



**Grades 6–8**

**3.2.6-8.M Physical Science: Energy**

**Students who demonstrate understanding can** *apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*

**Clarifying Statement:** Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.

**Assessment Boundary:** Assessment does not include calculating the total amount of thermal energy transferred.

| Science and Engineering Practices (SEP)   | Disciplinary Core Ideas (DCI)   | Crosscutting Concepts (CCC)   |
|---|---|---|
| <p><b>Constructing Explanations and Designing Solutions</b></p> <p>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.</p> <ul style="list-style-type: none"> <li>Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.</li> </ul> | <p><b>PS3.A: Definitions of Energy</b></p> <ul style="list-style-type: none"> <li>Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.</li> </ul> <p><b>PS3.B: Conservation of Energy and Energy Transfer</b></p> <ul style="list-style-type: none"> <li>Energy is spontaneously transferred out of hotter regions or objects and into colder ones.</li> </ul> <p><b>ETS1.A: Defining and Delimiting an Engineering Problem</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul> <p><b>ETS1.B: Developing Possible Solutions</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul> | <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>The transfer of energy can be tracked as energy flows through a designed or natural system.</li> </ul> |

**Pennsylvania Context:** N/A

**PA Career Ready Skills:** Identify and evaluate distractors that impact reaching one’s goals.



**Connections to Other Standards Content and Practices**

| Standard Source   | Possible Connections to Other Standard(s) or Practice(s)   |
|---|--|
| <b>Agriculture (AFNR)</b>   | CS.01.02.01.c: Solve problems in AFNR workplaces or scenarios using technology.  |
| <b>Science, Environmental Literacy and Sustainability (NAAEE)</b> | 5-8 Strand 2.1.A. Earth's physical systems: Learners describe the physical processes that shape Earth, including weather, climate, plate tectonics, and the hydrologic cycle. They explain how matter cycles and energy flows among the abiotic and biotic components of the environment. They describe how humans affect and are affected by Earth's physical systems.              |
| <b>PA Core Standards: ELA</b>                                     | CC.3.5.6-8.C: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.<br>CC.3.6.6-8.F: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| <b>PA Core Standards and Practices: Math</b>                      | N/A  |
| <b>PA Standards: Social Studies</b>                               | N/A  |
| <b>Educational Technology (ISTE)</b>                              | 1.4. Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.  |
| <b>Technology and Engineering (ITEEA)</b>                         | STEL-7Q: Apply the technology and engineering design process.<br>STEL-7U: Evaluate the strengths and weaknesses of different design solutions.   |