North Carolina Department of Public Instruction
INSTRUCTIONAL SUPPORT TOOLS
FOR ACHIEVING NEW STANDARDS

This document is designed to help North Carolina educators teach the Essential Standards (Standard Course of Study). NCDPI staff are continually updating and improving these tools to better serve teachers.

Essential Standards: Grade 7 Science ● Unpacked Content

For the Essential Standards that will be effective in all North Carolina schools in the 2012-13 school year.

What is the purpose of this document?
To increase student achievement by ensuring educators understand specifically what the new standards mean a student must know, understand and be able to do.

What is in the document?
Descriptions of what each standard means a student will know, understand and be able to do. The "unpacking" of the standards done in this document is an effort to answer a simple question "What does this standard mean that a student must know and be able to do?" and to ensure the description is helpful, specific and comprehensive for educators.

How do I send Feedback?
We intend the explanations and examples in this document to be helpful and specific. That said, we believe that as this document is used, teachers and educators will find ways in which the unpacking can be improved and made ever more useful. Please send feedback to us at feedback@dpi.state.nc.us and we will use your input to refine our unpacking of the standards. Thank You!

Just want the standards alone?
You can find the standards alone at http://www.ncpublicschools.org/docs/acre/standards/phase1/science/6-8.pdf .

Forces and Motion

Essential Standard and Clarifying Objectives

7.P.1 Understand motion, the effects of forces on motion and the graphical representations of motion.

7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object.

7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets).

7.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time.

7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion.

Unpacking

What does this standard mean a child will know, understand and be able to do?

7.P.1.1

The motion of an object is always judged with respect to some other object or point. When an object changes position over time relative to a reference point, the object is in motion. Motion can be described with a reference direction such as North, South, East, West, up or down. The speed of an object is a measure of how quickly the object gets from one place to another.

7.P.1.2

An unbalanced force acting on an object changes its speed or direction of motion, or both. The change in motion (direction or speed) of an object is proportional to the applied force and inversely proportional to the mass. All motion is relative to whatever frame of reference is chosen, for there is no motionless frame from which to judge all motion. Friction is a force that opposes motion between two surfaces that are in contact. The amount of friction depends on factors such as the roughness of the surfaces and the force pushing the surfaces together. Newton's law describes the relationship between gravitational force, mass, and distance. An object will not start moving until a force acts upon it. An object will stay in motion forever unless an unbalanced force acts upon it. Inertia is the tendency of objects to resist any change in motion. Likewise, inertia is the reason a moving object stays in motion with the same velocity unless a force changes its speed or direction or both. *Note: Newton's Laws should not be memorized at this age. Rather, the principles which underpin the Laws ought to be well*

conceptualized and applied.

7.P.1.3
When an object changes position over time relative to a reference point, the object is in motion. You can describe the direction of motion with a reference direction such as north, south, east, west, up or down. Collect and organize data to show how the motion of an object changes in position over a period of time. Communicate and graph data showing how the motion of an object changes in position over a period of time.

7.P.1.4
Students should collect and organize their own data for graphing distance versus time. Graphs for constant speed and variable motion. Students will interpret prepared graphs for distance versus time for constant speed and variable motion.

Energy: Conservation and Transfer

Essential Standard and Clarifying Objectives

7.P.2 Understand forms of energy, energy transfer and transformation and conservation in mechanical systems.

7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object.
7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).
7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.
7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axels are used to create mechanical advantage and increase efficiency.

Unpacking

What does this standard mean a child will know, understand and be able to do?

7.P.2.1
Mechanical energy is the energy possessed by an object due to its motion or its stored energy of position. Mechanical energy can be either kinetic (energy of motion) or potential (energy of position). An object that possesses mechanical energy is able to do work. Mechanical energy is the form involved in the operation of simple machines.

