

Content and Performance Standards for Science

Fifth Grade

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark.

Example: 5 23.1 5 = 5th grade 2= standard 2 3=benchmark 3 1= the first course content skill under the benchmark

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for Fifth Grade to be applied to Content Standards:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, predict, decide, relate, interpret).
- B. Communications (present, demonstrate, explain, defend).
- C. Goal setting/attainment (brainstorm, envision, research, plan, organize).
- D. The planning process (draft, analyze, and revise when producing products).

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method.
- B. Conduct research (field research, library research, experimentation).
- C. Use scientific equipment appropriately (safely).
- D. Apply knowledge of the relationship between humans, the environment and the earth's resources to improve the environment.
- E. Possess technical skills:
 - read/write/present: instructions, table, chart, reports (progress, research, lab), proposal, letters (complaint, request, response), manual, checklist, pamphlet, technical research, bid, technical analysis, summary
 - technology: word processing, spreadsheet, database, desktop publishing, Internet, search tools, current technology
 - measurement practice in measurement practice in metric.

Fifth Grade Course Content

CONTENT STANDARD 1. Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations.

5 11.0 Identify a question, determine relevant variable and a control, formulate a testable hypothesis, plan and predict the outcome of an investigation, safely conduct scientific investigation, and compare and analyze data A. Recognize and select a testable question when presented with multiple choices.

- .1 Write a testable question for an investigation
- .2 Identify a hypothesis
- .3 Explain the relationship between a testable question and a hypothesis
- .4 Plan an investigation to test a hypothesis
- .5 Identify the independent and dependent variable
- .6 Identify a control group and explain its purpose
- .7 List and follow appropriate safety procedures.
- .8 Conduct the investigation

Essential Vocabulary 5 11: control, prediction, hypothesis, variable, testable question, independent variable, dependent variable, Scientific method, data table (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 12.0 Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations.

- .1 Collect data using observation and tools such as scale, balances, thermometer, beaker, digital probes, stop watch, graduated cylinder in metric units
- .2 Record data using data tables
- .3 Represent data using graphs

Essential Vocabulary 12: graduated cylinder, scales, Celsius thermometers, beaker, digital probes, stop watch, balances, metric units, data tables, graphs (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 13.0 Review, communicate and defend results of investigations, including considering alternative explanations.

- .1 Compare data to hypothesis with guidance
- .2 Determine if hypothesis is supported or not supported with guidance
- .3 Communicate findings in written or oral format.

Essential Vocabulary: hypothesis, supported, not supported, prediction (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

Fifth Grade Science Course Content

5 14.0 Create models to illustrate scientific concepts and use the model to predict change. (e.g., computer simulation, stream table, graphic representation).

- .1 Explain the purpose of a model
- .2 List various types of models including 2-D, 3-D and computer simulations
- .3 Follow step-by-step directions to build a model

Essential Vocabulary: 2-D, 3-D, computer simulations, legend/key, model (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 15.0 Identify strengths and weakness in an investigation design.

Benchmark is addressed in grades MS science course work: Earth Science, Life Science, Physical Science

5 16.0 Compare how observations of nature form an essential base of knowledge among the Montana American Indians.

- .1 Identify examples of Montana American Indians using observation to create knowledge of nature
- .2 Explain how Montana American Indians have used observation to explain processes of nature

Essential Vocabulary: Crow Blackfeet, Salish, Kootenai, Assiniboine Sioux, Little Shell, Northern Cheyenne, Chippewa Cree, Pend d'Orelle, and Gros Vetnre

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and Interactions of physical and chemical systems.

5 21.0 Classify, describe, and manipulate the physical models of matter in terms of: elements, and compounds, pure substances and mixtures, atoms, and molecules.

- .1 Identify common elements
- .2 Define elements and compounds as pure substances
- .3 Identify common compounds (water, carbon dioxide, salt)
- .4 Distinguish between substances and mixtures
- .5 Explain the relationship between elements, compounds and mixtures.

