

Pre-Kindergarten

Standard PKSa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills- curiosity, perseverance, and cooperation to conduct a simple scientific investigation.

Indicators:

- PKSa.1: Ask questions and use senses to explore objects and natural phenomena.
- PKSa.2: Use simple tools (including magnifiers, binoculars and droppers) safely to expand observational skills.
- PKSa.3: Describe objects or events based on observations and experiences.
- PKSa.4: Make comparisons among objects.
- PKSa.5: Use appropriate safety procedures when conducting investigations.

Kindergarten

Standard KSa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Indicators

KSa.1: Identify observed objects or events by using the senses.

KSa.2: Use tools (including magnifiers and eyedroppers) safely, accurately, and appropriately when gathering specific data.

KSa.3: Predict and explain information or events based on observation or previous experience.

KSa.4: Compare objects by using nonstandard units of measurement.

KSa.5: Use appropriate safety procedures when conducting investigations.

Grade 1

Standard 1Sa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Indicators

- 1Sa.1: Compare, classify, and sequence objects by number, shape, texture, size, color, and motion, using standard English units of measurement where appropriate.
- 1Sa.2: Use tools (including rulers) safely, accurately, and appropriately when gathering specific data.
- 1Sa.3: Carry out simple scientific investigations when given clear directions.
- 1Sa.4: Use appropriate safety procedures when conducting investigations.

Grade 2

Standard 2Sa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Indicators

- 2Sa.1: Carry out simple scientific investigations to answer questions about familiar objects and events.
- 2Sa.2: Use tools (including thermometers, rain gauges, balances, and measuring cups) safely, accurately, and appropriately when gathering specific data.
- 2Sa.3: Represent and communicate simple data and explanations through drawings, tables, pictographs, bar graphs, and oral and written language.
- 2Sa.4: Infer explanations regarding scientific observations and experiences.
- 2Sa.5: Use appropriate safety procedures when conducting investigations.

Grade 3

Standard 3Sa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Indicators

- 3Sa.1: Classify objects by two of their properties (attributes).
- 3Sa.2: Classify objects or events in sequential order.
- 3Sa.3: Generate questions such as “what if?” or “how?” about objects, organisms, and events in the environment and use those questions to conduct a simple scientific investigation.
- 3Sa.4: Predict the outcome of a simple investigation and compare the result with the prediction.
- 3Sa.5: Use tools (including beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes) safely, accurately, and appropriately when gathering specific data.
- 3Sa.6: Infer meaning from data communicated in graphs, tables, and diagrams.
- 3Sa.7: Explain why similar investigations might produce different results.
- 3Sa.8: Use appropriate safety procedures when conducting investigations.

Grade 4

Standard 4Sa: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Indicators

- 4Sa.1: Classify observations as either quantitative or qualitative.
- 4Sa.2: Use appropriate instruments and tools (including a compass, an anemometer, mirrors, and a prism) safely and accurately when conducting simple investigations.
- 4Sa.3: Summarize the characteristics of a simple scientific investigation that represent a fair test (including a question that identifies the problem, a prediction that indicates a possible outcome, a process that tests one manipulated variable at a time, and results that are communicated and explained).
- 4Sa.4: Distinguish among observations, predictions, and inferences.
- 4Sa.5: Recognize the correct placement of variables on a line graph.
- 4Sa.6: Construct and interpret diagrams, tables, and graphs made from recorded measurements and observations.
- 4Sa.7: Use appropriate safety procedures when conducting investigations.

Grade 5

Standard 5Sa: The student will demonstrate an understanding of scientific inquiry, including the foundations of technological design and the processes, skills, and mathematical thinking necessary to conduct a controlled scientific investigation.

Indicators

- 5Sa.1: Identify questions suitable for generating a hypothesis.
- 5Sa.2: Identify independent (manipulated), dependent (responding), and controlled variables in an experiment.
- 5Sa.3: Plan and conduct controlled scientific investigations, manipulating one variable at a time.
- 5Sa.4: Use appropriate tools and instruments (including a timing device and a 10x magnifier) safely and accurately when conducting a controlled scientific investigation.
- 5Sa.5: Construct a line graph from recorded data with correct placement of independent (manipulated) and dependent (responding) variables.
- 5Sa.6: Evaluate results of an investigation to formulate a valid conclusion based on evidence and communicate the findings of the evaluation in oral or written form.
- 5Sa.7: Use a simple technological design process to develop a solution or a product, communicating the design by using descriptions, models, and drawings.
- 5Sa.8: Use appropriate safety procedures when conducting investigations.

Grade 6

Standard 6Sa: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Indicators

6Sa.1 Use appropriate tools and instruments (including a spring scale, beam balance, barometer, and sling psychrometer) safely and accurately when conducting a controlled scientific investigation.

6Sa.2 Differentiate between observation and inference during the analysis and interpretation of data.

6Sa.3 Use a technological design process to plan and produce a solution to a problem or a product (including identifying a problem, designing a solution or a product, implementing the design, and evaluating the solution or the product).

6Sa.4 Use appropriate safety procedures when conducting investigations.