7.P.2.2
Objects that have potential energy do not use their energy until they move. That is why it is called "potential" energy. Potential means that something is capable of becoming active. Any object that can move to a lower place has the potential to do work on the way down, such as a marble rolling down a driveway. Objects also store energy in motion. A moving mass can certainly exert forces, as you would quickly observe if someone ran into you during a basketball game. Energy of motion is called kinetic energy. Energy appears in different forms, such as motion and heat. Energy can travel in different forms, such as light, sound or electricity. The workings of the universe plus all of present day technology can be viewed from the perspective of energy flowing from one place to another and changing back and forth from one form to another.

7.P.2.3
Energy can be transferred from one system to another (or from a system to its environment) in different ways: 1) thermally, when a warmer object is in contact with a cooler one; 2) mechanically, when two objects push or pull on each other over a distance; 3) electrically, when an electrical source such as a battery or generator is connected in a complete circuit to an electrical device; or 4) by electromagnetic waves. Energy is one of the fundamental building blocks of our universe. Energy can change from one form to another, although in the process some energy is always converted to heat. Some systems transform energy with less loss of heat than others. Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy. Batteries store energy and transfer energy to components in a circuit. In the battery the energy comes from chemical reactions. Electricity is important because we can use it to make so many things work (electrical energy). For example, a bulb converts electrical energy into light energy and a speaker converts it into sound energy. The electrical energy generated by windmills, waterfalls and power plants is actually a secondary source of energy. To produce electricity, a heat source is needed to create the conditions in which electrical currents form. In effect, the primary source of electrical energy is the heat generated by burning fossil fuels, water power and wind power. A natural form of electrical energy can be seen in the lightning that appears during storms. Solar energy, water and wind power are sources of green energy—meaning they do not pollute the environment. *Note: It is not necessary to investigate nuclear energy.*

7.P.2.4
A machine is a device that makes work easier by changing the size or direction of a force. When you use a machine, you do the work on the machine, and the machine does the work on something else. Mechanical advantage is the number of times the machine multiplies force. Ideal Mechanical Advantage (IMA) is what is desired of a machine, where Actual Mechanical Advantage (AMA) is what the machine actually does. A lever is a simple machine that has a bar that pivots at a fixed point called a fulcrum. A pulley is a simple machine that consists of a wheel over which a rope, chain, or wire passes. A simple machine that consists of two circular objects of different sizes is known as a wheel and axle. The mechanical advantage of a wheel and axle is the radius of the wheel divided by the radius of the axle. A simple machine that is a straight, slanted surface, and facilitates the raising of loads is an inclined plane. A compound machine consists of two or more simple machines put together. In fact, most machines are compound machines. Some examples are a pair of scissors and a bicycle.

Earth Systems, Structures and Processes

Essential Standard and Clarifying Objectives

7.E.1 Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans.

7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include mixtures of gases and differences in temperature and pressure within layers.

7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on earth.

7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result.

7.E.1.4 Predict weather conditions and patterns based on information obtained from:

- Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure).
- Weather maps, satellites and radar

- Cloud shapes and types and associated elevation

7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions.

7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship.

Unpacking

What does this standard mean a child will know, understand and be able to do?

7.E.1.1

The earth has a variety of climates, defined by average temperature, precipitation, humidity, air pressure, and wind, over time in a particular place. The atmosphere is a mixture of gases, such as nitrogen (78%), oxygen (21%), argon (0.93%), carbon dioxide (0.04%), trace gases and water vapor. The amount of each gas in the mixture is usually very constant from the surface of the planet up to the top of the troposphere. These gases are constantly being used and renewed by the processes of respiration, photosynthesis, evaporation and condensation, the weathering of rock, and the decay of organic matter. The atmosphere has different properties at different elevations and different locations around the Earth. Air pressure, also known as atmospheric pressure, refers to the weight of the Earth's atmosphere pressing down on everything at the surface. Air pressure varies slightly over the Earth's surface, and variations in pressure are responsible for the weather. Low pressure is associated with storms, tornadoes, and hurricanes. High pressure is associated with clear and dry conditions. The air pressure is less on the top of mountains (higher elevation) than in valleys. At the equator the atmosphere is warmer; at the poles it is cooler. The uneven heating of land and water causes a rising and sinking of warm and cool air masses creating convection currents and causes winds. Five layers make up the atmosphere: the troposphere, stratosphere, mesosphere, thermosphere, and exosphere. Each of these layers has very unique properties. Weather occurs in the troposphere and is the physical condition of the atmosphere at a specific place at a specific time. Fronts, global wind systems, atmospheric pressure changes and many other factors influence the weather. Major atmospheric activities such as thunderstorms, tornadoes and hurricanes affect humans and can result in huge natural disasters. Air has weight. Air molecules are in constant motion and are affected by gravity. The force of this movement causes air pressure. Air pressure changes with elevation. As you move up into the atmosphere, the air molecules are further apart. So, air pressure decreases as distance above the surface increases. Air pressure also decreases as the amount of water vapor in the air goes up. Since warm air is less dense than cool air, when temperatures are higher, the air pressure is usually lower. Air pressure is measured with a mercury barometer (mm of mercury) or and aneroid barometer (millibars-mb). The atmosphere has constant change but strives to maintain equilibrium.

