

Science

Grades 6-8

1. Students explain and apply the Catholic Church's teachings as they relate to issues in science.
2. Students identify themes, relationships, and characteristics that unify science concepts and principles.
 - A. Systems, order and organization
 - B. Evidence, models and explanation
 - C. Constancy, change, and measurement
 - D. Evolution and equilibrium
 - E. Form and function
3. Students demonstrate an understanding of scientific principles, which govern physical, life and earth sciences.
4. Students relate past scientific accomplishments and the evolution of theories to the process of a better understanding of the principles of our universe.
 - A. Science as a human endeavor
 - 1) Participate as individuals and teams in the scientific approach.
 - 2) Give examples of scientists currently making significant contributions to their field of study
 - 3) Recognize that both external factors such as society and culture, and internal factors such as personal beliefs and talents influence scientific endeavors
 - 4) Value diverse talents and perspectives
 - B. Historical perspective
 - 1) Recognize that many individuals from diverse cultures have made valuable contributions to the tradition of science.
 - 2) Conclude that changes in science occur as small modifications in extant knowledge.
 - 3) Identify those advances in science and technology that have had important and long-lasting effects on science and society.
 - 4) Value the historical perspective of scientific explanations, which demonstrate how scientific knowledge evolves over time.
5. Students demonstrate the ability to think critically, to pose significant questions, to draw conclusions, and to apply those conclusions to everyday life.
 - A. Nature of science
 - 1) Recognize different kinds of questions which guide different kinds of scientific investigations.
 - 2) Demonstrate the understanding that mathematics, technology and scientific techniques used in an experiment can limit or enhance accuracy of scientific knowledge.

3) Discuss the importance of mathematical relationships in science.

B. Understanding scientific inquiry

- 1) Discuss how scientific investigations and knowledge are enhanced through peer review, alternative explanations, and constructive criticism.
- 2) Communicate that scientific investigations sometimes result in new ideas for study, generate new methods of investigation, and develop new technologies to improve the collection of data.

C. Applications to everyday life

- 1) Use scientific knowledge to influence decisions about personal health.
- 2) Analyze the risks resulting from natural or man-made hazards including but not limited to overpopulation or environmental quality.

6. Students use appropriate skills, tools and technology to design and conduct scientific investigations and to draw conclusions from these investigations.

A. Abilities necessary to do scientific inquiry

- 1) Identify questions that can be answered through scientific inquiry.
- 2) Design and analyze investigations using appropriate tools, techniques and technology to gather, analyze and interpret data.
- 3) Acquire, process and interpret data
- 4) Identify dependent and independent variables and their relationships
- 5) Identify cause and effect
- 6) Control and manipulate variables
- 7) Develop hypotheses
- 8) Formulate models, tables, charts and graphs
- 9) Keep accurate records
- 10) Develop descriptions, explanations, predictions and models using evidence gained through scientific inquiry.
- 11) Think critically and logically to make the relationships between evidence and explanations.
- 12) Compare alternative explanations and predictions.
- 13) Communicate scientific procedures and explanations in a variety of forms, including oral, written and graphic.
- 14) Utilize appropriate safety procedures during all experiments.

B. Abilities of technological design

- 1) Identify a problem or design an opportunity.
- 2) Propose designs and choose alternative solutions.
- 3) Enhance the gathering and manipulation of data.
- 4) Implement a proposed solution.
- 5) Evaluate the solution and its consequences.
- 6) Communicate the problem, process and solution.

