regards to water conservation in various species.	

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CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVE	ASSESSMENT
<b>Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems)</b> Understand the organization of living systems, and the role of energy within those systems.	<b>Goal 2: Mastery of Mathematical Skills</b> A. Construct and interpret graphs related to data collected and analyzed.  <b>Goal 3: Laboratory and Field Skills</b> A. Actively design, implement and analyze information gained through laboratory experiments.  B. Demonstrate care and use of appropriate technology and equipment.  C. Collaboration and Communication as applied to experimentation  <b>Goal 4: Scientific Reading and Research</b> A. Use of scientific journals and articles to acquire content.	PO 6H. Identify the pathway of blood through the various structure of the heart, body and lungs	
		PO 7H. Describe how the respiratory and cardiovascular systems work together to maintain oxygen and carbon dioxide levels in the blood	