



Heat Transfer

Grade 6: (9) Force, motion, and energy. The student knows that the Law of Conservation of Energy states that energy can neither be created nor destroyed, it just changes form. The student is expected to:

- (A) investigate methods of thermal energy transfer, including conduction, convection, and radiation;
 - (B) verify through investigations that thermal energy moves in a predictable pattern from warmer to cooler until all the substances attain the same temperature such as an ice cube melting; and
 - (C) demonstrate energy transformations such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy.
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Newton's Laws

(6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:

- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
 - (B) differentiate between speed, velocity, and acceleration; and
 - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
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Chemical Reactions

Grade 8: (5) Matter and energy. The student knows that matter is composed of atoms and has chemical and physical properties. The student is expected to:

- (A) describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud;
 - (B) identify that protons determine an element's identity and valence electrons determine its chemical properties, including reactivity;
 - (C) interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements;
 - (D) recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts; and
 - (E) investigate how evidence of chemical reactions indicates that new substances with different properties are formed and how that relates to the law of conservation of mass.
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Linear Momentum

(6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:

- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
 - (B) differentiate between speed, velocity, and acceleration; and
 - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
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Kinetics

Grade 8: (5) Matter and energy. The student knows that matter is composed of atoms and has chemical and physical properties. The student is expected to:

- (A) describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud;
 - (B) identify that protons determine an element's identity and valence electrons determine its chemical properties, including reactivity;
 - (C) interpret the arrangement of the Periodic Table, including groups and periods, to explain how properties are used to classify elements;
 - (D) recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts; and
 - (E) investigate how evidence of chemical reactions indicates that new substances with different properties are formed and how that relates to the law of conservation of mass.
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Waves

Grade 7: (5) Matter and energy. The student knows that interactions occur between matter and energy. The student is expected to:

- (A) recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis; and
 - (B) diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids.
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Energy

Grade 6: (8) Force, motion, and energy. The student knows force and motion are related to potential and kinetic energy. The student is expected to:

- (A) compare and contrast potential and kinetic energy;
 - (B) identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces;
 - (C) calculate average speed using distance and time measurements;
 - (D) measure and graph changes in motion; and
 - (E) investigate how inclined planes can be used to change the amount of force to move an object.
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Gravity and Free Fall

Grade 8: (6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:

- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
 - (B) differentiate between speed, velocity, and acceleration; and
 - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
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Friction

(6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:

- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
 - (B) differentiate between speed, velocity, and acceleration; and
 - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
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Rockets

(6) Force, motion, and energy. The student knows that there is a relationship between force, motion, and energy. The student is expected to:

- (A) demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion;
 - (B) differentiate between speed, velocity, and acceleration; and
 - (C) investigate and describe applications of Newton's three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.
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