7.E.1.2

Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the oceans. The cycling of water in and out of the atmosphere is a significant aspect of the weather patterns on Earth. Sunlight provides the energy that evaporates water from the surface of Earth. Some of the water vapor comes from the continents, but most comes from the oceans. Winds carry the water vapor from the ocean over the continents. Part of the water vapor condenses into clouds, then falls as rain or snow. Some of the rain returns to the ocean from rivers and streams as runoff. Some seeps into the ground to become groundwater. Some returns to the air by evaporation from the ground or by transpiration from plant leaves. When runoff from the continents returns to the ocean, one turn of the water cycle is completed. Other routes are possible. For example, water that evaporates from the ocean can return to the ocean as rain. The water cycle never ends. The salt water of the ocean supplies fresh water to the continents over and over again. Weather is the state of the atmosphere at a given time and place. A complete description of the weather includes the amount and type of clouds. Rain, snow, thunderstorms, lightning, and even dust storms are part of the weather. Measurements of temperature, air pressure, wind speed and direction, and the amount of moisture in the air are also included in a description of the weather. Weather is studied and predicted by scientists called Meteorologists. The science of meteorology is the study of the entire atmosphere, including the weather. To understand and predict the weather, meteorologist must first understand how the atmosphere heats and cools, how clouds form and produce rain, and what makes the wind blow.

7.E.1.3

An air mass is a large section of the lower troposphere that has the same weather throughout. Air masses can form over continents, icecaps or the ocean. Air masses are controlled by patterns of heating and cooling over large areas of the Earth's surface. Changes in air pressure readings indicate the passing of high and low pressure systems. Differences in air pressure cause Earth's winds and weather changes. Storms are natural disturbances in the atmosphere that involve air pressure, clouds, precipitation, and strong winds. The major types of storms are thunderstorms, hurricanes, tornadoes, and winter storms. Each type has its own characteristics and dangers. Tornadoes are violently whirling winds sometimes visible as a funnel-shaped cloud. They are produced by severe thunderstorms. Spiraling high winds and extremely low pressure are the unique features of tornadoes. Thunderstorms are known as electrical storms. A thunderstorm is characterized by the presence of lightning and thunder. They are produced rapidly when rising air causes cumulus clouds to build upward into a thunderhead. The cloud type associated with thunderstorms are cumulonimbus. Thunderstorms are usually accompanied by strong winds, heavy rain and sometimes snow, hail or no precipitation at all. Thunderstorms are brief, intense storms that affect a small area. Hurricanes are huge, rotating storms that form over the ocean near the equator. They produce very strong winds, heavy rains, and large, powerful waves and can cause severe flooding and damage from strong winds. Floods occur when an area is inundated with water. Weather related flooding is most often associated with hurricanes and thunderstorms. Winter storms are associated with quickly moving cold fronts and they can produce high winds, very low

temperatures plus include blizzards, ice storms and large accumulations of snow.

