

Force, Motion, and Energy**Kindergarten**

- K.2 The student will investigate and understand that pushes and pulls affect the motion of objects. Key ideas include
- pushes and pulls can cause an object to move;
 - pushes and pulls can change the direction of an object; and
 - changes in motion are related to the strength of the push or pull.

Grade 1

- 1.2 The student will investigate and understand that objects can move in different ways. Key ideas include
- objects may have straight, circular, spinning, and back-and-forth motions; and
 - objects may vibrate and produce sound.

Grade 2

- 2.2 The student will investigate and understand that different types of forces may cause an object's motion to change. Key ideas include
- pushes and pulls from direct contact can cause an object to move;
 - indirect forces, including gravity and magnetism, can also cause objects to move; and
 - forces have applications in our lives.

Grade 3

- 3.2 The student will investigate and understand that the direction and size of force affects the motion of an object. Key ideas include
- multiple forces may act on an object;
 - the net force on an object determines how an object moves;
 - simple machines increase or change the direction of a force; and
 - simple and compound machines have many applications.

Grade 5

- 5.2 The student will investigate and understand that energy can take many forms. Key ideas include
- energy is the ability to do work or to cause change;
 - there are many different forms of energy;
 - energy can be transformed; and
 - energy can be conserved.
- 5.3 The student will investigate and understand that there is a relationship between force and energy of moving objects. Key ideas include
- moving objects have kinetic energy;
 - motion is described by an object's direction and speed;
 - changes in motion are related to net force and mass;
 - the application of direct or indirect forces can cause objects to move;
 - when objects collide, the contact forces transfer energy and can change objects' motion; and
 - friction is a force that opposes motion.
- 5.4 The student will investigate and understand that electricity is transmitted and used in daily life. Key ideas include
- electricity flows through conductors but not insulators;
 - electricity flows through closed circuits;
 - static electricity can be generated by rubbing certain materials together;
 - electrical energy can be transformed into radiant, mechanical, and thermal energy;
 - a current flowing through a wire creates a magnetic field; and
 - electricity has many applications.
- 5.5 The student will investigate and understand that sound can be produced and transmitted. Key ideas include
- sound is produced when an object or substance vibrates;
 - sound is the transfer of energy;
 - different media transmit sound differently; and
 - sound waves have many uses and applications.

- 5.6 The student will investigate and understand that visible light has certain characteristics and behaves in predictable ways. Key ideas include
- visible light is radiant energy that moves in transverse waves;
 - the visible spectrum includes light with different wavelengths;
 - matter influences the path of light; and
 - radiant energy can be transformed into thermal, mechanical, and electrical energy.

Matter

Kindergarten

- K.3 The student will investigate and understand that physical properties of an object can be described. Properties include
- colors;
 - shapes and forms;
 - textures and feel; and
 - relative sizes and weights of objects.
- K.4 The student will investigate and understand that water is important in our daily lives and has properties. Key ideas include
- water has many uses;
 - water can be found in many places;
 - water occurs in different phases; and
 - water flows downhill.

Grade 1

- 1.3 The student will investigate and understand that objects are made from materials that can be described by their physical properties. Key ideas include
- objects are made of one or more materials with different physical properties and can be used for a variety of purposes;
 - when a material is changed in size most physical properties remain the same; and
 - the type and amount of material determine how much light can pass through an object.

Grade 2

- 2.3 The student will investigate and understand that matter can exist in different phases. Key ideas include
- solids, liquids, and gases have different characteristics; and
 - heating and cooling can change the phases of matter.

Grade 3

- 3.3 The student will investigate and understand how materials interact with water. Key ideas include
- some liquids mix with water;
 - some solids dissolve in water; and
 - many solids dissolve more easily in hot water than in cold water.

Grade 5

- 5.7 The student will investigate and understand that there are properties and interactions of matter. Key ideas include
- matter has mass and takes up space;
 - matter is composed of atoms;
 - atoms of different elements can combine to form new substances with new properties;
 - substances can be mixed together without changes in their physical properties; and
 - energy has an effect on the phases of matter.

Note that sixth grade is not divided into content strands.

- 6.4 The student will investigate and understand that there are basic sources of energy and that energy can be transformed. Key ideas include
- the sun is important in the formation of most energy sources on Earth;
 - Earth's energy budget relates to living systems and Earth's processes;
 - radiation, conduction, and convection distribute energy; and
 - energy transformations are important in energy usage.
- 6.5 The student will investigate and understand that all matter is composed of atoms. Key ideas include
- atoms consist of particles, including electrons, protons, and neutrons;

- b) atoms of a particular element are similar but differ from atoms of other elements;
- c) elements may be represented by chemical symbols;
- d) two or more atoms interact to form new substances, which are held together by electrical forces (bonds);
- e) compounds may be represented by chemical formulas;
- f) chemical equations can be used to model chemical changes; and
- g) a few elements comprise the largest portion of the solid Earth, living matter, the oceans, and the atmosphere.