Grade 7

Standard 7Sa: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Indicators

- 7Sa.1: Use appropriate tools and instruments (including a microscope) safely and accurately when conducting a controlled scientific investigation.
- 7Sa.2: Generate questions that can be answered through scientific investigation.
- 7Sa.3: Explain the reasons for testing one independent variable at a time in a controlled scientific investigation.
- 7Sa.4: Explain the importance that repeated trials and a well-chosen sample size have with regard to the validity of a controlled scientific investigation.
- 7Sa.5: Explain the relationships between independent and dependent variables in a controlled scientific investigation through the use of appropriate graphs, tables, and charts.
- 7Sa.6: Critique a conclusion drawn from a scientific investigation.
- 7Sa.7: Use appropriate safety procedures when conducting investigations.

Grade 8

Standard 8Sa: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Indicators

- 8Sa.1: Design a controlled scientific investigation.
- 8Sa.2: Recognize the importance of a systematic process for safely and accurately conducting investigations.
- 8Sa.3: Construct explanations and conclusions from interpretations of data obtained during a controlled scientific investigation.
- 8Sa.4: Generate questions for further study on the basis of prior investigations.
- 8Sa.5: Explain the importance of and requirements for replication of scientific investigations.
- 8Sa.6: Use appropriate tools and instruments (including convex lenses, plane mirrors, color filters, prisms, and slinky springs) safely and accurately when conducting a controlled scientific investigation.
- 8Sa.7: Use appropriate safety procedures when conducting investigations.

Biology

Standard Ba: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators

- Ba.1: Generate hypotheses based on credible, accurate, and relevant sources of scientific information.
- Ba.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Ba.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Ba.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Ba.5: Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
- Ba.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Ba.7: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Ba.8: Compare the processes of scientific investigation and technological design.
- Ba.9: Use appropriate safety procedures when conducting investigations.

Chemistry

Standard: Ca: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- Ca.1: Apply established rules for significant digits, both in reading a scientific instrument and in calculating a derived quantity from measurement.
- Ca.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Ca.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Ca.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Ca.5: Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas, scientific notation, and dimensional analysis), graphs, models, and/or technology.
- Ca.6: Evaluate the results of a scientific investigation in terms of whether they verify or refute the hypothesis and what the possible sources of error are.
- Ca.7: Evaluate a technological design or product on the basis of designated criteria.
- Ca.8: Use appropriate safety procedures when conducting investigations.

Chemistry Applications

Standard: CAa: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- CAa.1: Apply established rules for significant digits, both in reading a scientific instrument and in calculating a derived quantity from measurement.
- CAa.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- CAa.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- CAa.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- CAa.5: Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.
- CAa.6: Evaluate the results of a scientific investigation in terms of whether they verify or refute the hypothesis and what the possible sources of error are.
- CAa.7: Evaluate a technological design or product on the basis of designated criteria.
- CAa.8: Use appropriate safety procedures when conducting investigations.

Earth and Space Science

Standard: ESa: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- ESa.1: Apply established rules for significant digits, both in reading scientific instruments and in calculating derived quantities from measurement.
- ESa.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- ESa.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- ESa.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- ESa.5: Organize and interpret the data from a controlled scientific investigation by using mathematics (including calculations in scientific notation, formulas, and dimensional analysis), graphs, tables, models, diagrams, and/or technology.
- ESa.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- ESa.7: Evaluate conclusions based on qualitative and quantitative data (including the impact of parallax, instrument malfunction, or human error) on experimental results.
- ESa.8: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- ESa.9: Communicate and defend a scientific argument or conclusion.
- ESa.10: Use appropriate safety procedures when conducting investigations.

Environmental Science

Standard: Ea: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- Ea.1: Generate hypotheses based on credible, accurate, and relevant sources of scientific information.
- Ea.2: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Ea.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Ea.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Ea.5: Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
- Ea.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Ea.7: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Ea.8: Compare the processes of scientific investigation and technological design.
- Ea.9: Use appropriate safety procedures when conducting investigations.

Marine Biology

Standard: Ma: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- Ma.1: Generate hypotheses based on credible, accurate, and relevant sources of scientific information.
- Ma.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Ma.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Ma.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Ma.5: Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
- Ma.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Ma.7: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Ma.8: Compare the processes of scientific investigation and technological design.
- Ma.9: Use appropriate safety procedures when conducting investigations.

Physics

Standard Pa: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- Pa.1: Apply established rules for significant digits, both in reading scientific instruments and in calculating derived quantities from measurement.
- Pa.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- Pa.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- Pa.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- Pa.5: Organize and interpret the data from a controlled scientific investigation by using (including calculations in scientific notation, formulas, and dimensional analysis), graphs, tables, models, diagrams, and/or technology.
- Pa.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- Pa.7: Evaluate conclusions based on qualitative and quantitative data (including the impact of parallax, instrument malfunction, or human error) on experimental results.
- Pa.8: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- Pa.9: Communicate and defend a scientific argument or conclusion.
- Pa.10: Use appropriate safety procedures when conducting investigations.

Physics Applications

Standard: PAa: The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.

Indicators:

- PAa.1: Generate hypotheses on the basis of credible, accurate, and relevant sources of scientific information.
- PAa.2: Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.
- PAa.3: Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
- PAa.4: Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
- PAa.5: Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.
- PAa.6: Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
- PAa.7: Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
- PAa.8: Compare the processes of scientific investigation and technological design.
- PAa.9: Use appropriate safety procedures when conducting investigations.