

Physical World Concepts

Matter and Its Interactions PWC.PS1

- 1 Using the Bohr model of an atom, describe the following features and components of an atom: protons, neutrons, electrons, mass, number and types of particles, structure, and organization. PWC.PS1.1
- 2 Use the kinetic molecular theory to explain how molecular motion is related to internal energy, temperature, heat, phase change, and expansion and contraction. PWC.PS1.2
- 3 Use data collected from a calorimeter to construct a phase diagram to explain both the constant temperature and linearly changing segments of a graph. PWC.PS1.3
- 4 Describe three forms of radioactivity in terms of changes in atomic number and mass number in order to write balanced equations for the three forms of radioactive decay. PWC.PS1.4
- 5 Create a model that illustrates the difference between nuclear fission and nuclear fusion in terms of transmutation. PWC.PS1.5
- 6 Through experimental data collections, investigate the concept of half-life. PWC.PS1.6

Motion and Stability: Forces and Interactions PWC.PS2

- 1 Investigate, measure, calculate, and analyze the relationship among position, displacement, velocity, acceleration, and time. PWC.PS2.1
- 2 Explore characteristics of rectilinear motion and create distance-time graphs and velocity-time graphs. PWC.PS2.2
- 3 Explain how Newton's first law applies to objects at rest and objects moving at a constant velocity. PWC.PS2.3
- 4 Using Newton's second law, analyze the relationship among the net force acting on a body, the mass of the body, and the resulting acceleration through mathematical and graphical methods. PWC.PS2.4
- 5 Apply Newton's third law to identify the interacting forces between two bodies. PWC.PS2.5
- 6 Understand that the two-dimensional movement of an object can be explained as a combination of its horizontal and vertical components of motion. PWC.PS2.6

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- 7** Analyze the general relationship between net force, acceleration, and motion for an object undergoing uniform circular motion. PWC.PS2.7
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- 8** Describe the nature and magnitude of frictional forces. PWC.PS2.8
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- 9** Quantify interactions between objects to show that the total momentum is conserved in both elastic collisions and inelastic collisions. PWC.PS2.9
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- 10** Determine the impulse required to produce a change in momentum. PWC.PS2.10
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- 11** Using the law of universal gravitation, predict how gravitational force will change when the distance between two masses changes or the mass of one object changes. PWC.PS2.11
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- 12** Distinguish between mass and weight using SI units. PWC.PS2.12
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- 13** Represent the force conditions that exist for a system in equilibrium. PWC.PS2.13
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- 14** Through the use of force diagrams, explain why objects float or sink in terms of force and density. PWC.PS2.14
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- 15** Experimentally investigate the buoyant force exerted on floating and submerged objects. PWC.PS2.15
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- 16** Demonstrate the effects of Bernoulli's principle on fluid motion. PWC.PS2.16
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Energy PWC.PS3

- 1** Investigate the definitions of force, work, power, kinetic energy, and potential energy. PWC.PS3.1
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- 2** Analyze the characteristics of energy and conservation of energy including friction, gravitational potential energy, and kinetic energy. PWC.PS3.2
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- 3** Compare and contrast the following ways in which energy is stored in a system: mechanical, electrical, chemical, and nuclear. PWC.PS3.3
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- 4** Describe various ways in which energy is transferred from one system to another (mechanical contact, thermal conduction, and electromagnetic radiation). PWC.PS3.4
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- 5** Demonstrate how or explain that energy is conserved in an isolated system even if transformations occur within the system (i.e., chemical to electrical, electrical to mechanical). PWC.PS3.5
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- 6** Calculate quantitative relationships associated with the conservation of energy. PWC.PS3.6
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- 7** Describe various ways in which matter and energy interact. PWC.PS3.7
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- 8 Mathematically quantify the relationship among electrical potential, current, and resistance in an ohmic system.** PWC.PS3.8
 - 9 Relate the first law of thermodynamics as an application of the law of conservation of energy.** PWC.PS3.9
 - 10 Analyze the relationship between energy transfer and disorder in the universe (second law of thermodynamics).** PWC.PS3.10
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Waves and Their Applications in Technologies for Information Transfer PWC.PS4

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- 1 Build a model of a wave that describes the following characteristics of longitudinal waves and transverse waves: wavelength, frequency, period, amplitude, and velocity.** PWC.PS4.1
 - 2 Quantify the relationship among the frequency, wavelength, and the speed of a wave.** PWC.PS4.2
 - 3 Compare and contrast the properties and the applications of mechanical and electromagnetic waves.** PWC.PS4.3
 - 4 Explain the relationship between the wavelength of light absorbed or released by an atom or molecule and the transfer of a discrete amount of energy.** PWC.PS4.4
 - 5 Experimentally explore the additive and subtractive properties associated with color formation.** PWC.PS4.5
 - 6 Using real world application, explain the principle of the Doppler Effect.** PWC.PS4.6
 - 7 Investigate reflection, refraction, diffraction, and interference of waves.** PWC.PS4.7
 - 8 Explain what function sound resonance has in practical form.** PWC.PS4.8
 - 9 Analyze the application of polarization.** PWC.PS4.9
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