# QUEENS ACADEMY HIGH SCHOOL

## DEPARTMENT OF SCIENCE

### Earth Science Regents Prep Curriculum

**Course Description**
The New York State Earth Science Regents Examination is a standardized assessment test that all students in New York State must pass along with one other science Regents Exam in order to graduate from high school with a Regents diploma. In addition, the Earth Science Regents exam requires students to demonstrate their proficiency on a performance-based, laboratory exam. Students must demonstrate their knowledge of Earth science in three primary areas of study. These include astronomy; meteorology and climate; and geology, geologic history, plate tectonics, earthquakes and volcanoes.

**Textbooks**
There are three books used in this class. They are:

Callister, J., (2002). *Brief review in Earth science: The physical setting*. Glenview, Illinois: Prentice Hall.

Exline, J., Pasachoff, J., Brooks Simons, B., Garbuny Vogel, C., & Wellnitz, T., (2002). *Science explorer: Earth science.* Upper Saddle River, NJ: Prentice Hall.

Tarbuck, E., & Lutgens, F., (2006). *New York: Physical setting/Earth science*. Upper Saddle River, New Jersey: Pearson Prentice-Hall.

In addition, The Baron's review book for Earth science is very strongly recommended for all students taking the Regents exam.

**Materials**
Every student is expected to have their own annotated copy of the Earth Science Reference Tables available in each class and laboratory session. Students will also need a basic, 4-function calculator to complete homework assignments. Additional materials such as rulers, compasses, and protractors will be supplied to the students as needed.

**Assessment**
Students will be assessed on their ability to answer multiple choice and constructed-response questions. In addition, students must demonstrate their ability to successfully graph a table of data; read and interpret graphs; construct isolines and calculate gradients; read maps and locate points using latitude and longitude; construct profiles from topographic maps; and diagram, label and explain processes such as convection and high pressure air movements. Some of these are authentic assessments such as GRASPS activities. These assessments are done on an on-going basis and include baseline, formative and summative. Students are required to demonstrate mastery of basic skills in the laboratory portion of the class. These

skills include, but are not limited to using lab equipment to make measurements of mass, volume and density. Lastly, students must demonstrate their skill in using the Earth Science reference tables to locate and interpret information from this 16-page document. *Approximately 40% of all Regents exam questions come directly from the reference tables.*

**Topics to be Covered and Pacing Schedule**

**Unit 1: Maps and Measurement (17 days)**
- Short introduction of origin of Earth
- Measurements, reference tables, graphing
- Locating points on Earth: latitude and longitude
- Isomaps (topographic maps)
- GPS

**Unit 2: Dynamic Earth (18 days)**
- Structure of Earth and properties
- Convection cycles and density
- Evidence of movement
- Plate tectonics
- Earthquakes, Volcanoes, Tsunamis

**Unit 3: Rocks and Minerals (15 days)**
- Minerals
- Igneous rocks
- Sedimentary rocks
- Metamorphic rocks
- Mining and natural resources

**Unit 4: Landscapes (30 days)**
- Water cycle
- Hydrology
- Weathering agents
- Erosion and Deposition
- Soils
- Real world applications – agriculture, mudslides

**Unit 5: Earth History (12 days)**
- Fossils
- Geologic time
- Stratigraphy
- Radioactive dating

**Unit 6: Insolation (13 days)**
- Arc of sun’s travel
- Seasons
- Energy exchanges in the atmosphere

**Unit 7: Meteorology (17 days)**
- Systems
- Models
- Weather variables

**Unit 8: Climate (10 days)**
- Factors affecting climate
- Water budget
- Global warming

**Unit 9: Astronomy (17 days)**
- Phases of the moon
- Solar system
- Tides
- Celestial Observations
- Hertzsprung-Russell Diagrams

**Review (10 days)**
- Regents Exam preparation

**<u>New York State Standards for Math, Science and Technology</u>**
Including the Earth Science Core Curriculum with key ideas and performance indicators for Standard 4 (Science).

