



monarch

Curriculum Catalog

Physics

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Physics Course Overview

Physics is intended to expose students to the design and order in the world that God has created. In preceding years, students should have developed a basic understanding of the macroscopic and microscopic world of forces, motion, waves, light, and electricity. The physics course will expand upon that prior knowledge and further develop both. The curriculum will also seek to teach the symbolic and mathematical world of formulas and symbols used in physics. The major concepts covered are kinematics, forces and motion, work and energy, sound and light waves, electricity and magnetism, and nuclear physics.

Students at this level should show development in their ability and understanding of scientific inquiry. The units contain experiments and projects that seek to develop a deeper conceptual meaning for the student and actively engage the student. The continued exposure of science concepts and scientific inquiry will serve to improve the student's skill and understanding.

Physics should be preceded by Algebra I and II courses and geometry.

- **Kinematics:** Students will learn to use scalars and vectors to visualize and calculate concepts of motion.
- **Dynamics:** Students will articulate Newton's and Kepler's laws of motion.
- **Work and Energy:** Students will demonstrate an understanding of how energy is transferred and changed from one form to another.
- **Introduction to Waves:** Students will describe wave characteristics such as amplitude, velocity, wavelength, and frequency.
- **Light:** Students will describe phenomena that characterize light as a wave and phenomena that characterize it as a particle.
- **Static Electricity:** Students will understand that all electric charges produce an electric field around them
- **Electric Currents:** Students will apply and solve problems using Ohm's Law and Watt's Law for both series and parallel circuits.
- **Magnetism:** Students will describe the relationship between magnetism and electricity.
- **Atomic and Nuclear Physics:** Students will acquire a general understanding of atomic theory, including fusion and fission.

Unit 1: Kinematics		
Assignments		
Physics	1. Course Overview	11. Acceleration and Acceleration Due to Gravity
	2. Introduction to the Language of Physics	12. Experiment: Determining Reaction Time
	3. Experiment: Making a Soda Straw Balance	13. Quiz 4: Acceleration and Acceleration Due to Gravity
	4. Experiment: Making a Simple Model of the Solar System	14. Vectors
	5. Quiz 1: Measurements	15. Projectiles
	6. Scalars and Vectors	16. Quiz 5: Review
	7. Quiz 2: Scalars and Vectors	17. Special Project*
	8. Speed and Velocity	18. Review Game
	9. Project: Tutorial for Making a Scatter Plot Using an Electronic Spreadsheet Program*	19. Test
	10. Quiz 3: Speed and Velocity	20. Alternate Test*
		21. Reference

Unit 2: Dynamics		
Assignments		
Physics	1. Newton's First and Second Laws	13. Experiment: Collisions
	2. Report: Isaac Newton	14. Quiz 4
	3. Quiz 1	15. Kepler's Laws of Planetary Motion
	4. Project: Virtual Lab - Newton's Laws	16. Report: Solar System
	5. Gravity	17. Experiment: Kepler's Law
	6. Quiz 2	18. Quiz 5
	7. Uniform Circular Motion	19. Special Project
	8. Project: Virtual Lab - Circular Motion	20. Review Game
	9. Experiment: Circular Motion	21. Test
	10. Quiz 3	22. Alternate Test
	11. Newton's Third Law and Conservation of Momentum	23. Reference
	12. Project: Virtual Lab - Conservation of Momentum	

Unit 3: Work and Energy		
Assignments		
Physics	1. Work, Kinetic, and Potential Energy	11. Latent Heat
	2. Report: Nuclear Energy*	12. Experiment: Latent Heat*
	3. Quiz 1	13. Laws of Thermodynamics
	4. Conservation of Energy	14. Quiz 3
	5. Power and Efficiency	15. Special Project*
	6. Project: Virtual Lab- Simple Machines	16. Review Game
	7. Experiment: Simple Machines	17. Test
	8. Quiz 2	18. Alternate Test*
	9. Project: Virtual Lab- Projectiles	19. Reference
	10. Heat Energy	

