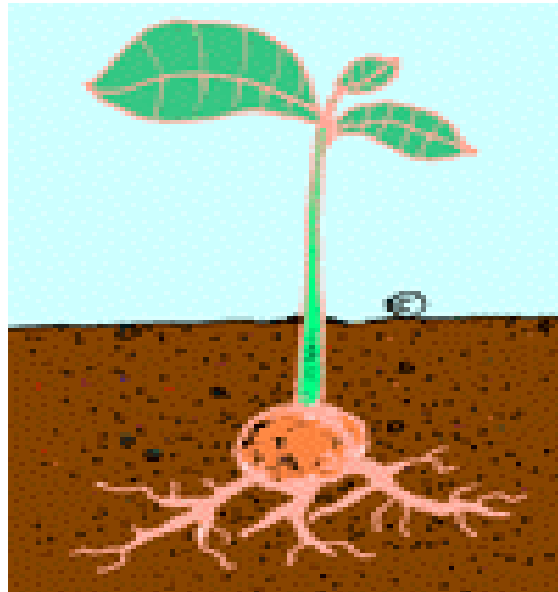


Grade 8 Science and Technology Standards



Based on the Massachusetts Curriculum Frameworks and the Quincy Public Schools Design for Learning 2000

Grade 8 Science and Technology Standards

STRAND #1: INQUIRY		
State Standards		Grade 8 Objectives
Science and Technology		
1.	Apply Multiple Lines of Inquiry to Address and Analyze Questions	<ul style="list-style-type: none"> Evaluate the deciding factors that determine which type of scientific inquiry will be used to answer a given scientific investigation.
2.	Design an Investigation or Problem Specifying Variables to be Changed, Controlled, and Measured	<ul style="list-style-type: none"> Independently design a scientific inquiry to further the understanding of a given area of science. Publish results of a scientific inquiry. Conduct scientific inquiries in each of the scientific domains. Self-evaluate the procedures using a rubric.
3.	Use More Complex Tools to Make Observations, Gather, and Represent Quantitative Data	<ul style="list-style-type: none"> Evaluate the advantages and disadvantages of scientific tools over others.
4.	Describe Trends in Data Even When Patterns are Not Exact	<ul style="list-style-type: none"> Explain what must happen have sound data and conclusions.
5.	Reformulate Ideas and Technological Solutions Based on Evidence	<ul style="list-style-type: none"> Restate scientific question to reinvestigate a problem. Compare and contrast conclusions between the first 2nd cycles of an investigation. Compare and contrast findings with other investigations conducted on the same scientific question.
6.	Analyze Alternative Explanations and Procedures	<ul style="list-style-type: none"> Evaluate different investigations conducted on same scientific question. State the degree of difference between more than one investigation conducted on same scientific question.
7.	Represent Data and Findings Using Graphics	<ul style="list-style-type: none"> Demonstrate the ability to represent data.
8.	<p>Communicate Ideas and Questions Generated and Suggest Improvements or Alternatives to the Experimental Techniques Used.</p> <p>Communicate the Idea That There is More Than One Solution to a Technological Problem.</p>	<ul style="list-style-type: none"> Evaluate scientific investigations that use alternative protocols and find different conclusions.

Grade 8 Science and Technology Standards

STRAND #2: DOMAINS OF SCIENCE		
	State Standards	Grade 8 Objectives
Physical Science		
1.	Properties of Matter	<ul style="list-style-type: none"> • Assess the properties of materials. • Determine the most efficient procedure to complete an analysis. • Observe and describe PHysical traits of samples. • Determine the actual measurement. • Calculate data. • Interpret the results. • State valid conclusions. • Present results in an accurate and logical manner. • Determine the atomic make-up and arrangement of electrons, in orbits and suborbital. • Distinguish the elements on the Periodic Table in groups IA, IIA, and VIIA in a laboratory setting. • Determine and create chemical formulas using oxidation numbers (valence). • Separate compounds by their PHysical properties. • Differentiate acids from bases using PH, litmus paper, and PH meter. • Determine the actual strength of acids and bases. • Explain the Law of Conservation of Matter and Energy. • Prove the Law of Conservation of Matter in a laboratory setting. • Identify the chemical change in a substance. • Determine the energy change in a substance. • Demonstrate an understanding that matter is neither created nor destroyed in an ordinary chemical reaction. • Design and defend an experiment to prove the conservation of mass. • Identify and explain changes in properties of matter. • Use measuring equipment to determine the properties of matter. • Conduct calculations using formulas. • Explain distributed nature of pressure, effects of temperature on expansion and contraction, change in pressure due to weight, depth, etc.

