

CURRICULUM

GUIDE

Physics

Providence
Schools

QUARTER I

Content students have to learn

Processes students will learn and use

Unit 1.1 – Kinematics: One-Dimensional Motion (18 days)

- Understand the mathematical relationships between speed, velocity, acceleration, distance, and time for an object in motion.
- Model, illustrate, and describe one-dimensional motion.
- Collect and use quantitative data to make predictions about the motion of an object.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
- » Organize, analyze, evaluate, make inferences, and predict trends from any data source.
- » Communicate valid conclusions supported by data.

Unit 1.2 – Kinematics: Two-Dimensional Motion (11 days)

- Understand the mathematical relationships between speed, velocity, acceleration, distance, and time for an object in motion.
- Model, illustrate, and describe twodimensional motion.
- Collect and use quantitative data to make predictions about the motion of an object.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
- » Organize, analyze, evaluate, make inferences, and predict trends from any data source.
- » Communicate valid conclusions supported by data.

Unit 1.3 – Forces and Equilibrium (11 days)

- Understand that there are multiple methods for finding a resultant vector.
- Know how to use and construct a free-body diagram.
- Understand the similarities and differences between types of forces.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
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QUARTER 2

Content students have to learn

Processes students will learn and use

Unit 2.1 – Introduction to Newton’s Laws

(9 days)

- Recognize everyday examples of Newton’s laws of motion.
- Understand that net forces cause accelerations.
- Understand the difference between motion caused by an applied force and motion that results from an object’s inertia.
- Recognize the action–reaction pairs in a given situation.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
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Unit 2.2 – Applications of Newton’s Laws

(8 days)

- Identify the forces acting on an object.
- Determine the direction and magnitude of the acceleration of an object acted upon by a net force.
- Identify how the force of friction changes the net force acting on an object.
- Determine how different surfaces and surface areas affect the force of friction.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
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Unit 2.3 – Newton’s Law of Universal Gravitation

(9 days)

- Develop an understanding of how satellite motion results from the interactions between centripetal force and inertia.
- Recognize that orbital (satellite) motion is a special kind of motion.
- Confirm that centripetal acceleration and centripetal force are special cases of Newton’s first and second laws of motion.
- Determine that the mass of two objects and the distance between them affects the force of gravity between the objects.

- » Plan and implement investigative procedures.
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- » Collect data and make measurements with precision.
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Unit 2.4 – Work and Energy

(13 days)

- Determine the conditions that result in work being done.
- Identify and differentiate between different forms of mechanical energy.
- Use the work–energy theorem to determine (investigate and calculate) how much work is transferred to mechanical energy.
- Investigate and compare, in terms of efficiency, two or more systems for completing the same amount of work.

- » Plan and implement investigative procedures.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
- » Organize, analyze, evaluate, make inferences, and predict trends from any data source.
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QUARTER 3

Content students have to learn

Processes students will learn and use

Unit 3.1 – Energy Conservation (10 days)

- Establish that energy is conserved in a system.
- Recognize the forms of mechanical energy.
- Differentiate between mechanical and nonmechanical energy.
- Relate power, work, time, and energy to each other.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
- » Organize, analyze, evaluate, make inferences, and predict trends from any data source.
- » Communicate valid conclusions supported by data.

Unit 3.2 – Impulse and Momentum (16 days)

- Recognize the relationship between impulse and change in momentum.
- Differentiate between elastic and inelastic collisions.
- Demonstrate that momentum is conserved during a collision.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
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Unit 3.3 – Mechanical Waves and Wave Properties (17 days)

- Compare the characteristics of transverse and longitudinal waves.
- Describe the mathematical relationship among frequency, wavelength, and wave speed.
- Establish the relationship between period and frequency.
- Recognize and explain mechanical wave interactions.
- Apply the characteristics of mechanical waves to the study of seismic waves.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
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QUARTER 4

Content students have to learn

Processes students will learn and use

Unit 4.1 – Electromagnetic Waves (11 days)

- Identify components of the electromagnetic spectrum.
- Calculate the frequency or wavelength of electromagnetic radiation.
- Recognize that the energy of an electromagnetic wave is related to its frequency.
- Recognize that the speed of light is a finite speed.
- Compare and contrast electromagnetic waves and mechanical waves.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom and laboratory.
- » Collect data and make measurements with precision.
- » Express and manipulate physical quantities using scientific conventions and mathematical procedures.
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Unit 4.2 – Nuclear Physics (9 days)

- Determine the structural properties of the nucleus.
- Explain the relationship between mass and energy.
- Describe nuclear stability and decay.
- Balance nuclear reactions and determine daughter elements.
- Distinguish between nuclear fission and nuclear fusion.

- » Plan and implement investigative procedures.
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Unit 4.3 – Astronomy (12 days)

- Interpret information from the Hertzsprung-Russell (H-R) diagram about star evolution.
- Explain why stars have a life cycle.
- Determine the composition of a star based on line spectra analysis and explain how this can be used to date the star.
- Use the knowledge of the electromagnetic spectra to examine the structure and movement of stars and galaxies.
- Understand how the development of technology has provided evidence for the Big Bang Theory.

- » Plan and implement investigative procedures.
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Unit 4.4 – Electromagnetism (12 days)

- Know the basic law of electrostatics.
- Investigate the ways that an object can transfer electric charge.
- Compare and contrast the force of gravity to the force of electromagnetism.
- Use Coulomb's law to find the electric force between two objects.
- Investigate the relationship between magnetic fields and electric currents.

- » Plan and implement investigative procedures.
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