C. Understanding about science and technology

- 1) Explain how new technologies make advances in science possible.
 - 2) Recognize that creativity, imagination, and a good knowledge base are all required in the work of science and engineering.
 - 3) Relate the purpose of technology to solving human problems, helping humans adapt, and fulfilling human aspirations, while recognizing that technological solutions may create new problems.
 - 4) Recognize that technological knowledge is sometimes undisclosed because of patents and the financial potential of the ideas or invention.
7. Students communicate scientific information effectively in the written, graphic and verbal form, using technology when appropriate.
- A. Communication skills
 - 1) Illustrate and label diagrams.
 - 2) Record observations and data accurately.
 - 3) Communicate the results of scientific inquiry through logical arguments.
 - 4) Demonstrate written and graphic skills through lab reports, research papers, displays and projects.
 - 5) Demonstrate verbal skills through presentations.
 - B. Use of modern technology in communication

PHYSICAL SCIENCE

- A. Structure of atom
 - 1) Trace the historical development of the atomic model.
 - 2) Describe all matter as made of atoms, molecules, etc.
 - 3) Describe the structure of the atom, identify and characterize the measurable properties of each of the particles.
 - 4) Draw Bohr and Dot diagrams.
 - 5) Relate patterns in the periodic table to electron configurations.
 - 6) Define atomic number and mass and determine each from the periodic table.
- B. Structure and properties of matter.
 - 1) Describe the four states of matter.
 - 2) Relate the states of matter to the Kinetic Theory of Matter.
 - 3) Describe changes in states of matter.
 - 4) Distinguish between elements, compounds, and/or mixtures.
 - 5) Define ionic and covalent bonding.
 - 6) Distinguish between physical and chemical properties.
 - 7) Distinguish between physical and chemical changes.
 - 8) Show how mixtures are separated based upon physical properties and their components.
- C. Chemical reactions
 - 1) Compare and contrast ionic and covalent bonding.
 - 2) Classify compounds as organic or inorganic.

- 3) Recognize acids, bases, salts, and oxides in formulas and lab experiments.
 - 4) Balance and classify the four types of simple chemical equations.
- D. Force and motion.
- 1) Explore the relationships between distance, time, velocity, and acceleration.
 - 2) Make and interpret distance-time graphs.
 - 3) Illustrate the effect of force on motion as described by Newton's three laws.
 - a. First Law, property of inertia
 - b. Second Law, unbalanced force, friction, gravitational force
 - c. Third Law, momentum
 - 4) Distinguish between mass and weight.
 - 5) Calculate volume and density.
 - 6) Define centripetal force and relate it to motion in a curved path.
- E. Energy
- 1) Identify and compare mechanical (potential and kinetic), electrical, light, and nuclear energies.
 - 2) Relate different kinds of energy changes to the Law of Conservation of Energy and trace the path of energy changes and transfer.
 - 3) Recognize the sun as a major source of energy for changes on the earth's surface.
 - 4) Distinguish among conduction, convection, and radiation as forms of energy transfer.
 - 5) Explore alternative sources of energy.
- F. Light
- 1) Describe the different parts of the electromagnetic spectrum, especially in the visible range.
 - 2) Distinguish among opaque, translucent, and transparent materials.
 - 3) Relate wavelength of light reflected or absorbed to color of object.

LIFE SCIENCE

- A. Structure and function in living systems
- 1) Demonstrate an understanding of cell theory.
 - 2) Describe prokaryotic and eukaryotic cells.
 - 3) Compare structure and function of plant and animal cells
 - 4) Relate the following important levels of organization to structure and function: cells, tissue, organs, organ systems, whole organisms, ecosystems.
 - 5) Give an overview of cell processes.
 - 6) Explore and explain the interactions between the following organ systems: digestion, respiration, reproduction, circulation, excretion, movement, control and coordination.
- B. Heredity
- 1) Differentiate between asexual and sexual reproduction, listing specific organisms as examples of each.
 - 2) Relate heredity to an organism's required set of instructions for specifying its traits.

