

HONORS PHYSICS
Semester One
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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.</p> <p>Goal 2: Experimentation Skills A. Engagement in original scientific research.</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).	
		PO 4H Solve quantitative problems using math models without a calculator with a reasonable degree of accuracy	

HONORS PHYSICS
Semester One
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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.</p> <p>Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.</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"> • Identify dependent and independent variables in a controlled investigation. • Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes). • Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/calculators). 	

HONORS PHYSICS
Semester One
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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.	Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.	PO 4. Conduct a scientific investigation that is based on a research design.	
		PO 4H. Present student research in a public format (i.e., science fair, symposium, classroom presentations)	
	Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.	PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.	

HONORS PHYSICS
Semester One
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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 3: Analysis, Conclusions, and Refinements Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value.</p>	<p><i>PO 1. Interpret data that show a variety of possible relationships between variables, including:</i></p> <ul style="list-style-type: none"> • <i>positive relationship</i> • <i>negative relationship</i> • <i>no relationship</i> 	
		<p>PO 2. Evaluate whether investigational data support or do not support the proposed hypothesis.</p>	
	<p>PO 3. Critique reports of scientific studies (e.g., published papers, student reports).</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"> • sample size • trials • controls • analyses 		
<p>Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.</p>			

HONORS PHYSICS
Semester One
Benchmark Blueprint

Strand 1: Inquiry Process			
<p>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.</p>			
CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 3: Analysis, Conclusions, and Refinements Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure. Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.</p>	PO 5. Design models (conceptual or physical) of the following to represent "real world" scenarios: <ul style="list-style-type: none"> • carbon cycle • water cycle • phase change • collisions 	
		PO 6. Use descriptive statistics to analyze data, including: <ul style="list-style-type: none"> • mean • frequency • range (See MHS-S2C1-10)	
		PO 7. Propose further investigations based on the findings of a conducted investigation.	
		PO 7H Combine units when applying a mathematical model	
		PO 8H Simplify units when applying a mathematical model.	
		PO 9H Algebraically manipulate a mathematical model to solve for a desired variable.	
		PO 10H Analyze the effect of changes in one variable on other parts of the model	

HONORS PHYSICS
Semester One
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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
Concept 4: Communication Communicate results of investigations.	Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure. Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.	PO 1. For a specific investigation, choose an appropriate method for communicating the results.	
		PO 2. Produce graphs that communicate data. (See MHS-S2C1-02)	
		PO 3. Communicate results clearly and logically.	
		PO 4. Support conclusions with logical scientific arguments.	

HONORS PHYSICS
Semester One
Benchmark Blueprint

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 OBJECTIVES	ASSESSMENT
<p>Concept 1: History of Science as a Human Endeavor Identify individual, cultural, and technological contributions to scientific knowledge.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.</p> <p>Goal 2: Laboratory and Field Skills A. Engagement in original scientific research.</p>	PO 1. Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.	
		<i>PO 2. Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.</i>	
		PO 3. Analyze how specific changes in science have affected society.	
		PO 4. Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

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 OBJECTIVES	ASSESSMENT
<p>Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.</p> <p>Goal 2: Experimentation Skills A. Engagement in original scientific research.</p>	<p>PO 1. Specify the requirements of a valid, scientific explanation (theory), including that it be:</p> <ul style="list-style-type: none"> • logical • subject to peer review • public • respectful of rules of evidence 	
		<p>PO 2. Explain the process by which accepted ideas are challenged or extended by scientific innovation.</p>	
		<p>PO 3. Distinguish between pure and applied science.</p>	
		<p>PO 4. Describe how scientists continue to investigate and critically analyze aspects of theories.</p>	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