Essential Vocabulary for 5 21: element, compound, mixture, pure substance (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

Fifth Grade Science Course Content (cont.)

5 22.0 Examine, describe, compare and classify objects and substances based on common physical properties and simple chemical properties.

- .1 Define physical properties as properties that do not change the chemical nature of matter (i.e., color, smell, freezing point, boiling point, melting point, magnetism)
- .2 Define chemical properties as properties that do change the chemical nature of matter (i.e., combustion, rust, decompose)
- .3 Identify examples of chemical change (generating a gas, color change, rust)

Essential Vocabulary for 5 22: mass, volume, chemical change, physical change, physical property, chemical property, chemical reaction (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 23.0 Describe energy and compare and contrast the energy transformations and the characteristics of light, heat, motion, magnetism, electricity, sound and mechanical waves.

- .1 Identify that most matter can exist as a solid, liquid or gas depending on temperature.
- .2 Describe the processes of sublimation, condensation, and evaporation
- .3 Explain how sound is produced, transmitted, and received.
- .4 Describe how sound can be changed.
- .5 Design and construct instruments that produce sound

(The effects of mechanical waves are applied in Standard 4 Benchmark 1)

Essential Vocabulary for Light is addressed in Physical Science course work

- .6 Define electricity as the flow of energy
- .7 Distinguish the differences between simple, series, and parallel circuits
- .8 Model series and parallel circuits
- .9 Explain the flow of energy in a circuit.
- .11 Explain the three types of heat transfer

Essential Vocabulary for: (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 23.1 & .2: **sublimation, evaporation, condensation, freezing point, melting point, energy, boiling point, solid, liquid, gas, matter**

5 23.3-.5: **frequency, amplitude, pitch, wavelength, vibration, tension, medium, transmit, instrument**

5 23.6-.9: **energy, electricity, circuits (simple, parallel, series), battery, positive and negative charge**

5 23.11: **conduction, convection, radiant energy (light), heat transfer, temperature, heat**

Fifth Grade Science Course Content (cont.)

5 24.0 Model and explain that states of matter are dependent upon the quantity of energy present in the system and describe what will change and what will remain unchanged at the particulate level when matter experiences an external force or energy change.

This benchmark is addressed in Physical Science Course Content

5 25.0 Describe and explain the motion of an object in terms of its position, direction, & speed as well as the forces acting upon it.

- .1 Experiment with potential and kinetic energy, (i.e., cars/balls on ramp)
- .2 Explain the differences between kinetic and potential energy
- .3 Identify that work is movement following application of a force.
- .4 Demonstrate an example of work.

Essential Vocabulary for: *(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)*

5 25.1 & .2: **potential, kinetic, speed, force, mass**

5 25.3 & .4: **work, force**

5 26.0 Identify, build, describe, measure, and analyze mechanical systems (e.g., simple and complex compound machines) and describe the forces acting within those systems.

This benchmark is addressed in Physical Science Course Content

5 27.0 Give examples and describe how energy is transferred and conserved (e.g. electric to light and heat [light bulb], chemical to mechanical [fuel to propulsion]).

This benchmark is addressed in Physical Science Course Content

Fifth Grade Science Course Content (cont.)

CONTENT STANDARD 3. Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

5 31.0 Compare the structure and function of prokaryotic cells (bacteria) and eukaryotic cells (plant, animal, etc.) including the levels of organization of the structure and function, particularly with humans.

- .1 Describe the basic structure and function of a cell.
- .2 Observe plant and animal cells using a microscope.
- .3 Compare plant and animals cells
- .4 Create model/diagram of an animal and/or plant cells.

Essential Vocabulary for 5 31: cell membrane, cell wall, nucleus, vacuoles, cytoplasm, mitochondria, chloroplast, organelle
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)

5 32.0 Explain how organisms and systems of organisms obtain and use energy resources to maintain stable conditions (e.g., food webs, photosynthesis, respiration).

