

MS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

California Science Test—Item Content Specifications

# MS-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

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.

[Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [*Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Obtaining, Evaluating, and Communicating Information  Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.  Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. | PS4.C: Information Technologies and Instrumentation  3. Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. | Structure and Function  Structures can be designed to serve particular functions.  Connections to Engineering, Technology, and Applications of Science  Influence of Science, Engineering, and Technology on Society and the Natural World  Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.  Connections to Nature of Science  Science is a Human Endeavor  Advances in technology influence the progress of science and science has influenced advances in technology. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

8.1 Ability to comprehend and evaluate text in terms of its validity, reliability, and sources

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

8.1.1 Ability to obtain relevant information through conducting searches in print and online sources and evaluate the reliability of the obtained information

8.1.2 Ability to recognize, interpret, and critique key ideas in scientific and engineering text, including a mix of words, symbols, tables, diagrams, and graphs

8.1.3 Ability to summarize information from a single source and/or combine and synthesize information from multiple sources to address a question or solve a problem

### Disciplinary Core Idea Assessment Targets

#### PS4.C.3

* Gather evidence from multiple sources that is sufficient to support a claim that digital signals are more reliable than analog signals
* Describe specific features that make digital transmission of signals more reliable than analog transmission of signals
* Describe at least one technology that uses digital encoding and transmission of information
* Describe how digital encoding and transmission of information is used to advance scientific investigations and measurement

### Crosscutting Concept Assessment Target(s)

CCC6 Design structures to serve particular functions

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides resources that describe digital and analog transfer of information:

* Recognizes and/or interprets scientific text, including a mix of words, symbols, tables, diagrams, and graphs (8.1.1, PS4.C.3, and CCC6)
* Critiques key ideas in scientific text, including a mix of words, symbols, tables, diagrams, and graphs (8.1.1, PS4.C.3, and CCC6)

Task provides source material transmitted by digital and analog sources:

* Evaluates the reliability of the two transmission processes (8.1.2, PS4.C.3, and CCC6)

Task provides several different scientific and technical resources that discuss the digital transfer of information:

* Summarizes information from a single source in order to address a question or solve a problem (8.1.3, PS4.C.3, and CCC6)
* Combines and synthesizes information from the sources to address a question or solve a problem (8.1.3, PS4.C.3, and CCC6)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Fiber optics transmitting light pulses
* Wi-Fi devices transmitting radio pulses
* Cameras converting reflected light into digital signals
* Comparisons of transmission of digital and analog signals from a source to a receiver
* Comparisons of characteristics of analog and digital recordings

## Common Misconceptions

None listed at this time.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-PS4-3 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-PS4-3 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-PS4-3%20Evidence%20Statements%20June%202015%20asterisks.pdf)

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

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