- 3) Explain the interrelationships between genes, chromosomes, and inherited traits, understanding that a human cell contains many thousands of different genes.
 - 4) Describe the characteristics of an organism in terms of a combination of traits, both inherited and those resulting from interactions with environment.
 - 5) Compare and contrast mitosis and meiosis.
- C. Biological evolution and the diversity of life
- 1) Through analysis of internal structures, chemical processes and evidence of common ancestry, describe the unity of apparently dissimilar species of animals, plants and microorganisms.
 - 2) Describe how biological evolution accounts for the diversity of species as developed through gradual processes over many generations.
 - 3) Relate biological evolution to the following biological adaptations that enhance survival and reproductive success: changes in structure, behaviors, and physiology.
 - 4) Through study of fossil records, explain how the extinction of a species occurs when the adaptive characteristics of a species are insufficient to keep pace with environmental changes.
 - 5) Use the techniques of classification to understand the distinctions among the kingdoms of life.
- D. Populations and ecosystems
- 1) Explain the following relationships among living organisms: competition, producer/consumer/decomposer, and predator/prey.
 - 2) Describe the factors that affect the growth and survival of populations within an ecosystem.
 - 3) Analyze ways by which matter and energy flow through an ecosystem.
- E. Regulation and behavior
- 1) Explain that all organisms must be able to obtain and use resources, grow reproduce, and maintain stable internal conditions while living in a constantly changing external environment.
 - 2) Describe the regulation of an organism's internal environment as it involves sensing the internal environment.
 - 3) Relate behavioral responses of an organism to both internal and external stimuli.
 - 4) Demonstrate an understanding that behavioral response is determined by heredity and experience.

EARTH AND SPACE SCIENCE

- A. Geology/Earth History
- 1) Label and describe the parts of the earth.
 - 2) Describe how the movement of lithospheric plates causes both slow changes in the earth's surface, such as mountain building, and rapid ones, such as earthquakes and volcanic eruptions.
 - 3) Explain the properties of minerals and classify rocks and minerals according to type.
 - 4) Identify the "rock cycle" as a pattern of changes in the solid earth resulting from several ongoing processes.

- 5) Investigate the components of soil and describe soil layers in terms of formation, chemical composition and texture.
 - 6) Describe how the fossil record shows the wide variety of organisms that have lived in the past and that many are now extinct.
- B. Meteorology and Atmosphere
- 1) Explain the stages of the water cycle as water circulates through the crust, oceans and atmosphere of the earth.
 - 2) Examine water's role as the universal solvent, tracing its route as it dissolves minerals and gases, then carrying them to the ocean.
 - 3) List the various components of the atmosphere and recognize that it has different properties at different elevations.
 - 4) Discuss the formation of clouds and how they affect weather and climate.
 - 5) Explain the relationship between air masses and fronts to weather.
 - 6) Describe the formation and characteristics of severe weather.
 - 7) Analyze the role of heat in global patterns of atmospheric movement and it's influence on local weather, recognizing that water in oceans holds a large amount of heat.
- C. Oceanography
- 1) Summarize the properties of ocean water.
 - 2) Identify the major regions of the ocean floor and classify their features.
 - 3) Identify and describe the three main groups of ocean organisms and the two ocean environments.
 - 4) Contrast surface and deep ocean currents and the factors that control them.
 - 5) Describe wave components and the formation and movement of ocean waves.
 - 6) Relate tides to the movement of the earth, moon and sun.
- D. Ecology and Conservation
- 1) Communicate how living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.
 - 2) Explore how human populations use resources in the environment in order to maintain and improve their existence.
 - 3) Recognize that the earth does not have infinite resources; increasing human consumption depletes resources that cannot be renewed
 - 4) Investigate factors that influence environmental quality. Factors that may be explored include population growth, resource use, population distribution, overconsumption, the capacity of technology to solve problems, poverty, the role of economic, political, and religious views, and different ways humans view the earth.
- E. The Universe
- 1) Describe the earth and other objects in the solar system.
 - 2) Identify the role of gravity, both in forming planets and stars and maintaining the orbit of objects in the solar system.
 - 3) Relate eclipses, phases of the moon and tides to the relative positions of the earth, moon and sun.
 - 4) Apply scale to models of the solar system.
 - 5) Compare the composition, size and orbital motion of objects in the solar system.

- 6) Describe the components of the universe, including galaxies, stars, comets, meteors and space dust and their apparent relationships, including membership in systems, effects on each other, relative size distance and motion.