**<u>Standard 1- Analysis, Inquiry and Design-</u>**
Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

***<u>Mathematical Analysis</u>***
**Key Idea 1**- Abstraction and symbolic representation are used to communicate mathematically. For example:
- ➢ Use eccentricity, rate, gradient, standard error of measurement, and density in context.

**Key Idea 2**-Deductive and inductive reasoning are used to reach mathematical conclusions. For example:
- ➢ Determine the relationships among: velocity, slope, sediment size, channel shape, and volume of a stream.
- ➢ Understand the relationships among: the planets' distance from the Sun, gravitational force, period of revolution, and speed of revolution.

**Key Idea 3**-Critical thinking skills are used in the solution of mathematical problems. For example:
- ➢ In a field, use isolines to determine a source of pollution.

***<u>Scientific Inquiry</u>***
**Key Idea 1**- The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process. For example:

- Show how our observation of celestial motions supports the idea of stars moving around a stationary Earth (the geocentric model), but further investigation has led scientists to understand that most of these changes are a result of Earth's motion around the Sun (the heliocentric model).

**Key Idea 2**- Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity. For example:
- Test sediment properties and the rate of deposition.

**Key Idea 3**- Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity. For example:
- Determine the changing length of a shadow based on the motion of the Sun.

***Engineering Design***
**Key Idea 1**- Engineering design is an iterative process involving modeling and optimization finding the best solution within given constraints which is used to develop technological solutions to problems within given constraints. For example:
- After experimenting with conduction of heat (using calorimeters and aluminum bars), make recommendations to create a more efficient system of heat transfer.
- Determine patterns of topography and drainage around your school and design solutions to effectively deal with runoff.

**Standard 2 - Information systems**-
Students will access, generate, process, and transfer information, using appropriate technologies.
**Key Idea 1**- Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning. For example:
- Analyze weather maps to predict future weather events.
- Use library or electronic references to obtain information to support a laboratory conclusion.

**Key Idea 2**- Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use. For example:
- Obtain printed or electronic materials which exemplify miscommunication and/or misconceptions of current commonly accepted scientific knowledge.

**Key Idea 3**- Information technology can have positive and negative impacts on society, depending upon how it is used. For example:
- Discuss how early warning systems can protect society and the environment from natural disasters such as hurricanes, tornadoes, earthquakes, tsunamis, floods, and volcanoes.

**Standard 3 - Mathematics**-
Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically, by applying mathematics in real-world settings, and by solving problems through the integrated study of number systems, geometry, algebra, data analysis, probability, and trigonometry.

***Mathematical Reasoning***
**Key Idea 1**-

Students use mathematical reasoning to analyze mathematical situations, make conjectures, gather evidence, and construct an argument.

***Number and Numeration***
**Key Idea 2-** Students use number sense and numeration to develop an understanding of the multiple uses of numbers in the real world, the use of numbers to communicate mathematically, and the use of numbers in the development of mathematical ideas.

***Operations***
**Key Idea 3**- Students use mathematical operations and relationships among them to understand mathematics.

***Modeling, Multiple representation***
**Key Idea 4-** Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.

***Measurement***
**Key Idea 5**- Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.

***Uncertainty***
**Key Idea 6**- Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.

***Patterns and functions***
**Key Idea 7**- Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently.

**Standard 4 - Science-*The Physical Setting***
Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

**Key Idea 1**-The Earth and celestial phenomena can be described by principles of relative motion and perspective.

**Performance Indicator 1.1**- Explain complex phenomena, such as tides, variations in day length, solar insolation, apparent motion of the planets, and annual traverse of the constellations.

**Major Understandings:**
**1.1a**- Most objects in the solar system are in regular and predictable motion.
- These motions explain such phenomena as the day, the year, seasons, phases of the moon, eclipses, and tides.
- Gravity influences the motions of celestial objects. The force of gravity between two objects in the universe depends on their masses and the distance between them.

**1.1b**- Nine planets move around the Sun in nearly circular orbits.
- The orbit of each planet is an ellipse with the Sun located at one of the foci.
- Earth is orbited by one moon and many artificial satellites.

