

#### **4.17 Science (Grades 7-12)**

To be endorsed in science, an applicant shall hold an earned bachelor's or higher degree from an accepted institution of higher education; have completed an approved teacher preparation program including prescribed field experience and student teaching requirements; have completed an approved program in science; be knowledgeable about the Colorado Academic Standards in science; and have demonstrated the competencies specified below:

- 4.17(1) The science educator is knowledgeable about the content, concepts and skills of the sciences and is able to effectively instruct students regarding physical, life and earth sciences and applicable mathematics.
- 4.17(2) The science educator shall have completed an area or areas of concentration in, demonstrate knowledge of and effectively instruct students about one or more areas selected from:
  - 4.17(2)(a) physics including, but not limited to, general and experimental physics, mechanics, electricity, magnetism, quantum and atomic physics, sound, and optics.
  - 4.17(2)(b) chemistry including, but not limited to, general chemistry, organic chemistry, inorganic chemistry, analytical chemistry and physical chemistry.
  - 4.17(2)(c) biology including, but not limited to, general biology, environmental biology, biotechnology, genetics, evolution, human anatomy, ecology, molecular biology, and matter and energy in living systems.
  - 4.17(2)(d) earth and space science including, but not limited to, historical and physical geology, astronomy, environmental science, meteorology, oceanography, geomorphology, stratigraphy, mineralogy and earth systems.
  - 4.17(2)(e) general science including, but not limited to, general chemistry, physics, biology, earth and space science, environmental science and applicable mathematics.
- 4.17(3) The science educator is knowledgeable about and is able to:
  - 4.17(3)(a) effectively articulate to students current issues and events affecting or affected by science; age-/grade-appropriate controversial topics from multiple science perspectives, including historical and philosophical bases; and an analytical approach to students with clarity and without bias.
  - 4.17(3)(b) effectively demonstrate to students and instruct students on the use of a wide variety of science tools, primary and secondary source materials, print resources, laboratory and natural settings, and technological resources.
  - 4.17(3)(c) effectively instruct students about the design of experiments; data reporting; use of appropriate and relevant technology; interpretation of results; and the steps which may be taken in the presentation of the processes involved and the results obtained.
  - 4.17(3)(d) effectively instruct students in core scientific practices which include, but are not limited to, asking questions and defining problems; analyzing and interpreting data; engaging in argument from evidence; constructing explanations and designing solutions; developing and using models; planning and carrying out investigations; obtaining, evaluating, and communicating information; and using mathematics and computational thinking.

- 4.17(3)(e) effectively integrate technology into instructional and assessment strategies, as appropriate to science education and the learner.
  - 4.17(3)(f) effectively instruct students about the interconnected nature of science as it is practiced and experienced in the real world, including the connections between and among the various science disciplines and within other disciplines.
  - 4.17(3)(g) effectively demonstrate for and instruct students about the basic elements of the nature of science including, but not limited to, inquiry, curiosity, discovery, openness to new ideas and skepticism.
  - 4.17(3)(h) effectively communicate to students the historical and dynamic nature of science.
  - 4.17(3)(i) demonstrate for students the connection between an inquiry-based lesson and a larger conceptual-based module and the linkage of both to state-approved student science academic standards.
  - 4.17(3)(j) effectively demonstrate for and instruct students in the linkage(s) between curriculum, instruction and assessment as they relate to state-approved student science academic standards.
  - 4.17(3)(k) effectively demonstrate for and instruct students about safety considerations in science instruction and in the science classroom including, but not limited to, proper use, storage and disposal or maintenance of biological, chemical and scientific equipment and specimens.
  - 4.17(3)(l) instruct and supervise students in the proper preparation and use of laboratory equipment and materials.
  - 4.17(3)(m) evaluate laboratory settings, equipment, materials and procedures to identify and manage the resolution of potential safety hazards.
  - 4.17(3)(n) provide solutions to equipment problems and be able to make minor adjustments in the operation of equipment.
  - 4.17(3)(o) incorporate into planning information related to state and federal regulations, legal issues and guidelines pertaining to scientific materials and specimens.
- 4.17(4) The science educator shall self-assess the effectiveness of instruction based on the achievement of students and pursue continuous professional development through appropriate activities, coursework and participation in relevant professional organizations.