7.E.1.4

The earth has a variety of climates, defined by average temperature, precipitation, humidity, air pressure, and wind, over time in a particular place. Weather forecasting is an attempt to make accurate predictions of future weather. The accuracy of weather prediction is improving as technology advances. A weather map is useful for making predictions. Weather maps usually show precipitation, wind direction, temperature, cloud cover, high or low pressure, cold and warm fronts, stationary and occluded fronts. Weather systems generally move from west to east across the USA. Long rang weather forecasting is more difficult than short-range weather predictions. Technologies such as computer, satellite images and radar enable forecasters to track movements of large-scale weather systems like air masses and fronts. Weather data collection results from using direct observations and measurements such as wind speed, wind direction, air temperature, humidity and air pressure. Wind direction can be shown by flags or blowing dust. The actual wind speed can be estimated by observing its affects. Temperature is a measure of the energy of molecules. The more energy the molecules in air have, the hotter it feels. Relative humidity compares the actual amount of water vapor in the air with the maximum amount of water vapor the air can hold at that temperature (its capacity). Differences in air pressure cause Earth's winds and weather changes. Air pressure is simply the weight of the atmosphere per unit area. Air pressure is directed equally in all directions. Clouds have three simple names: Cirrus, Stratus, and Cumulus. These three names represent the three main cloud types. Cirrus clouds are high level clouds and due to high altitude, the water is almost frozen to form ice crystals. If there are isolated Cirrus clouds, they do not indicate any instability in the weather and may not bring rain. However, if the clouds are dense, they often indicate that a storm might be approaching. Both Stratus clouds and Cumulus clouds are low-level. Stratus clouds are layered clouds that usually bring a drizzle and there is widespread rain and in some cases ocean air. Cumulus clouds are neutral weather clouds. All the other clouds are combinations or variations of these types. Technology has greatly influenced the ease and accuracy of making weather predictions. Weather data at thousands of locations can be gathered instantaneously and applied to weather prediction models to produce weather maps. A cold front is the leading edge of a cooler air mass of air, replacing at ground level a warmer mass of air. The cooler, denser air wedges under the less-dense warmer air, lifting it. The upward motion causes lowered pressure along the cold front and can cause the formation of a narrow line of showers and thunderstorms when enough moisture is present. On weather maps, the surface position of the cold front is marked with the symbol of a blue line of triangles/spike pointing in the direction it is traveling. Cold fronts can move up to twice as fast as warm front and can produce sharper changes in the weather. Cold fronts are usually associated with an area of high pressure. A warm front is the leading edge of a warm air mass that displaces colder air, bringing a temperature increase and heavy rain where the front makes contact with the ground. On a weather map a warm front is represented by a solid line with semicircles pointing towards the colder air and in the direction of the movement. On a colored weather map, a warm front is drawn with a solid red line.

7.E.1.5

Thermal energy carried by ocean currents has a strong influence on climates around the world. Areas near oceans tend to have more moderate temperatures than they would if they were farther inland but at the same latitude because water in the oceans can hold a large amount of thermal energy. Changes in weather involve air movements, formation of clouds, and precipitation. Energy is needed to make all these things happen. That energy comes from the sun. Convection is very important in moving heat through the atmosphere and the oceans. It transfers heat from one place to another. All winds result from uneven heating of the atmosphere. An island, is surrounded by cool water. During the day, the island heats faster than the water and so the air above the island becomes warmer. The molecules in the air become farther apart; so the air expands upward and outward. This expansion lowers the air pressure at the island's surface. The cooler ocean air moves in toward the low-pressure area over the island. There is a pressure gradient between the ocean and the island. The wind moves form high to low pressure. The speed of the wind depends on the pressure gradient. The lower the pressure (the hotter the island), the steeper the pressure gradient and the stronger the wind. The pressure gradient provides the force that makes the wind blow. This force is called the pressure-gradient force. Wind speeds are very high in the upper troposphere. It is here that the spectacular jet stream is found. Jet streams are a fairly narrow zone of very strong winds in the upper troposphere. Jet streams are most common in the middle latitudes, so the winds in the jet streams are usually from the west. Winds are also influenced by the Coriolis effect, which is due to the Earth rotating on its axis. Rather than flowing directly from areas of high pressure to low pressure, as they would on a non-rotating planet, winds and currents tend to flow to the right of this direction north of the equator, and to the left of this direction south of the equator. This effect is responsible for the rotation of large cyclones. The Gulf Stream is a powerful, warm surface current in the North Atlantic Ocean. It is one of the strongest know currents. As the Gulf Stream reaches Cape Hatteras, North Caroling the cold current that flows from the north separates it from the coast. When the warm Gulf Stream waters from the south (Florida) combine with the cold winds a dense concentration of fog forms along with an immense heat transfer causing atmospheric storms to intensify in this region.

