

# FLINT RIVER ACADEMY SCIENCE STANDARDS

## PHYSICAL SCIENCE

### 1. Motion and Forces

- a. Compare and contrast vector quantities (i.e., displacement, velocity, acceleration force, linear momentum) and scalar quantities (i.e., distance, speed, energy, mass, work)
- b. Distinguish between displacement, distance, velocity, speed and acceleration. Solve problems involving displacement, distance, velocity, speed, and constant acceleration
- c. Create and interpret graphs of 1-dimensional motion, such as position vs. time, speed vs. time, velocity vs. time, and acceleration vs. time where acceleration is constant
- d. Interpret and apply Newton's three laws of motion
- e. Use a free-body force diagram to show forces acting on a system consisting of a pair of interacting objects. For a diagram with only co-linear forces, determine the net force acting on a system and between the objects
- f. Distinguish qualitatively between static and kinetic friction, and describe their effects on the motion of objects
- g. Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses and the distance between them
- h. Explain why the moon does not fall into the Earth
- i. Describe and explain for a projectile the changes in the horizontal and vertical components of its velocity
- j. Show the connection between a fast-moving projectile and an earth satellite
- k. Compare and contrast circular and elliptical orbits

### 2. Conservation of Energy and Momentum

- a. Interpret and provide examples that illustrate the law of conservation of energy
- b. Interpret and provide examples of how energy can be converted from gravitational potential energy to kinetic energy and vice versa
- c. Be able to calculate gravitational potential energy and kinetic energy of an object
- d. Recognize the source of all energy is the sun (except nuclear energy)
- e. Describe both qualitatively and quantitatively how work can be expressed as a change in mechanical energy (Energy – Work Theorem)
- f. Recognize when work is being done on an object. Be able to calculate the work being done on an object
- g. Describe both qualitatively and quantitatively the concept of power as work done per unit time
- h. State the Law of Conservation of Energy and relate it to how simple machines help us accomplish work

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- i. Provide and interpret examples showing that linear momentum is the product of mass and velocity, and is always conserved. Calculate the momentum in an object
- j. Recognize that impulse equals a change in momentum and give examples of how both size of the forces and the length of time interval affect the change in momentum
- k. Distinguish between inelastic and elastic collisions

### 3. Electromagnetism

- a. Describe electrical forces between objects
- b. Distinguish between an insulator and a conductor
- c. Develop qualitatively and quantitatively an understanding of current, voltage, resistance, and the connections between them (Ohm's Law)
- d. Analyze simple arrangements of electrical components in both series and parallel circuits. Recognize common symbols and their functions.
- e. Describe conceptually Coulomb's Law
- f. Explain how electric current is a flow of charge caused by a potential difference, and how high power is equal to current multiplied by voltage
- g. Compare and contrast series and parallel circuits with respect to current, voltage, and resistance.
- h. Compare and contrast AC and DC currents
- i. Describe the difference and similarities between magnetic poles and electric charges
- j. Describe the magnetic field produced by a current carrying wire and give examples of how the field can be made stronger
- k. Describe the conditions necessary for a magnetic field to exert a force on a charged particle in the field
- l. Describe how voltage is induced in a coil of wire

### 4. Waves

- a. Describe the measurable properties of waves and explain the relationships among them
- b. Distinguish between electromagnetic and mechanical waves
- c. Distinguish between the two types of mechanical waves, transverse and longitudinal
- d. Recognize that mechanical waves generally travel faster through solids and slower through gases
- e. Explain what happens to light striking a metal surface compared to glass or water
- f. Predict the path of reflected light striking a reflective surface
- g. Give examples of refractive sound waves and its effects
- h. Give examples of refracted light waves and its effects
- i. Distinguish between converging and diverging lenses
- j. Distinguish between a real image and a virtual image formed by a lens.

# FLINT RIVER ACADEMY SCIENCE STANDARDS

## Investigation and Experimentation

1. Make observations, raise questions and formulate hypotheses.
  - a. Observe the world from a scientific perspective
  - b. Pose questions and form hypotheses based on personal observations, scientific articles, experiments and knowledge
  - c. Read, interpret, and examine credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories
  - d. Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted
  
2. Design and conduct scientific investigations.
  - a. Articulate and explain the major concepts being investigated and the purpose of an investigation
  - b. Select required materials, equipment, and conditions for conducting an experiment
  - c. Identify independent and dependent variables
  - d. Write procedures that are clear and replicable
  - e. Employ appropriate methods for accurately and consistently making observations, making and recording measurements at appropriate levels of precision and collecting evidence or data in an organized way
  - f. Properly use instruments, equipment, and materials (scales, balances, meter sticks, probeware, microscopes, computers, etc...) including set up, calibration, technique, maintenance, and storage
  - g. Follow safety guidelines
  
3. Analyze and interpret results of scientific investigations.
  - a. Present relationships between and among variables in appropriate forms using charts, graphs, appropriate technology (graphing software) and other tools
  - b. Use mathematical operations to analyze and interpret data results
  - c. Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrollable conditions
  - d. Recognize, analyze, and evaluate alternative explanations for the same set of observations
  - e. Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis
  - f. State questions raised by an experiment that may require further investigation
  
4. Communicate and apply the results of scientific investigations.
  - a. Develop descriptions of explanations for scientific concepts that were a focus of one or more investigations
  - b. Review information, explain statistical analysis and summarize data collected and analyzed as the result of the investigation
  - c. Explain diagrams and charts that represent relationships between variables

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- d. Construct a reasoned argument and respond appropriately to critical comments and questions
- e. Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology and other tools to present findings
- f. Use and refine scientific models that stimulate physical processes or phenomena

### Application of Mathematical Skills

- a. Construct and use tables and graphs to interpret data sets
- b. Solve simple algebraic expressions
- c. Perform basic statistical procedures to analyze the center and spread of data
- d. Measure with accuracy and precision (length, volume, mass, temperature, time)
- e. Convert within a unit
- f. Use common prefixes such as milli, centi, and kilo
- g. Use scientific notation, where appropriate
- h. Use ratio and proportions to solve problems
- i. Translate data into the correct units and dimensions using conversion factors and scientific notation
- j. Determine the correct number of significant figures
- k. Determine percent error from experimental and accepted values
- l. Use appropriate metric/standard international (SI) units of measurement
- m. Use the Celsius and Kelvin scales

# FLINT RIVER ACADEMY SCIENCE STANDARDS

## Flint River Academy Physical Science

### Year Curriculum Map

Year Curriculum Map											
1 <sup>st</sup> Nine Weeks		2 <sup>nd</sup> Nine Weeks				3 <sup>rd</sup> Nine Weeks			4 <sup>th</sup> Nine Weeks		
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12
Graphing, Metric Conversions and Measurement	Newton's First Law of Motion and Vector Quantities	Newton's Second Law of Motion	Newton's Third Law of Motion	Universal Law of Gravity	Projectile and Satellite Motion	Law of Conservation of Momentum	Law of Conservation Energy, Work and Simple Machines	Electricity	Magnetic Fields	Waves Sound and Light	Optics
5 weeks	3 weeks	3 weeks	3 weeks	2 weeks	2 weeks	2 weeks	4 weeks	3 weeks	3 weeks	3 weeks	3 weeks