**1.1c**- Earth's coordinate system of latitude and longitude, with the equator and prime meridian as reference lines, is based upon Earth's rotation and our observation of the Sun and stars.

**1.1d**- Earth rotates on an imaginary axis at a rate of 15 degrees per hour. To people on Earth, this turning of the planet makes it seem as though the Sun, the moon, and the stars are moving around Earth once a day. Rotation provides a basis for our system of local time; meridians of longitude are the basis for time zones.

**1.1e**- The Foucault pendulum and the Coriolis Effect provide evidence of Earth's rotation.

**1.1f**- Earth's changing position with regard to the Sun and the moon has noticeable effects.
- Earth revolves around the Sun with its rotational axis tilted at 23.5 degrees to a line perpendicular to the plane of its orbit, with the North Pole aligned with Polaris.
- During Earth's one-year period of revolution, the tilt of its axis results in changes in the angle of incidence of the Sun's rays at a given latitude; these changes cause variation in the heating of the surface. This produces seasonal variation in weather.

**1.1g**- Seasonal changes in the apparent positions of constellations provide evidence of Earth's revolution.

**1.1h**- The Sun's apparent path through the sky varies with latitude and season.

**1.1i**- Approximately 70 percent of Earth's surface is covered by a relatively thin layer of water, which responds to the gravitational attraction of the moon and the Sun with a daily cycle of high and low tides.

**Performance Indicator 1.2-** Describe current theories about the origin of the universe and solar system.

**Major Understandings:**
**1.2a**-The universe is vast and estimated to be over ten billion years old. The current theory is that the universe was created from an explosion called the Big Bang. Evidence for this theory includes cosmic background radiation and a red-shift (the Doppler Effect) in the light from very distant galaxies.

**1.2b**- Stars form when gravity causes clouds of molecules to contract until nuclear fusion of light elements into heavier ones occurs. Fusion releases great amounts of energy over millions of years.
- The stars differ from each other in size, temperature, and age.
- Our Sun is a medium-sized star within a spiral galaxy of stars known as the Milky Way. Our galaxy contains billions of stars, and the universe contains billions of such galaxies.

**1.2c**- Our solar system formed about five billion years ago from a giant cloud of gas and debris. Gravity caused Earth and the other planets to become layered according to density differences in their materials.

- The characteristics of the planets of the solar system are affected by each planet's location in relationship to the Sun.
- The terrestrial planets are small, rocky, and dense. The Jovian planets are large, gaseous, and of low density.

**1.2d**- Asteroids, comets, and meteors are components of our solar system

- Impact events have been correlated with mass extinction and global climatic change.
- Impact craters can be identified in Earth's crust.

**1.2e**- Earth's early atmosphere formed as a result of the outgassing of water vapor, carbon dioxide, nitrogen, and lesser amounts of other gases from its interior.

**1.2f**- Earth's oceans formed as a result of precipitation over millions of years. The presence of an early ocean is indicated by sedimentary rocks of marine origin, dating back about four billion years.

**1.2g**- Earth has continuously been recycling water since the outgassing of water early in its history. This constant recirculation of water at and near Earth's surface is described by the hydrologic (water) cycle.

- Water is returned from the atmosphere to Earth's surface by precipitation. Water returns to the atmosphere by evaporation or transpiration from plants. A portion of the precipitation becomes runoff over the land or infiltrates into the ground to become stored in the soil or groundwater below the water table. Soil capillarity influences these processes.
- The amount of precipitation that seeps into the ground or runs off is influenced by climate, slope of the land, soil, rock type, vegetation, land use, and degree of saturation.
- Porosity, permeability, and water retention affect runoff and infiltration.

**1.2h**- The evolution of life caused dramatic changes in the composition of Earth's atmosphere. Free oxygen did not form in the atmosphere until oxygen-producing organisms evolved.