7.E.1.6

Air quality affects the quality of life for all organisms on Earth. Natural and human activities greatly influence the quality of the air. The environment may contain dangerous levels of substances that are harmful to human beings. Therefore, the good health of individuals requires monitoring the soil, air, and water and taking steps to make them safe. Air quality affects the quality of life for all organisms on Earth. Natural and human activities greatly influence the quality of the air. Technology has allowed us to measure the characteristics of the air and to monitor how air quality changes. This information helps us to make informed decisions to protect air quality and risks to human health and other organisms. The cumulative ecological effects of global ozone depletion, air pollution, increased particulate matter, acid rain, and global

warming concern the entire global community. Studies have shown that the human impact on these factors has impacted the global system. Using less fossil fuel is the best way to improve air quality. Most forms of transportation and many industries produce carbon dioxide and add particles to the air and reduce the quality of the atmosphere. The burning of fossil fuels is the major cause of air pollution. Smog is a colloid of smoke, fog, and chemicals. Many areas have smog problems. Smog irritates the lungs. The burning of fossil fuels releases large amounts of carbon dioxide and other gases into the air. Some of these gases mix with water vapor and then form acid rain. Acid rain is harmful to both living and non-living things. Natural events also release pollutants such as forest fires, volcanic eruptions and plant pollen. Because air pollutants are often carried along by prevailing winds, acid rain may fall far from the source of pollution. Laws exist to help control and reduce air pollution. The Environmental Protection Agency (EPA) provides daily information about air quality. Local weather channels also issue information related to the health of the atmosphere. Air pollution does not consist entirely of man-made substances. Many pollutants are released directly from natural sources, and some pose as much of a health hazard as man-made substances. These "natural" pollutants include radon, pollen and mold spores. Others are dust from plowed fields and volcanic eruptions. These eruptions could create situations where planes could not fly.

Structures and Functions of Living Organisms

Essential Standard and Clarifying Objectives

7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.

7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including:

- Euglena
- Amoeba
- Paramecium
- Volvox

7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).

7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms.

7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.

Unpacking

What does this standard mean a child will know, understand and be able to do?

7.L.1.1

Within cells, many of the basic functions of organisms—such as extracting energy from food, getting rid of waste, movement and secreting waste—are carried out. The way in which cells function is similar in all living organisms. Even the simplest organisms have parts which enable them to move, take in food, to reproduce and to detect the environment they are in. Euglena-moves by a flagellum, know for a unique feature-- an eye spot, some contain chlorophyll and are common in fresh water. The amoeba moves by cytoplasmic streaming, surrounds food and engulfs it using pseudopods. Paramecium is the most complex and specialized of the protists. It moves by cilia. Volvox is a colony of ciliates, some containing chlorophyll.

7.L.1.2

All living things are composed of cells, from just one to many millions, whose details usually are visible only through a microscope. A cell is the smallest part of any living thing. There are many parts of a cell. Each part of a cell completes a certain function for the cell.
These parts are found in plant and animal cells.

