

# Height-O-Meters

## Grades 6-7-8-9-10

### National Science Education Standards

#### SCIENCE AS INQUIRY STANDARDS

LEVELS 5-8	LEVELS 9-12
Abilities necessary to do scientific inquiry	Abilities necessary to do scientific inquiry
Understanding about scientific inquiry	Understanding about scientific inquiry

#### PHYSICAL SCIENCE STANDARDS

LEVELS 5-8	LEVELS 9-12
Motion and forces	Motions and forces

#### SCIENCE AND TECHNOLOGY STANDARDS

LEVELS 5-8	LEVELS 9-12
Abilities of technological design	Abilities of technological design
Understanding about science and technology	Understanding about science and technology

# Texas Essential Knowledge and Skills

## Grade 6 Science

### (a) Introduction.

- (1) In Grade 6, the study of science includes conducting laboratory investigations and fieldwork using scientific methods, analyzing information, making informed decisions, and using tools such as beakers, test tubes and spring scales to collect, analyze, and record information.
  - (4) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
  - (5) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
  - (6) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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### (b) Knowledge and skills

- (1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.

The student is expected to:

- (A) demonstrate safe practices during laboratory investigations and fieldwork; and
- (B) make wise choices in the use and conservation of resources and the disposal of materials.

- (2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, and charts to organize, examine, and evaluate information.

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| (3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. | The student is expected to:<br>(C) represent the physical world using models and identify their limitations.   |
| (4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry.       | The student is expected to:<br>(A) collect, analyze, and record information using tools including beakers, petri dishes, metric-meter sticks, graduated cylinders, weather instruments, timing devices, heating apparatuses, test tubes, safety goggles, spring scales, magnets, balances, microscopes, telescopes, thermometers, calculators, field equipment, compasses, computers, and computer probes; and<br>(B) identify patterns in collected information using percent, average, range, and frequency. |
| (5) Science concepts. The student knows that there is a relationship between force and motion.                          | The student is expected to:<br>(A) identify and describe the changes in position, direction of motion, and speed of an object when acted upon by force;<br>(B) demonstrate that changes in motion can be measured and graphically represented.   |

## **Grade 7 Science**

### **(a) Introduction.**

- (1) In Grade 7, the study of science includes conducting laboratory investigations and fieldwork using scientific methods, critical-thinking, problem-solving, and using tools such as weather instruments and graphing calculators to collect and analyze information to explain a phenomena.
  - (4) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
  - (5) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
  - (6) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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### **(b) Knowledge and skills**

(1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.

The student is expected to:

- (A) demonstrate safe practices during laboratory investigations and fieldwork; and
- (B) make wise choices in the use and conservation of resources and the disposal of materials.

(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, and charts to organize, examine, and evaluate information.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.

The student is expected to:

- (C) represent the physical world using models and identify their limitations.

(4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry.

The student is expected to:

- (A) collect, analyze, and record information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, heating apparatuses, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, graphing calculators, field equipment, compasses, computers, computer probes, timing devices, magnets, and compasses; and
- (B) analyze collected information to recognize patterns such as rates of change.

(5) Science concepts. The student knows that there is a relationship between force and motion.

The student is expected to:

- (A) demonstrate relationships between force and motion using simple machines including pulleys and levers; and
- (B) demonstrate that an object will remain at rest or move at a constant speed and in a straight line if it is not being subjected to an unbalanced force.

## Grade 8 Science

### (a) Introduction.

- (1) In Grade 8, the study of science includes conducting laboratory investigations using scientific methods, analyzing data, critical-thinking, scientific problem-solving, and using tools such as telescopes to collect, analyze, and record information.
  - (5) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
  - (6) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
  - (7) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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### (b) Knowledge and skills

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| (1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices. | The student is expected to:<br>(A) demonstrate safe practices during laboratory investigations and fieldwork; and<br>(B) make wise choices in the use and conservation of resources and the disposal of materials.  |
| (2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.   | The student is expected to:<br>(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;<br>(B) collect information by observing and measuring in various ways;<br>(C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;<br>(D) communicate valid conclusions; and<br>(E) construct graphs, tables, and charts to organize, examine, and evaluate information. |
| (3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.                               | The student is expected to:<br>(C) represent the physical world using models and identify their limitations.  |

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| <p>(4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry.</p> | <p>The student is expected to:<br/>(A) collect, analyze, and record information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, heating apparatuses, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, graphing calculators, field equipment, compasses, computers, computer probes, water test kits,, timing devices; and<br/>(B) extrapolate from collected information to make predictions.</p> |
| <p>(5) Science concepts. The student knows that there is a relationship between force and motion.</p>                    | <p>The student is expected to:<br/>(A) demonstrate how unbalanced forces cause changes in the speed or direction of an object's motion.</p>   |

### **Integrated Physics and Chemistry**

#### **(b) Introduction.**

- (1) In Integrated Physics and Chemistry, students conduct laboratory investigations and fieldwork, use scientific methods during investigations, and make informed decisions using, critical-thinking and scientific problem-solving. This course integrates the disciplines of physics and chemistry in the following topics: motion, waves, energy transformations, properties of matter, changes in matter, and solution chemistry.
  - (2) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
  - (3) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
  - (4) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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(c) Knowledge and skills

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| <p>(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.</p> | <p>The student is expected to:<br/>(A) demonstrate safe practices during laboratory investigations and fieldwork; and<br/>(B) make wise choices in the use and conservation of resources and the disposal of materials.</p>  |
| <p>(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.</p>   | <p>The student is expected to:<br/>(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;<br/>(B) collect information by observing and measuring in various ways;<br/>(C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence; and<br/>(D) communicate valid conclusions.</p> |
| <p>(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.</p>   | <p>The student is expected to:<br/>(C) represent the physical world using models and identify their limitations.</p>   |

**Physics**

(b) Introduction.

- (1) In Physics, students conduct laboratory investigations and fieldwork, use scientific methods during investigations, and make informed decisions using, critical thinking and scientific problem-solving. Physics students study a variety of topics that include: laws of motion; changes within physical systems and conservation of energy and momentum; force; thermodynamics; characteristics and behavior of waves; and quantum physics. This course provides students with a conceptual framework,, factual knowledge, and analytical and scientific skills.
  - (2) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
  - (3) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
  - (4) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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(c) Knowledge and skills

(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.

The student is expected to:

- (A) demonstrate safe practices during laboratory investigations and fieldwork; and
- (B) make wise choices in the use and conservation of resources and the disposal of materials.

(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from data;
- (D) communicate valid conclusions;
- (E) graph data to observe and identify relationships between variables; and
- (F) read the scale on scientific instruments with precision.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.

The student is expected to:

- (B) express laws symbolically and employ mathematical procedures including vector addition and right-triangle geometry to solve physical problems.

(4) Science concepts. The student knows the laws governing motion.

The student is expected to:

- (A) generate and interpret graphs describing motion including the use of real-time technology;
- (C) demonstrate the effects of forces on the motion of objects;
- (E) identify and describe motion relative to different frames of reference.