**1.2i**- The pattern of evolution of life-forms on Earth is at least partially preserved in the rock record.

- Fossil evidence indicates that a wide variety of life-forms has existed in the past and that most of these forms have become extinct.
- Human existence has been very brief compared to the expanse of geologic time.

**1.2j**- Geologic history can be reconstructed by observing sequences of rock types and fossils to correlate bedrock at various locations.

- The characteristics of rocks indicate the processes by which they formed and the environments in which these processes took place.
- Fossils preserved in rocks provide information about past environmental conditions.
- Geologists have divided Earth history into time units based upon the fossil record.

- Age relationships among bodies of rocks can be determined using principles of original horizontality, superposition, inclusions, cross-cutting relationships, contact metamorphism, and unconformities. The presence of volcanic ash layers, index fossils, and meteoritic debris can provide additional information.
- The regular rate of nuclear decay (half-life time period) of radioactive isotopes allows geologists to determine the absolute age of materials found in some rocks.

**Key Idea 2**-Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

**Performance Indicator 2.1**- Use the concepts of density and heat energy to explain observations of weather patterns, seasonal changes, and the movements of Earth's plates.

**Major Understandings:**
**2.1a**- Earth systems have internal and external sources of energy, both of which create heat.

**2.1b**- The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's interior results in the formation of regions of different densities. These density differences result in motion.

**2.1c**- Weather patterns become evident when weather variables are observed, measured, and recorded. These variables include air temperature, air pressure, moisture (relative humidity and dewpoint), precipitation (rain, snow, hail, sleet, etc.), wind speed and direction, and cloud cover.

**2.1d**- Weather variables are measured using instruments such as thermometers, barometers, psychrometers, precipitation gauges, anemometers, and wind vanes.

**2.1e**- Weather variables are interrelated. For example:

- Temperature and humidity affect air pressure and probability of precipitation.
- Air pressure gradient controls wind velocity.

**2.1f**- Air temperature, dewpoint, cloud formation, and precipitation are affected by the expansion and contraction of air due to vertical atmospheric movement.

**2.1g**- Weather variables can be represented in a variety of formats including radar and satellite images, weather maps (including station models, isobars, and fronts), atmospheric cross-sections, and computer models.

**2.1h**- Atmospheric moisture, temperature and pressure distributions; jet streams, wind; air masses and frontal boundaries; and the movement of cyclonic systems and associated tornadoes, thunderstorms, and hurricanes occur in observable patterns. Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness.

**2.1i**- Seasonal changes can be explained using concepts of density and heat energy. These changes include the shifting of global temperature zones, the shifting of planetary wind and ocean current patterns, the occurrence of monsoons, hurricanes, flooding, and severe weather.

**2.1j**- Properties of Earth's internal structure (crust, mantle, inner core, and outer core) can be inferred from the analysis of the behavior of seismic waves (including velocity and refraction).

- Analysis of seismic waves allows the determination of the location of earthquake epicenters, and the measurement of earthquake magnitude; this analysis leads to the inference that Earth's interior is composed of layers that differ in composition and states of matter.

**2.1k**- The outward transfer of Earth's internal heat drives convective circulation in the mantle that moves the lithospheric plates comprising Earth's surface.

**2.1l**- The lithosphere consists of separate plates that ride on the more fluid asthenosphere and move slowly in relationship to one another, creating convergent, divergent, and transform plate boundaries. These motions indicate Earth is a dynamic geologic system.

- These plate boundaries are the sites of most earthquakes, volcanoes, and young mountain ranges.
- Compared to continental crust, ocean crust is thinner and denser. New ocean crust continues to form at mid-ocean ridges.
- Earthquakes and volcanoes present geologic hazards to humans. Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness.

**2.1m**- Many processes of the rock cycle are consequences of plate dynamics. These include the production of magma (and subsequent igneous rock formation and contact metamorphism) at both subduction and rifting regions, regional metamorphism within subduction zones, and the creation of major depositional basins through down-warping of the crust.

