Minnesota Science

Grade 8

Adopted 2019

Grade 8

Matter and Its Interactions

1. Asking questions and defining problems. 8PI.1.1
    1. Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read. 8PI.1.1.1
        1. Ask questions about locations of common elements on the periodic table to note patterns in the properties of similarly grouped elements. 8PI.1.1.1.1
2. Planning and carrying out investigations. 8PI.1.2
    1. Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena. 8PI.1.2.1
        1. Plan and conduct an investigation of changes in pure substances when thermal energy is added or removed and relate those changes to particle motion. 8PI.1.2.1.1
        2. Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. 8PI.1.2.1.2
        3. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. 8PI.1.2.1.3
1. Analyzing and interpreting data. 8PI.2.1
    1. Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables. 8PI.2.1.1
        1. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. 8PI.2.1.1.1
1. Developing and using models. 8PI.3.1
    1. Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others. 8PI.3.1.1
        1. Develop models to describe the atomic composition of simple molecules and crystals. 8PI.3.1.1.1
        2. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. 8PI.8P.3.1.1.2
2. Constructing explanations and designing solutions. 8PI.3.2
    1. Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others. 8PI.8PI.3.2.1

1. Construct an explanation based on evidence and scientific principles of a common phenomenon that can be explained by the motions of molecules. 8PI.3.2.1.1

1. Construct, test and modify a device that either releases or absorbs thermal energy by chemical processes. 8PI.3.2.2.1

2. Obtaining, evaluating and communicating information. 8PI.4.2

1. Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats. 8PI.4.2.1

1. Gather and evaluate information from multiple sources to describe that synthetic materials come from natural resources and impact society. 8PI.4.2.1.1

Motion and Stability: Forces and Interactions

1. Asking questions and defining problems. 8PF.1.1

1. Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read. 8PF.1.1.1

2. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. 8PF.1.1.1.2

2. Constructing explanations and designing solutions. 8PF.3.2

2. Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. 8PF.3.2.2

2. Design a solution to a problem involving the motion of two colliding objects using Newton's 3rd Law. 8PF.3.2.2.2

1. Engaging in argument from evidence. 8PF.4.1

1. Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counterarguments. 8PF.4.1.1

1. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. 8PF.4.1.1.1

Energy

2. Planning and carrying out investigations. 8PE.1.2
    1. Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena. 8PE.1.2.1
        4. Plan and conduct an investigation to determine how the temperature of a substance is affected by the transfer of energy, the amount of mass, and the type of matter. 8PE.1.2.1.4
1. Analyzing and interpreting data. 8PE.2.1
    1. Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables. 8PE.2.1.1
        2. Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass and speed of an object. 8PE.2.1.1.2
2. Using mathematics and computational thinking. 8PE.2.2
    1. Students will be able to use mathematics to represent physical variables and their relationships, compare mathematical expressions to the real world, and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds. 8PE.2.2.1
        2. Create a computer program to illustrate the transfer of energy within a system where energy changes form. 8PE.2.2.1.2
1. Developing and using models. 8PE.3.1
    1. Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others. 8PE.3.1.1
        3. Develop and revise a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. 8PE.3.1.1.3
2. Constructing explanations and designing solutions. 8PE.3.2
    2. Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. 8PE.3.2.2
        3. Design, construct, and test a device that either minimizes or maximizes thermal energy transfer. 8PE.3.2.2.3
1. Engaging in argument from evidence. 8PE.4.1
    1. Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counterarguments. 8PE.4.1.1

2. Compare and evaluate evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. 8PE.4.1.1.2

Waves and Their Applications in Technologies for Information Transfer

2. Using mathematics and computational thinking. 8PW.2.2
    1. Students will be able to use mathematics to represent physical variables and their relationships, compare mathematical expressions to the real world, and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds. 8PW.2.2.1
        1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. 8PW.2.2.1.1

1. Developing and using models. 8PW.3.1
    1. Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others. 8PW.3.1.1
        4. Develop and use a model to qualitatively describe that waves are reflected, absorbed, or transmitted through various materials. 8PW.3.1.1.4

2. Obtaining, evaluating and communicating information. 8PW.4.2
    1. Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats. 8PW.4.2.1
        2. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. 8PW.4.2.1.2