

DCI: Energy

MS.PS3.A: Definitions of Energy

Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3), (MS-PS3-4)

DCI: Energy

MS.PS3.A: Definitions of Energy

Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)

DCI: Energy

MS.PS3.A: Definitions of Energy

A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)

DCI: Energy

MS.PS3.B: Conservation of Energy and Energy Transfer

When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

DCI: Energy

MS.PS3.B: Conservation of Energy and Energy Transfer

The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)

DCI: Energy

MS.PS3.B: Conservation of Energy and Energy Transfer

Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)

DCI: Energy

MS.PS3.C: Relationship Between Energy and Forces

When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

DCI: Engineering Design

MS.ETS1.A: Defining and Delimiting Engineering Problems

The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-PS3-3)

DCI: Engineering Design

MS.ETS1.B: Developing Possible Solutions

A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (MS-PS3-3)

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Develop a model to describe unobservable mechanisms. (MS-PS3-2)

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

(MS-PS3-4)

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.

(MS-PS3-3)

Crosscutting Concepts

Scale, Proportion, and Quantity

Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1), (MS-PS3-4)

Crosscutting Concepts

Energy and Matter

The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3)

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)

Science and Engineering Practices

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5)

Crosscutting Concepts

Systems and System Models

Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS3-2)

Crosscutting Concepts

Energy and Matter

Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5)

