

# Next Generation Science Standards for CA Public Schools

## MS-PS3 Energy

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Students who demonstrate understanding can:

- MS-PS3-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.\* [Clarification 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.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

| Science and Engineering Practices                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Disciplinary Core Ideas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Crosscutting Concepts                                                                                                                                                                    |
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| <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. (MS-PS3-3)</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. (MS-PS3-3)</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. (MS-PS3-3)</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. (secondary to MS-PS3-3)</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. (secondary to MS-PS3-3)</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. (MS-PS3-3)</li> </ul> |

*Connections to other DCIs in this grade-band:* **MS.PS1.B** (MS-PS3-3); **MS.ESS2.A** (MS-PS3-3); **MS.ESS2.C** (MS-PS3-3); **MS.ESS2.D** (MS-PS3-3)

*Articulation across grade-bands:* **4.PS3.B** (MS-PS3-3); **HS.PS3.B** (MS-PS3-3)

*California Common Core State Standards Connections:*

*ELA/Literacy –*

**RST.6–8.3**

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3)

**WHST.6–8.7**

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. (MS-PS3-3)

\*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

\*\*California clarification statements, marked with double asterisks, were incorporated by the California Science Expert Review Panel. The section entitled "Disciplinary Core Ideas" is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*.

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