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STRAND #2: DOMAINS OF SCIENCE		
State Standards		Grade 8 Objectives
Physical Science		
2.	Particulate Model of Matter	<ul style="list-style-type: none"> • Demonstrate an understanding of electrons in the outermost shell and their use in determining valance for the chemical combinations of elements to form compounds. • Determine accurate count of each atom in a molecule or compound. • Determine the molecular weight using the periodic table. • Illustrate a diagram of the Bohr atom from given atomic information. • Demonstrate an understanding of specific energy levels within the shell (s,p,d,f). • Demonstrate and interpret the Kinetic Molecular Theory as related to temperature and PHases of matter.
3.	Motions and Changes in Motion	<ul style="list-style-type: none"> • Distinguish between different types of forces. • Show and explain what happens to a body that undergoes each of the following: friction, inertia, force, motion, gravity. • Demonstrate an understanding that $F= ma$ and that as "a" increases, "F" increases (directly proportional). • Differentiate between speed and velocity, mass and weight. • Demonstrate understanding that a force in one direction generates an equal force in the opposite direction. • Demonstrate an understanding that all matter in the universe exerts force on all other matter in the universe.

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STRAND #2: DOMAINS OF SCIENCE		
	State Standards	Grade 8 Objectives
Physical Science		
4.	Transformations of Energy	<ul style="list-style-type: none"> Demonstrate understanding that energy can be changed from one form to another. Demonstrate understanding that heat is the total amount of energy contained within a certain mass and temperature is the measurement of the motion of molecules in the matter. Demonstrate understanding that the addition or removal of heat will lead to PHase changes in the states of matter. Distinguish between "c" calorie and "C" Calorie (food calorie). Know that it takes one (1) calorie to increase 1 gram of water by 1 degree C. Realize that heat travels in different modes, depending on the medium. Know that the energy is related to the wavelength. Recognize that the strength of energy is defined by the height of the wave. Explain and provide examples of absorption, reflection, refractions, and scattering of light. Distinguish between the effect that concave and convex lenses have on light and the images that they produce.

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STRAND #2: DOMAINS OF SCIENCE		
State Standards		Grade 8 Objectives
Life Sciences		
1.	Characteristics of Living Things	<ul style="list-style-type: none"> • Compare, contrast, and explain the processes of osmosis, diffusion, and active transport. • Discuss the processes of photosynthesis, respiration, and metabolism. • Discuss the specific characteristics of various living things. • Explain the structure and function of the nervous, endocrine, and immune systems. • Describe the transfer of disease, including communicable/non-communicable diseases, infectious diseases, deficiency diseases, and immunity (both natural/acquired). • Discuss the interdependence of body systems with regard to a healthy organism.
2.	Cells	<ul style="list-style-type: none"> • Explain the theories of cell origin. • Identify the scientists that developed cell theory. • Identify the organelles of the cell and their functions. • Compare and contrast the specific differences between plant and animal cells. • Explain the term "structure determines function." • Draw, label, and explain a "typical cell" and its organelles. • Illustrate and describe the phases of mitosis. • Discuss the ramifications of abnormal cell division. • Describe the process of meiosis and its importance in sexual reproduction. • Compare and contrast the processes of meiosis and mitosis.

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STRAND #2: DOMAINS OF SCIENCE		
	State Standards	Grade 8 Objectives
Life Sciences		
3.	Heredity and Reproduction	<ul style="list-style-type: none"> • Define genetics. • Demonstrate an understanding that human characteristics have their basis in genetics. • Explain how human traits are inherited. • Discuss gender-linked traits that are inherited. • Discuss Gregor Mendel's contributions. • Explain why human sperm and egg cells carry 23 chromosomes. • Demonstrate understanding that the structure of the DNA molecule and its replication and duplication. • Demonstrate understanding that family traits are passed on to offspring in various combinations. • Explain the significance of dominant and recessive genes. • Explain incomplete dominance and codominance. • Illustrate a Punnet Square and its use in predicting heredity. • Explain the difference between phenotype and genotype. • Explain the difference between homogeneous and heterogeneous genes. • Explain how some characteristics of parents are passed on to offspring but others are not as a result of inherited dominant and recessive genes. • Explain how variations in offspring can result from the same two parents, which leads to variation in populations of the same species. • Describe the difference between a hybrid and purebred organisms. • Discuss genetic mutations that can lead to genetic diseases, i.e. cancer.

