

# Physical Science: Grades 9, 10, 11, 12

Adopted 2016

## Matter and Its Interactions PSCI.PS1

1. Using the kinetic molecular theory and heat flow considerations, explain the changes of state for solids, liquids, gases, and plasma. PSCI.PS1.1

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2. Graphically represent and discuss the results of an investigation involving pressure, volume, and temperature of a gas. PSCI.PS1.2

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3. Construct a graphical organizer for the major classifications of matter using composition and separation techniques. PSCI.PS1.3

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4. Apply scientific principles and evidence to provide explanations about physical and chemical changes. PSCI.PS1.4

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5. Trace the development of the modern atomic theory to describe atomic particle properties and position. PSCI.PS1.5

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6. Characterize the difference between atoms of different isotopes of an element. PSCI.PS1.6

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7. Use the periodic table as a model to predict the relative properties of elements. PSCI.PS1.7

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8. Using the patterns of electrons in the outermost energy level, predict how elements may combine. PSCI.PS1.8

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9. Use the periodic table as a model to predict the formulas of binary ionic compounds. Explain and use the naming conventions for binary ionic and molecular compounds. PSCI.PS1.9

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10. Develop a model to illustrate the claim that atoms and mass are conserved during a chemical reaction (i.e., balancing chemical equations). PSCI.PS1.10

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11. Use models to identify chemical reactions as synthesis, decomposition, single-replacement, and double-replacement. Given the reactants, use these models to predict the products of those chemical reactions. PSCI.PS1.11

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12. Classify a substance as acidic, basic, or neutral by using pH tools and appropriate indicators. PSCI.PS1.12

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**13. Research and communicate explanations on how acid rain is created and its impact on the ecosystem.** PSCI.PS1.13

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**14. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** PSCI.PS1.14

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**15. Communicate scientific and technical information about nuclear energy and radioactive isotopes with respect to their impact on society.** PSCI.PS1.15

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**Motion and Stability:  
Forces and  
Interactions** PSCI.PS2

**1. Use mathematical representations to show how various factors (e.g., position, time, direction of force) affect one-dimensional kinematics parameters (distance, displacement, speed, velocity, acceleration). Determine graphically the relationships among those one-dimensional kinematics parameters.** PSCI.PS2.1

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**2. Algebraically solve problems involving constant velocity and constant acceleration in one-dimension.** PSCI.PS2.2

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**3. Use free-body diagrams to illustrate the contact and non-contact forces acting on an object.** PSCI.PS2.3

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**4. Plan and conduct an investigation to gather evidence and provide a mathematical explanation about the relationship between force, mass, and acceleration. Solve related problems using  $F=ma$ .** PSCI.PS2.4

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**5. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.** PSCI.PS2.5

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**6. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on an object during a collision.** PSCI.PS2.6

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**7. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field.** PSCI.PS2.7

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**Energy** PSCI.PS3

**1. Identify and give examples of the various forms of energy (kinetic, gravitational potential, elastic potential) and solve mathematical problems regarding the work-energy theorem and power.** PSCI.PS3.1

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**2. Plan and conduct an investigation to provide evidence that thermal energy will move as heat between objects of two different temperatures, resulting in a more uniform energy distribution (temperature) among the objects.** PSCI.PS3.2

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**3. Design, build, and refine a device within design constraints that has a series of simple machines to transfer energy and/or do mechanical work.** PSCI.PS3.3

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**4. Collect data and present your findings regarding the law of conservation of energy and the efficiency, mechanical advantage, and power of the refined device.** PSCI.PS3.4

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5. Investigate the relationships among kinetic, potential, and total energy within a closed system (the law of conservation of energy). PSCI.PS3.5
  6. Determine the mathematical relationships among heat, mass, specific heat capacity, and temperature change using the equation  $Q = mC_p\Delta T$ . PSCI.PS3.6
  7. Demonstrate Ohm's Law through the design and construction of simple series and parallel circuits. PSCI.PS3.7
  8. Plan and conduct an experiment using a controlled chemical reaction to transfer thermal energy and/or do mechanical work. PSCI.PS3.8
  9. Demonstrate the impact of the starting amounts of reacting substances upon the energy released. PSCI.PS3.9
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**Waves and Their Applications in Technologies for Information Transfer** PSCI.PS4

1. Use scientific reasoning to compare and contrast the properties of transverse and longitudinal waves and give examples of each type. PSCI.PS4.1
2. Design/conduct an investigation and interpret gathered data to explain how mechanical waves transmit energy through a medium. PSCI.PS4.2
3. Develop and use mathematical models to represent the properties of waves including frequency, amplitude, wavelength, and speed. PSCI.PS4.3
4. Describe and communicate the similarities and differences across the electromagnetic spectrum. Research methods and devices used to measure these characteristics. PSCI.PS4.4
5. Research and communicate scientific explanations about how electromagnetic waves are used in modern technology to produce, transmit, receive, and store information. Examples include: medical imaging, cell phones, and wireless networks. PSCI.PS4.5