

**CRLS Science Learning Expectations
Physics Grade 9**

Physics First is a first year physics course for all freshmen at CRLS. It covers concepts in electricity, magnetism, waves, light, sound, mechanics, and energy. It prepares students for understanding interactions at an atomic and molecular level in Chemistry and gives students an understanding of the Laws of Conservation of Energy and Conservation of Mass, which are important in both Chemistry and Biology. This course develops students writing and problem solving skills.

| FIRST QUARTER | | | | |
|-----------------------------------|------------------------------|-----------------------------------|---|---|
| CRLS Learning Expectations | Mass Standard Physics | Topic/Theme | Key Understandings | Assessments/Evidence |
| | 5.1 5.2 5.3 | The nature of electricity. | Students will: Recognize the characteristics of static charge, and explain how a static charge is generated. Interpret and apply Coulomb's Law, conceptually. Explain the difference in concept between electric forces and electric fields. | Create a unit of measurement and make a poster to present it. |
| | 5.4 5.5 | Electricity is used in our homes. | Develop a qualitative and quantitative understanding of current, voltage, resistance, and power and the connection between them. Identify appropriate units of measurement for current, voltage, resistance, and power* and explain how they are measured. | |
| | 2.0 | The work of scientists. | Analyze circuits (find the current at any point and the potential difference between any two points in the circuit) using Kirchoff's and Ohm's laws. | Build and wire a model of a one-room living unit. |

SECOND QUARTER

| CRLS Learning Expectations | Mass Standard Physics | Topic/Theme | Key Understandings | Assessments/Evidence |
|-----------------------------------|------------------------------|---|---|--|
| | 4.1 | Sound and how is it produced. | Students will: Differentiate between wave motion and the motion of objects. | Design, build and demonstrate musical instrument |
| | 4.2 | Electricity and magnetism. | Recognize the measurable properties of waves (e.g., velocity, frequency, wavelength) and explain the relationships among them. | Begin Science Fair Project. |
| | 4.3 | Different types of electromagnetic radiation. | Distinguish between transverse and longitudinal waves. | |
| | 4.4 | | Distinguish between mechanical and electromagnetic waves. | |
| | 6.1 | | Describe the electromagnetic spectrum in terms of wavelength and energy and be able to identify specific regions such as visible light. | |
| | 6.2 | Explain how the various wavelengths in the electromagnetic spectrum have many useful applications such as radio, television, microwave appliances, etc. | | |
| | 6.4 | Recognize and explain the ways in which the direction of visible light can be changed. | | |

THIRD QUARTER

| CRLS Learning Expectations | Mass Standard Physics | Topic/Themes | Key Understandings | Assessments/Evidence |
|-----------------------------------|--|---|---|--|
| | <p>1.3</p> <p>1.3 – 1.6</p> <p>1.12</p> <p>1.6</p> <p>1.7</p> <p>1.10</p> <p>1.11</p> | <p>Physics tools we use to describe motion.</p> <p>Physics helps us to drive safely.</p> <p>Physics problems can be translated into math language and vice versa.</p> | <p>Students will:</p> <p>Distinguish between, and solve problems involving, velocity, speed and constant acceleration.</p> <p>Create and interpret graphs of motion (position vs. time, speed vs. time, velocity vs. time, constant acceleration vs. time).</p> <p>Explain the relationship between mass and inertia.</p> <p>Interpret and apply Newton’s first law of motion.</p> <p>Interpret and apply Newton’s second law of motion to show how an object’s motion will change only when a net force is applied.</p> <p>Interpret and apply Newton’s third law of motion.</p> <p>Understand conceptually Newton’s law of universal gravitation.</p> | <p>Report and poster display for Science Fair Project</p> <p>Letter to parents about what student has learned about driving safely</p> |

THIRD QUARTER

| CRLS Learning Expectations | Mass Standard Physics | Topic/Theme | Key Understandings | Assessments/Evidence |
|-----------------------------------|---|--|--|---|
| | 1.12 2.5 | Interpret the law of conservation of momentum and provide examples that illustrate it. | Students will: Identify appropriate standard international units of measurement for force, mass, distance, speed, acceleration time, and momentum and explain how they are measured. Interpret and provide examples that illustrate the law of conservation of energy. | Lab report and presentation for water wheels project. |

FOURTH QUARTER

| CRLS Learning Expectations | Mass Standard Physics | Topic/Theme | Key Understandings | Assessments/Evidence |
|-----------------------------------|--|---|--|--|
| | <p>2.2</p> <p>2.3</p> <p>4.0 (Technology/Engineering, p. 84)</p> | <p>Energy transfer.</p> <p>Can anything be 100% efficient?</p> <p>How can we use our energy resources wisely?</p> | <p>Provide examples of how energy can be transformed from kinetic to potential and vice versa.</p> <p>Apply quantitatively the law of conservation of mechanical energy to simple systems.</p> <p>Describe the relationship among energy, work, and power both conceptually and quantitatively.</p> <p>Identify appropriate standard international units of measurement for energy, work, power, and momentum.</p> | <p>Research paper on alternative energy resources.</p> |