- .1 Identify plant structures involved in photosynthesis and transpiration
- .2 Identify the compounds involved in photosynthesis and transpiration
- .3 Explain the process of photosynthesis and transpiration in terms of the key structures and compounds that are utilized.
- .4 Explain the relationship between photosynthesis and transpiration

Essential Vocabulary for 5 32: chlorophyll, photosynthesis, oxygen, carbon dioxide, sugar, water, light energy, transpiration, water vapor, roots, leaves, xylem, phloem, vascular, non vascular, carbon cycle
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)

5 33.0 Communicate the differences in the reproductive processes of a variety of plants and animals using the principles of genetic modeling (e.g., Punnet squares).

This benchmark is addressed in Life Science Course Content

5 34.0 Investigate and explain the interdependent nature of populations and communities in the environment and describe how species in these populations adapt by evolving.

- .1 Explore and compare symbiotic relationships
- .2 Define symbiosis
- .3 Identify the key characteristics of an ecosystem
- .4 Describe the interdependence between the parts of an ecosystem

Essential Vocabulary for 5 34: symbiosis, ecosystems, population, community, environment, interdependence, diversity, abiotic, biotic, biosphere
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)

Fifth Grade Science Course Content (cont.)

5 35.0 Create and use a basic classification scheme to identify plants and animals.

- .1 Employ dichotomous key to separate a collection of basic objects
- .2 Identify the kingdoms
- .3 Know the difference between kingdom, phylum and class
- .4 Define vertebrate/invertebrate, warm blooded/cold blooded
- .5 Compare and contrast key characteristics of organisms in the animal kingdom
- .6 Classify plants by flowering, non-flowering, mosses, ferns

Essential Vocabulary for 5 35: dichotomous key, kingdom, phylum, class, vertebrate, invertebrate, cold-blooded, warm-blooded, mosses, ferns, flowering, non-flowering, monocot, dicot, endotherm, ectotherm (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

CONTENT STANDARD 4. Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

5 41.0 Model and explain the internal structure of the earth and describe the formation and composition of earth's external features in terms of the rock cycle and plate tectonics and constructive and destructive forces.

- .1 Describe Earth's physical features
- .2 Explain glaciations and weathering effects on the Earth's surface
- .3 Define the role that plate tectonics play in changing Earth's features
- .4 Explain the rock cycle

Essential Vocabulary for 5 41: glaciations, erosion, deposition, plate tectonics, continental drift, mountain, earthquake, volcano, mantle, inner core, outer core, crust, igneous, sedimentary, metamorphic, mineral, rock, rock cycle (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 42.0 Differentiate between rocks types and minerals types and classify both by how they are formed and the utilization by humans.

- .1 Differentiate between igneous, sedimentary, and metamorphic rocks.
- .2 Identify that rock is composed of different kinds of minerals
- .3 Define minerals as the building blocks of rocks.
- .4 Compare and contrast the differences between rocks and minerals.

Essential Vocabulary for 5 42: igneous, sedimentary, metamorphic, mineral, rock (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

Fifth Grade Science Course Content (cont.)

5 43.0 Use fossils to describe the geological timeline.

- .1 Explain how sedimentary rock layers represent a progression of time
- .2 Describe how the relative age of fossils can be determined from their position in sedimentary rock layers

Essential Vocabulary for 5 43: sedimentary, fossil, relative age (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 44.0 Describe the water cycle, the composition and structure of the atmosphere and the impact of oceans on large-scale weather patterns.

- .1 Explain the water cycle and its application to weather.
- .2 Identify different types of clouds and how they can be used to predict weather.
- .3 Describe properties of air masses moving across the earth's surface
- .4 Discuss how interactions of air masses are used to forecast the weather
- .5 Interpret a weather map using correct symbols.