**2.1n**-1n Many of Earth's surface features such as mid-ocean ridges/rifts, trenches/subduction zones/island arcs, mountain ranges (folded, faulted, and volcanic), hot spots, and the magnetic and age patterns in surface bedrock are a consequence of forces associated with plate motion and interaction.

**2.1o**- Plate motions have resulted in global changes in geography, climate, and the patterns of organic evolution.

**2.1p**- Landforms are the result of the interaction of tectonic forces and the processes of weathering, erosion, and deposition

**2.1q**- Topographic maps represent landforms through the use of contour lines that are isolines connecting points of equal elevation. Gradients and profiles can be determined from changes in elevation over a given distance.

**2.1r**- Climate variations, structure, and characteristics of bedrock influence the development of landscape features including mountains, plateaus, plains, valleys, ridges, escarpments, and stream drainage patterns.

**2.1s**- Weathering is the physical and chemical breakdown of rocks at or near Earth's surface. Soils are the result of weathering and biological activity over long periods of time.

**2.1t**- Natural agents of erosion, generally driven by gravity, remove, transport, and deposit weathered rock particles. Each agent of erosion produces distinctive changes in the material that it transports and creates characteristic surface features and landscapes. In certain erosional situations, loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness.

**2.1u**- The natural agents of erosion include:
*Streams (running water*): Gradient, discharge, and channel shape influence a stream's velocity and the erosion and deposition of sediments. Sediments transported by streams tend to become rounded as a result of abrasion. Stream features include V-shaped valleys, deltas, flood plains, and meanders. A watershed is the area drained by a stream and its tributaries.

*Glaciers (moving ice):* Glacial erosional processes include the formation of U-shaped valleys, parallel scratches, and grooves in bedrock. Glacial features include moraines, drumlins, kettle lakes, finger lakes, and outwash plains.

*Wave Action*: Erosion and deposition cause changes in shoreline features, including beaches, sandbars, and barrier islands. Wave action rounds sediments as a result of abrasion. Waves approaching a shoreline move sand parallel to the shore within the zone of breaking waves.

*Wind:* Erosion of sediments by wind is most common in arid climates and along shorelines. Wind-generated features include dunes and sand-blasted bedrock.

*Mass Movement:* Earth materials move downslope under the influence of gravity.

**2.1v**-Patterns of deposition result from a loss of energy within the transporting system and are influenced by the size, shape, and density of the transported particles. Sediment deposits may be sorted or unsorted.

**2.1w**- Sediments of inorganic and organic origin often accumulate in depositional environments. Sedimentary rocks form when sediments are compacted and/or cemented after burial or as the result of chemical precipitation from seawater.

**Performance indicator 2.2**- Explain how incoming solar radiation, ocean currents, and land masses affect weather and climate.

**Major Understandings:**
**2.2a**- Insolation (solar radiation) heats Earth's surface and atmosphere unequally due to variations in: the intensity, characteristics of the materials absorbing the energy, duration.

- The intensity caused by differences in atmospheric transparency and angle of incidence which vary with time of day, latitude, and season
- Characteristics of the materials absorbing the energy such as color, texture, transparency, state of matter, and specific heat
- Duration, which varies with seasons and latitude.

**2.2b**- The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's surface occurs as the result of radiation, convection, and conduction.

- Heating of Earth's surface and atmosphere by the Sun drives convection within the atmosphere and oceans, producing winds and ocean currents.

**2.2c**- A location's climate is influenced by latitude, proximity to large bodies of water, ocean currents, prevailing winds, vegetative cover, elevation, and mountain ranges.

**2.2d**- Temperature and precipitation patterns are altered by natural events, human influences including deforestation, urbanization, and the production of greenhouse gases such as carbon dioxide and methane.

- Natural events such as El Nino and volcanic eruptions
- Human influences including deforestation, urbanization, and the production of green-house gases such as carbon dioxide and methane.

