

Grade 8 Science Curriculum

• Force and Motion

- Compare speed and velocity
- Interpret motion graphs (distance/time and velocity/time)
- Explain and give examples of acceleration of an object.
- Describe how applying an unbalanced force will:
 - o change the speed of an object
 - o change the direction of an object
 - o recognize that forces act as pairs
 - o calculate the net force acting on an object.
- Explain how Newton's First law applies to a real-world example
- Explain Newton's 2nd Law of Motion
- Explain how force and mass are related
- Explain how force causes an object to accelerate
- Provide real world examples of Newton's Third Law of Inertia
- Create a scenario illustrating all of Newton's three laws of motion and describe the law within the scenario

• Atomic Structure and the Periodic Table

• Atomic Structure

- Explain differences between protons, electrons, and neutrons
- Explain what the atomic number represents
- Identify the name of an element by the number of protons, electrons, and neutrons
- Determine the number of valence electrons each element contains
- Interpret information presented in atomic models
- Create a basic Bohr model including the nucleus and electron cloud

• Periodic Table

- Describe how elements are arranged on the periodic table.
- Compare/contrast the following features of the periodic table including:
 - o Periods (are horizontal and determine the number of energy levels in an atom).
 - o Groups (are vertical and determine the number of valence electrons).
 - o Elements (in the same group have similar chemical and physical properties).
- Determine the physical properties of an element.
 - o Metals, non-metals, and metalloids
- Use Bohr models for elements 1-20 to show the arrangement of the periodic table:
 - o Nucleus (protons and neutrons)
 - o Energy levels (electrons 2,8,8,8)
 - o Valence electrons
- Describe why elements in the same group have similar chemical properties (reactivity):
 - o Most reactive groups 1 & 17
 - o Least reactive/stable group 18

• Chemical Reactions

- Describe chemical properties of a newly formed substance
- Identify and describe the evidence that proves that a possible chemical change occurred, and a new substance was formed:
 - o Production of gas
 - o Change in temperature
 - o Production of a precipitate
 - o Color change
- Explain how the law of conservation of mass is illustrated in a chemical reaction

- Use chemical formulas to identify substances:
 - o Identify elements in a compound and chemical formula.
 - o Identify subscripts
 - o Determine the number of atoms for each element.
 - o Determine how many molecules of each compound are present in a chemical equation
- Use subscripts in chemical formulas to count the number of atoms of each element present
- **Characteristics of the Universe**
 - Describe galaxies, nebulae, and stars
 - Compare the masses, size and shape of galaxies, nebulae, and stars
 - Analyze the H-R diagram to classify stars
 - Describe and explain the life cycle of a star
 - Describe the main characteristics of the Sun including:
 - o Location
 - o Size
 - o Distance from the Earth
 - o Temperature and brightness
 - Explain how scientists use electromagnetic waves as a tool to gain information about objects' distances in the universe.
 - Describe the components of the universe
- **Sun, Moon, and Earth Relationships**
 - **Seasons**
 - Create a model to illustrate and identify the rotation of the Earth on a tilted axis to describe:
 - o day and night
 - o amount of time to complete one rotation
 - o direction (counterclockwise)
 - Create a model to illustrate and identify the revolution of the Earth around the sun and describe:
 - o Earth's tilt
 - o seasons in relation to months
 - o changes in the amount of daylight
 - o amount of time to complete one revolution direction (counterclockwise)
 - Demonstrate the following using a model:
 - o How the Earth rotates on its axis and revolves around the sun.
 - o How the rotation of the Earth causes night and day.
 - o How the tilt of the Earth and revolution causes seasonal changes
 - Relate the number of daylight hours to a specific position on Earth as it relates to seasons
 - **Lunar Cycle**
 - Recognize and describe the phases of the moon
 - Demonstrate the lunar cycle using a model
 - Analyze and predict the lunar phases given different lunar cycle representations (i.e., graph, table, diagram, calendar)
 - Describe how the gravitational force of the Sun and moon are responsible for causing the tides on earth
 - Describe and illustrate how the alignment of the sun, moon, and earth will affect the cycle of ocean tides

- **Earth's Forces and Natural Impact**

- **Plate Tectonics**

- Demonstrate how convection in the asthenosphere (mantle) is causing lithospheric (crustal) plate movement
 - Describe the movement of convergent boundaries, divergent boundaries, and transform boundaries
 - Relate and describe the movement/boundary to the land features formed, such as:
 - o volcanic mountains
 - o fault line
 - o rift valleys
 - o mid-ocean ridge
 - o rift valleys
 - o folded mountains
 - Explain the theory of Plate Tectonics
 - Identify the major tectonic plates and minor plates
 - Explain convection currents and relate it to the theory of plate tectonics

- **Topographic Maps**

- Determine the elevation of a specific contour line given the contour interval
 - Calculate the difference in elevation between two points
 - Interpret a topographic map to determine land features and characteristics of those features
 - Interpret satellite images to identify land features
 - Predict how land features may be reshaped by weathering, erosion, and deposition using satellite views