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.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 2: Science and Technology in Society Develop viable solutions to a need or problem.</p>	<p>Goal 1: Mastery of Mathematical Skills A. Estimate values for problem solving and checking reasonability of final value. B. Utilize algebraic manipulation of models and units of measure.</p> <p>Goal 2: Experimentation Skills A. Engagement in original scientific research.</p>	PO 2. Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology.	
		PO 3. Support a position on a science or technology issue.	
<p>Concept 3: Human Population Characteristics Analyze factors that affect human populations.</p>		PO 3. Predict the effect of a change in a specific factor on a human population.	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 2: Motions and Forces Analyze relationships between forces and motion.</p>	<p style="text-align: center;">Goal 3: Problem-Solving/Reasoning Skills</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>	PO 1. Determine the rate of change of a quantity (e.g., rate of erosion, rate of reaction, rate of growth, velocity).	
		PO 2. Analyze the relationships among position, velocity, acceleration, and time: <ul style="list-style-type: none"> • graphically • mathematically 	
		PO 3. Explain how Newton's 1 st Law applies to objects at rest or moving at constant velocity.	
		PO 4. Using Newton's 2 nd Law of Motion, analyze the relationships among the net force acting on a body, the mass of the body, and the resulting acceleration: <ul style="list-style-type: none"> • graphically • mathematically 	
		PO 5. Use Newton's 3 rd Law to explain forces as interactions between bodies (e.g., a table pushing up on a vase that is pushing down on it; an athlete pushing on a basketball as the ball pushes back on her).	
		PO 6. Analyze the two-dimensional motion of objects by using vectors and their components.	
		PO 7. Give an example that shows the independence of the horizontal and vertical components of projectile motion.	
		PO 8. Analyze the general relationships among force, acceleration, and motion for an object undergoing uniform circular motion.	
		PO 9. Represent the force conditions required to maintain static equilibrium.	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 2: Motions and Forces Analyze relationships between forces and motion.</p>	<p style="text-align: center;">Goal 3: Problem-Solving/Reasoning Skills</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>	PO 10. Describe the nature and magnitude of frictional forces.	
		PO 11. Using the Law of Universal Gravitation, predict how the gravitational force will change when the distance between two masses changes or the mass of one of them changes.	
		PO 12. Using Coulomb's Law, predict how the electrical force will change when the distance between two point charges changes or the charge of one of them changes.	
		PO 13. Analyze the impulse required to produce a change in momentum.	
		PO 14. Quantify interactions between objects to show that the total momentum is conserved in both collision and recoil situations	
		PO15H Apply Newton's 2 nd Law to objects traveling in a uniform circular path <ul style="list-style-type: none"> • Centripetal accelerations versus radius • Centripetal acceleration versus velocity 	
		PO 16H Combine Universal Gravitation and Uniform Circular Motion to predict circular orbit characteristics.	
		PO 17H Predict the effect of changing the physical parameters of a pendulum (mass, length, amplitude) on the period.	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 3: Conservation of Energy and Increase in Disorder Understand ways that energy is conserved, stored, and transferred.</p>	<p style="text-align: center;">Goal 3: Problem-Solving/Reasoning Skills</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>PO 1. Describe the following ways in which energy is stored in a system:</p> <ul style="list-style-type: none"> • mechanical • electrical • chemical • nuclear 	
		<p>PO 2. Describe various ways in which energy is transferred from one system to another (e.g., mechanical contact, thermal conduction, electromagnetic radiation.)</p>	
		<p>PO 3. Recognize that energy is conserved in a closed system .</p>	
		<p>PO 4. Calculate quantitative relationships associated with the conservation of energy.</p>	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 5: Interactions of Energy and Matter Understand the interactions of energy and matter</p>	<p style="text-align: center;">Goal 3: Problem-Solving/Reasoning Skills</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>PO 2. Describe the following characteristics of waves:</p> <ul style="list-style-type: none"> • wavelength • frequency • period • amplitude 	
		<p>PO 3. Quantify the relationships among the frequency, wavelength, and the speed of light.</p>	
		<p>PO 8. Describe the relationship among electric potential, current, and resistance in an ohmic system.</p>	
		<p>PO 9. Quantify the relationships among electric potential, current, and resistance in an ohmic system.</p>	

HONORS PHYSICS
Semester Two
Benchmark Blueprint

Strand 5: Physical Science

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy, including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

CONCEPT	HONORS GOALS	PERFORMANCE OBJECTIVES	ASSESSMENT
<p>Concept 5: Interactions of Energy and Matter Understand the interactions of energy and matter</p>	<p>Goal 3: Problem-Solving/Reasoning Skills</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>PO 10H Describe the characteristics of an object undergoing simple harmonic motion (mass on a spring)</p> <ul style="list-style-type: none"> • Amplitude • Frequency • Period • Spring constant • Force • Kinematics • Energy 	
		<p>PO 11H Describe the relationship between simple harmonic motion and mechanical waves.</p>	