**Key Idea 3**-Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

**Performance indicator 3.1**- Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them.

**Major Understandings:**

**3.1a**- Minerals have physical properties determined by their chemical composition and crystal structure.

- Minerals can be identified by well-defined physical and chemical properties, such as cleavage, fracture, color, density, hardness, streak, luster, crystal shape, and reaction with acid.
- Chemical composition and physical properties determine how minerals are used by humans.

**3.1b**- Minerals are formed inorganically by the process of crystallization as a result of specific environmental conditions.

- Cooling and solidification of magma.
- Precipitation from water caused by such processes as evaporation, chemical reactions, and temperature changes.
- Rearrangement of atoms in existing minerals subjected to conditions of high temperature and pressure.

**3.1c**- Rocks are usually composed of one or more minerals.

- Rocks are classified by their origin, mineral content, and texture.
- Conditions that existed when a rock formed can be inferred from the rock's mineral content and texture.
- The properties of rocks determine how they are used and also influence land usage by humans.

**Key Idea 4**-Energy exists in many forms, and when these forms change energy is conserved.

**Key Idea 5**-Energy and matter interact through forces that result in changes in motion.

**<u>Standard 5-Technology</u>**

**Key Idea 1** - Engineering design- 1. Engineering design is an iterative process involving *modeling* and *optimization* used to develop technological solutions to problems within given constraints.

**Key Idea 2**- Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological processes change energy, information, and material resources into more useful forms.

**Key Idea 3**-Computer technology-Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

**Key Idea 4**-Technological systems- Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

**Key Idea 5**-History and evolution of technology- Technology has been the driving force in the evolution of society from an agricultural to an industrial to an information base.

**Key Idea 6**-Impacts of technology- Technology can have positive and negative impacts on individuals, society, and the environment and humans have the capability and responsibility to constrain or promote technological development.

**Key Idea 7**-Management of technology- Project management is essential to ensuring that technological endeavors are profitable and that products and systems are of high quality and built safely, on schedule, and within budget.

**Standard 6-Interconnectedness, Common Themes**
Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

**Key Idea 1**-Systems thinking-Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions. For example:
- Analyze a depositional-erosional system of a stream.

**Key Idea 2**-Models-Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. For example:
- Draw a simple contour map of a model landform.
- Design a 3-D landscape model from a contour map.
- Construct and interpret a profile based on an isoline map.
- Use flowcharts to identify rocks and minerals.

**Key Idea 3**-Magnitude and scale
The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.
For example:
- Develop a scale model to represent planet size and/or distance

- Develop a scale model of units of geologic time
- Use topographical maps to determine distances and elevations

**Key Idea 4**-Equilibrium and stability
Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium). For example:

- Analyze the interrelationship between gravity and inertia and its effects on the orbit of planets or satellites.

**Key Idea 5**-Patterns of change-Identifying patterns of change is necessary for making predictions about future behavior and conditions. For example:

- Graph and interpret the nature of cyclic change such as sunspots, tides, and atmospheric carbon dioxide.
- Based on present data of plate movement, determine past and future positions of land masses.
- Using given weather data, identify the interface between air masses, such as cold fronts, warm fronts, and stationary fronts.

**Key Idea 6**-Optimization-In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs. For example:

- Debate the effect of human activities as they relate to quality of life on Earth systems (global warming, land use, preservation of natural resources, pollution).

**<u>Standard 7- Interdisciplinary problem solving</u>**
Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

**Key Idea 1**-Connections-The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena. For example:

- Analyze the issues related to local energy needs and develop a viable energy generation plan for the community.
- Investigate two similar fossils to determine if they represent a developmental change over time.
- Investigate the political, economic, and environmental impact of global distribution. and use of mineral resources and fossil fuels
- Consider environmental and social implications of various solutions to an environmental Earth resources problem.

**Key Idea 2**-Strategies-Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results. For example:

- Collect, collate, and process data concerning potential natural disasters (tornadoes, thunderstorms, blizzards, earthquakes, tsunamis, floods, volcanic eruptions, asteroid impacts, etc.) in an area and develop an emergency action plan.
- Using a topographic map, determine the safest and most efficient route for rescue purposes.