- **Earth, Ocean, and Weather Systems**

- **Atmosphere and Oceans**

- Describe how the uneven heating causes convection currents in the atmosphere creating changes in pressure (wind).
 - Describe how the sun warms the earth unevenly.
 - Describe how uneven heating causes convection currents in oceans

- **Weather Patterns and Maps**

- Identify the characteristics of the different air masses and how that creates the different fronts
 - Explain how a front is formed and how it is represented on a weather map
 - Identify and describe the type of weather associated with high and low pressure
 - Describe the current weather and predict what changes will occur along the front and after the front passes using a weather map
 - Explain how atmospheric movement when given a global map will affect local weather

- **Organisms and the Environment**

- **Competition**

- Describe how organisms depend on and compete for abiotic and biotic factors to survive
 - Investigate the availability of certain resources and the effects on organisms and populations in an ecosystem
 - Analyze how organisms are affected by competition for resources

- **Environmental Changes**

- Compare short term and long-term environmental changes
 - Investigate how short-term environmental change could force organisms or populations to move or become extinct

- Identify ways humans depend on oceans systems
- Explain how human activities could affect ocean systems.
- Explain how artificial reefs can have positive and negative impact to an ocean system

Grade 7 Science Curriculum

- **Cell Structure and Function**
 - Identify and describe the organelles that make up plant and animal cells. (cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole).
 - Explain the function of the cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole
 - Describe the structure of the cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole
- **Heredity**
 - **Asexual/Sexual Reproduction**
 - Explain the purpose of asexual reproduction.
 - Explain the purpose of sexual reproduction.
 - Describe how asexual reproduction results in uniform offspring.
 - Identify the advantages of asexual and sexual reproduction.
 - Compare the offspring of sexual and asexual reproduction.
 - Describe how traits are inherited from generation to generation.
 - Identify inherited traits that determine the appearance in organisms. (ex: earlobes, widow's peak, hitchhiker's thumb, rolling tongue, etc.)
 - Describe how traits are inherited from generation to generation.
 - Define heredity as the passage of genetic instruction from one generation to the next generation.
- **Human Body Systems**
 - **Body Systems**
 - Specify the correct order for the levels of organization.
 - Given a scenario, I will identify the body system, or the main function being described.
 - Compare the similarities between cell organelles and organ systems
 - Investigate the different responses of organisms to an external stimulus in a lab setting.
- **Natural Selection and Adaptations**
 - **Adaptations**
 - Provide examples of mutations that are harmful and some that are beneficial.
 - Describe observations that Darwin made in the Galapagos Islands.
 - Differentiate between natural selection and selective breeding.
 - **Response to Stimuli**
 - Define external stimulus.
 - Explain how an organism responds to external stimuli.
 - Describe types of responses to external stimuli.
 - Describe responses of organisms to external stimuli due to the environment.
- **Biodiversity**
 - **Organisms in the Environment**
 - Describe characteristics of a stable ecosystem.
 - Compare the sustainability of two different ecosystems based on their levels of biodiversity.
 - Explain how biodiversity impacts the sustainability of an ecosystem.
 - **Ecological Succession**
 - Compare the difference between primary and secondary succession.
 - Describe and provide real world examples of situation where ecological succession has occurred.
 - Describe the changes over time in a microhabitat (ex. Front yard).

- **Space Exploration and Ecology**

- **Space Exploration**

- Explain how water, the sun, and atmosphere play a role in allowing life to exist.
 - Identify the accommodations that allow for manned space exploration.

- **Ecology**

- Identify producer and consumers in any given food chain or pyramid.
 - Use the 10% rule to determine the energy at the next trophic level.
 - Illustrate food chains, food webs, and energy pyramids.
 - Explain the flow of energy through food chains, food webs, and energy pyramids.

- **Energy Transformations**

- Explain how radiant energy transforms to chemical energy through photosynthesis.
 - Identify where radiant energy comes from.
 - Describe the process of photosynthesis.

- **Natural and Human Events**

- **Impact of Natural Events on Ecosystems**

- Describe different types of catastrophic events.
 - Predict the impact of a catastrophic event on the Earth.
 - Describe real world catastrophic event that impact my local surrounding.

- **Human Impact of Ground Water**

- Identify ground water and surface water in a watershed.
 - Construct a model of a watershed.
 - Model how humans affect our water supply.