Essential Vocabulary for: (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 44.1 & .2: **water cycle, condensation, evaporation, precipitation, forecast, meteorologist**

5 44.3 - .5: **air mass, front, air pressure, warm front, cold front, precipitation, air currents**

5 45.0 Describe and model the motion and tilt of earth in relation to the sun, and explain the concepts of day, night, seasons, year, and climatic changes.

- .1 Compare and contrast revolution and rotation
- .2 Illustrate/model Earth's rotation in relation to the sun
- .3 Explain how the Earth's rotation causes day and night
- .4 Illustrate and model Earth's revolution in relation to the sun
- .5 Describe and model the causes of seasons and year due to the revolution and tilt of the Earth in relation to the sun

Essential Vocabulary for 5 45: revolution, rotation, tilt, axis, seasons, orbit, year, solstice, equinox (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 46.0 Describe the earth, moon, planets and other objects in space in terms of size, force of gravity, structure, and movement in relation to the sun.

- .1 Identify the relationship between the Earth, the sun, and the moon
- .2 Explain how the moon is lighted by the sun
- .3 Model the relative movements of the moon, Earth and sun
- .4 Identify phases of the moon by how much of the lighted part of moon can be seen from Earth

Essential Vocabulary for 5 46: Earth, planet, sun, moon, relative, phases of the moon, light, orbit (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

Fifth Grade Science Course Content (cont.)

5 47.0 Identify scientific theories about the origin and evolution of the earth and solar system.

This benchmark is addressed in Earth Science Course Content

CONTENT STANDARD 5. Through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies

5 51.0 Describe the specific fields of science and technology as they relate to occupations within those fields.

- .1 Identify specific fields of science
- .2 Identify occupations within specific fields of science
- .3 Identify uses of technology unique to specific occupations within each field of science

Essential Vocabulary for 5 51: life science, earth science, physical science, engineering, technology, occupations, science
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)

5 52.0 Apply scientific knowledge and process skills to understand issues and everyday events.

- .1 Identify a local current event or problem involving science
- .2 Research and summarize the scientific issues relevant to that local current event or problem

Essential Vocabulary for 5 52: current event, issue, problem *(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)*

5 53.0 Simulate collaborative problem solving and give examples of how scientific knowledge and technology are shared with other scientists and the public.

This benchmark is addressed in Earth Science Course Content

5 54.0 Use scientific knowledge to investigate problems and their proposed solutions and evaluate those solutions while considering environmental impacts.

- .1 Identify a local issue with an environmental impact
- .2 List possible environmental impacts
- .3 Research and discuss proposed solutions

Essential Vocabulary for 5 54: environmental impact *(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science)*

5 55.0 Describe how the knowledge of science and technology influences the development of the Montana American Indian cultures (see www.opi.mt.gov/IndianEd for science model lessons).

- .1 Investigate how science and technology have an impact on Montana American Indians
- .2 Explain the impact of science and technology on Montana American Indians.

CONTENT STANDARD 6. Understand historical developments in science and technology.

5 61.0 Give examples of scientific discoveries and describe the interrelationship between technological advances and scientific Essential understanding, including Montana American Indian examples (see www.opi.mt.gov/IndianEd for model lessons).

- .1 Identify examples of technological advances throughout history, including Montana American Indian examples
- .2 Identify and discuss scientific discoveries influenced by these technologies
- .3 Discuss how technology advances science understanding

Essential Vocabulary for 5 61.0: technology, scientific discoveries, advances (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 62.0 Identify major milestones in science that have impacted science, technology, and society.

- .1 Chart the history of scientific milestones (see Earth Science Course Content)
- .2 Discuss how milestones have impacted society over time.

Essential Vocabulary for 5 62: milestones (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)

5 63.0 Describe and explain science as a human endeavor and an ongoing process.

- .1 Investigate occupations that use science
- .2 Identify the features of science that make it a human endeavor and an ongoing process.

Essential Vocabulary for 5 63: occupation, human endeavor (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 5th Grade Science*)