Unit 4: Introduction to Waves		
Assignments		
Physics	1. Characteristics of Waves	10. Project: Virtual Lab- Sound
	2. Experiment: Wave Speeds	11. Project: Virtual Lab- Doppler Effect
	3. Experiment: Pulses*	12. Experiment: Doppler Effect*
	4. Quiz 1	13. Quiz 3
	5. Wave Phenomena	14. Special Project*
	6. Experiment: Waves	15. Review Game
	7. Experiment: Bending Waves*	16. Test
	8. Quiz 2	17. Alternate Test*
	9. Sound Waves	18. Reference

Unit 5: Light		
Assignments		
Physics	1. Speed of Light: Historical Calculations	10. Light Phenomena and Models of Light
	2. Properties of Light	11. Project: Virtual Lab- Light
	3. Experiment: Light Angles	12. Experiment: Light Observations*
	4. Experiment: Water Refraction*	13. Quiz 3
	5. Quiz 1	14. Special Project*
	6. Mirrors	15. Review Game
	7. Experiment: Convergence	16. Test
	8. Lenses	17. Alternate Test*
	9. Quiz 2	18. Reference

Unit 6: Semester Review and Exam	
Physics	Assignments
	1. Review
	2. Exam

Unit 7: Static Electricity	
Physics	Assignments
	1. Electric Charges
	2. Coulomb's Law
	3. Experiment: Static Electricity*
	4. The Transfer of Charges
	5. Quiz 1
	6. Electric Fields
	7. Quiz 2
	8. Electric Potential
	9. Potential and Energy
	10. Quiz 3
	11. Special Project*
	12. Review Game
	13. Test
	14. Alternate Test*
15. Reference	

Unit 8: Electric Currents	
Physics	Assignments
	1. Sources of EMF
	2. Project: Research and Report*
	3. Fluid Flow
	4. Quiz 1
	5. Resistance
	6. Quiz 2
	7. Ohm's Law
	8. Circuits
	9. Project: Virtual Lab- Circuits
	10. Quiz 3
	11. Special Project*
	12. Review Game
	13. Test
	14. Alternate Test*
15. Reference	

Unit 9: Magnetism	
Physics	Assignments
	1. Fields and Forces
	2. Experiment: Magnetic Fields*
	3. Forces
	4. Quiz 1
	5. Electromagnetism
	6. Experiment: Induced Magnetic Fields*
	7. Electromagnetic Induction
	8. Quiz 2
	9. Electron Beams
	10. Quiz 3
	11. Special Project*
	12. Review Game
	13. Test
	14. Alternate Test*
15. Reference	

Unit 10: Atomic and Nuclear Physics	
Physics	Assignments
	1. Quantum Theory
	2. X-Rays, Matter Waves, and the Uncertainty Principle
	3. Quiz 1
	4. Early Atomic Models
	5. Report: Early Atomic Physics*
	6. Bohr Model
	7. Nuclear Theory
	8. Quiz 2
	9. Nuclear Reactions
	10. Fusion and Applications of Nuclear Energy
	11. Quiz 3
	12. Special Project*
	13. Review Game
	14. Test
	15. Alternate Test*
16. Reference	

Unit 11: Review		
Assignments		
Physics	1. Mechanics	12. Modern Physics
	2. Dynamics	13. The Bohr Atom
	3. Energy	14. Duality
	4. Quiz 1	15. Nuclear Energy
	5. Wave Motion	16. Quiz 4
	6. Light and Sound	17. Special Project*
	7. Quiz 2	18. Review Game
	8. Electricity and Magnetism	19. Test
	9. Fields and Forces	20. Alternate Test*
	10. Circuits	21. Reference
	11. Quiz 3	

Unit 12: Semester Review And Exam		
Assignments		
Physics	1. Review	3. Alternate Exam: Form A*
	2. Exam	4. Alternate Exam: Form B*

Unit 13: Final Exam		
Assignments		
Physics	1. Exam	3. Alternate Exam: Form B*
	2. Alternate Exam: Form A*	

(*) Indicates alternative assignment