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STRAND #2: DOMAINS OF SCIENCE		
State Standards		Grade 8 Objectives
Earth Science		
1.	Interactions and Cycles the Earth System	<ul style="list-style-type: none"> • Describe the mechanism of plate movement with respect to convection in the upper mantle and lower crust. • Interpret the relationship among volcanism, earthquakes, and mountain buildings as they relate to the Theory of Plate Tectonics. • Explain changes of the Earth's features created by both continental and oceanic tectonic plate movement. • Describe and explain the rock cycle. • Describe conditions under which igneous, sedimentary, and metamorphic rocks form. • Analyze the various ways in which water, air, and land interact to create the environmental conditions of Earth. • Using models, demonstrate and explain how the revolution and the tilt of the earth cause the seasons. • Using models, demonstrate and explain how the rotation of the Earth on its axis every 24 hours results in day and night. • Explain theories for the salinity of the ocean. • List physical, chemical, and biological features of the ocean. • Identify the major ocean currents and predict the influence on the Earth's climate. • Describe the role of clouds in relation to radiation, filtering reflection, and absorption of sunlight on the Earth. • Identify sources of atmosphere and ocean pollution. • Describe the relationship between the carbon cycle and the atmosphere and material.
2.	Earth's History	<ul style="list-style-type: none"> • Explain the distribution of fossils as one piece of evidence supporting Wegener's theory of continental drift. • Cite other evidence, including the shape of continents and rock formations as evidence of Wegener's theory. • Interpret changes in geological history. • Use geological time scales to show how life and environmental conditions have changed over time.

Grade 8 Science and Technology Standards

STRAND #2: DOMAINS OF SCIENCE		
	State Standards	Grade 8 Objectives
Earth Science		
3.	Earth and Space	<ul style="list-style-type: none"> Define magnification. Explain how a telescope operates using both concave and convex lenses. Explain why the Earth appears to be the only planet to sustain life. Explain the moon's influence on tides. Compare and contrast a lunar eclipse with a solar eclipse. Explain why the same side of the moon is always facing Earth. List the phases of the moon as they appear during a lunar cycle. Explain Newton's Law of Universal Gravitation. Describe the forces of work on orbiting bodies. Define inertia and electrical forces. Explain Kepler's Laws of planetary motion.

Grade 8 Science and Technology Standards

STRAND #3: TECHNOLOGY		
State Standards		Grade 8 Objectives
Design Process		
1.	Make a Plan for Building a Device Considering the Limitations of the Material. Include Multiple Views.	<ul style="list-style-type: none"> • Select a design to implement. • List materials and technology needed for the design. • Draw an accurate and scale model of the design. • Make a three dimensional model to scale.
2.	Evaluate Design, Devices or Solutions and Develop Measures of Quality	<ul style="list-style-type: none"> • Evaluate the design.
3.	Communicate the Process of Technological Design	<ul style="list-style-type: none"> • Develop a design presentation for an audience. Include statement of problem, steps involved in design, displaying 3-D model, and evaluation of design.

STRAND #3: TECHNOLOGY		
State Standards		Grade 8 Objectives
Nature of Engineering		
1.	Understanding Technology as a System	<ul style="list-style-type: none"> • List the steps of the design. • Explain the design process.
2.	Bioengineering Systems	<ul style="list-style-type: none"> • Recognize a problem in agriculture or human physiology. • Define the term Bioengineering. • Discuss the role of research and development in bioengineering. • Design a device to overcome the stated problem.
3.	Designing a Product	<ul style="list-style-type: none"> • Design a product that is useful to humankind using engineering or scientific principles.
4.	Produce, Use, Evaluate, and Improve the Product	<ul style="list-style-type: none"> • Design the product. • Produce a prototype as designed. • Test/evaluate a given prototype as designed. • Suggest/make refinement in the prototype.
5.	Document Design Process	<ul style="list-style-type: none"> • Maintain and update a portfolio of all design aspects. • Produce 3- D drawings of product. • Produce written documentation of design and production.
6.	Engineering Presentation	<ul style="list-style-type: none"> • Make an oral presentation of the product. • Support presentation with drawings, graphs, and written documentation. • Utilize various media in presentation.

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STRAND #3: TECHNOLOGY		
State Standards		Grade 8 Objectives
Understanding and Using Technology in Society		
1.	Resources of Technology	<ul style="list-style-type: none"> • Explain how the choice of materials depends on their properties, characteristics, and interaction with other materials. • Explain why certain materials are useful. Give examples.
2.	Technological Areas	<ul style="list-style-type: none"> • Identify the processes used in construction: site preparation, building, and finishing the structure. • Describe limited energy sources. • Describe unlimited energy sources. • Describe renewable energy sources.