Grade 6 Science Curriculum

• Scientific Processes and Measurement

- Locate and describe the use of safety equipment.
- Follow all the safety rules during laboratory/field investigations.
- Use laboratory equipment in an appropriate manner
- Design and conduct a lab investigation using the following science practices:
 - o develop a scientific question (problem)
 - o formulate a testable hypothesis
 - o Procedures
 - o collect, organize, and analyze data
 - o draw conclusion based on the data

• Organisms and Environment

• Organisms

- Determine if organisms are unicellular or multicellular using a microscope.
- Use illustrations and prepared slides, to determine whether an organism is prokaryotic or eukaryotic based on the cell structure
- Classify organisms into their domains (Archaea, Bacteria or Eukarya) based on cell type and living environment.
- Classify organisms into the 6 kingdoms (Archaeobacteria, Eubacteria, Protist, Fungi, Plant, and Animal) based on the following characteristics:
 - o Cell type (Prokaryotic or eukaryotic)
 - o Number of cells (Unicellular or Multicellular)
 - o Method to obtain energy (Autotrophic or heterotrophic)
 - o Mode of reproduction (sexual or asexual)

• Environment

- Explain the parts of an ecosystem.
- Identify and describe the levels of organization within an ecosystem including organism, population, community, and ecosystem.
- Explain how biotic factors depend on abiotic factors in an ecosystem.
- Describe how abiotic and biotic factors interact within the ecosystem, such as competition for food, space, and water

• Chemistry

• Elements and Compounds

- Differentiate between an element and a compound
- Compare chemical symbols and formulas of substances to differentiate between elements and compounds.
- Using the periodic table, I will identify the most abundant elements that are found in the Earth's living matter, oceans, and atmospheres
- Identify and describe the evidence that proves that a possible chemical change occurred, and a new substance was formed, through a lab investigation:
 - o Production of gas
 - o Change in temperature
 - o Production of a precipitate
 - o Color change

• Metals and Non-metals

- Identify what physical properties are associated with metals, nonmetals, and metalloids.
- Test elements for conductivity, malleability, ductility, and luster
- Classify a metal, nonmetal, or metalloid, given an element's physical properties.

- **Density**
 - Use the appropriate tools to find the mass and volume of a substance including regular and irregular shaped objects
 - Calculate density of different types of matter
 - Determine the identity of an unknown substance by calculating its density and comparing it to given data (density table)
- **Energy**
 - Recognize the different forms of energy:
 - o Chemical
 - o Sound
 - o Electrical
 - o Thermal
 - o Mechanical
 - o Nuclear
 - o Radiant
 - Explain how one form of energy transforms into another form of energy.
 - Identify and describe the different energy resources including advantages and disadvantages:
 - o Fossil fuels
 - ♣ Coal
 - ♣ Oil
 - ♣ Natural gas
 - o Nuclear power
 - o Biomass
 - o Wind
 - o Hydropower
 - o Geothermal
 - o Solar
 - **Thermal Energy**
 - Explain thermal energy
 - Investigate and describe how thermal energy is transferred through:
 - o conduction
 - o convection
 - o radiation
 - Using a scientific investigation, measure, and record temperature to describe the movement of thermal energy
 - Determine how thermal energy moves in a predictable pattern.
- **Force and Motion**
 - Explain the two types of energy, potential and kinetic energy
 - Compare and contrast the potential and kinetic energy of an object in different positions and speeds
 - Describe force, motion, balanced forces, and unbalanced forces
 - Describe what happens to an object's position, speed, and direction when a balanced or unbalanced force is applied
 - Explain how unbalanced forces cause changes in motion using everyday examples
 - Calculate average speed by using the formula $\text{speed} = \text{distance}/\text{time}$
 - Create tables, charts, and graphs to show the motion of a moving object relative to speed vs. time and distance vs. time
 - Identify the different types of inclined planes

- Describe how an inclined plane effects the amount of force needed to move an object
- Compare the amount of force needed to move an object with and without an inclined plane
- **Geology**
 - **Minerals and the Rock Cycle**
 - Classify the rock based on how it was formed:
 - o Metamorphic
 - o Igneous
 - o Sedimentary
 - Explain how metamorphic, igneous, and sedimentary rocks are formed
 - Summarize three ways that minerals form
 - Identify all the physical properties of an unknown mineral
 - **Earth's Surface**
 - List and identify the physical layers of the Earth (lithosphere, asthenosphere, mesosphere)
 - Describe the layers of the Earth in terms of composition, state of matter, density, and thickness.
 - Build a model to illustrate the structural layers of Earth and discuss the model's limitations
 - **Plate Tectonics**
 - Describe and explain the cause-and-effect relationship between plate boundary movements and their resulting geologic events:
 - o ocean basins
 - o earthquakes
 - o volcanic eruptions
 - o mountain building
 - Identify and locate the major tectonic plates of the Earth.
 - Describe how convection currents cause the tectonic plates to move.
 - Describe and give examples of plate tectonics.
 - Investigate and describe the different ways that the tectonic plates move.
 - o Divergent
 - o Convergent
 - o Transform
- **Space**
 - Identify all components that make up the solar system.
 - o Sun
 - o Moon
 - o Asteroids
 - o Comets
 - o Meteorites
 - o Planets
 - Differentiate between sun, Galilean moon, planets, asteroids, and comets
 - Explain where each component of the solar system is located, how it moves and give physical characteristics of each
 - Describe how gravity effects the motion of the solar system
 - Create a timeline of past space travel including types of equipment and vehicles used
 - Explain what space travel will be like in the future