- Cell Membrane - forms the outer boundary of the cell and allows only certain materials to move into or out of the cell
- Cytoplasm - a gel-like material inside the cell; it contains water and nutrients for the cell
- Nucleus - directs the activity of a cell; it contains chromosomes with the DNA
- Nuclear Membrane - separates the nucleus from the cytoplasm
- Mitochondria - break down food and release energy to the cell
- Vacuoles - are storage areas for the cell

Some organelles are found only in Plant cells. These organelles are:

- Cell Wall - provides structure to the plant cell
- Chloroplasts - contain chlorophyll that is make food for the plant cell

7.L.1.3
Different body tissues and organs are made up of different kinds of cells. The cells in similar tissues and organs in other animals are similar to those in human beings but differ somewhat from cells found in plants. Important levels of organization for structure and function include cells, tissues, organs, organ systems, whole organisms and ecosystems. Specialized cells perform specialized functions in multi-cellular organisms. Groups of specialized cells cooperate to form a tissue, such as muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Organs group together to form systems and systems group together to form organisms. Each type of cell, tissue, organ, organ system has a distinct structure and functions that serve the organism as a whole.

7.L.1.4
To burn food for the release of energy stored in it, oxygen must be supplied to cells, and carbon dioxide removed. Lungs take in oxygen for the combustion of food and eliminate the carbon dioxide produced. The urinary system disposes of dissolved waste molecules, the intestinal tract removes solid wastes, and the skin and lungs aid in the transfer of thermal energy from the body. The circulatory system moves all these substances to or from cells where they are needed or produced, responding to changing demands. The human body has a set of systems, which regulate the internal environment and strive to give our cells the necessary conditions they need to function. These systems are made up of organs; each organ system functions in the human body and works in cooperation with other systems to benefit the entire organism. The skeletal system provides the support for movement and protection of internal organs. The muscular system creates the force that enables the body to move and carry out different functions related to movement. The body's circulatory, respiratory, digestive and urinary systems work in combination to supply all cells with what they need to function properly and remove wastes. The reproductive system enables the organism to make more of its kind. The immune system protects cells from microscopic invaders. The nervous system controls body processes by using electrical impulses via a network of nerves. The endocrine system uses chemical messages called hormones, which are released into the blood and regulate many bodily processes. The endocrine and nervous systems are two control systems that keep the body in balance (homeostasis). Body systems work together in maintaining a constant internal environment. When the balance is disrupted, the body systems may not function properly and human health can suffer.

Evolution and Genetics

Essential Standard and Clarifying Objectives

7.L.2 Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation and survival among offspring.

7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis).

7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis.

7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.

Unpacking

What does this standard mean a child will know, understand and be able to do?

7.L.2.1

In some kinds of organisms, all the genes come from a single parent. In organisms that have two sexes, typically half of the genes come from each parent. In sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male. Budding is a type of asexual reproduction in which a cell or group of cells pinch off from the parent to form a new individual. Mitosis is a type of asexual reproduction is when a nucleus undergoes cell division in which two daughter cells are formed, each containing a complete set of chromosomes. Meiosis is a type of sexual reproduction. A form of cell division that allows offspring to have the same number of chromosomes as their parent. This kind of cell division, which produces gametes (sex cell) containing half the number of chromosomes as a parent's body cell, is called meiosis. Fertilization is a type of sexual reproduction where there is a fusion of male (sperm) and female (egg) sex cells. Genetics explains why you have inherited certain traits from your parents. If you understand how meiosis occurs, you can see how these traits were passed on to you. A gene is a segment of DNA that controls the protein production and the cell cycle. Chromosomes are cell structures that carry the genetic material that is copied and passed from generation to generation of cells. People have noticed for thousands of years that family resemblances were inherited from generation to generation so characteristics that are inherited are called traits. A dominant trait is an observable trait of an organism that masks the recessive form of a trait. A recessive trait of an organism can be masked by the dominant form of a trait. Two organisms can look alike but have different underlying gene combinations. The way an organism looks and behaves makes up its phenotype. The phenotype of a tall plant is tall, regardless of the genes it contains. The gene combination an organism contains is known as it genotype. You cannot always know an organism's genotype simply by looking at its phenotype. New varieties of

cultivated plants and domestic animals have resulted from selective breeding for particular traits. In sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male. In some kinds of organism, all the genes come from a single parent. In organisms that have two sexes, typically half of the genes come from each parent. The fertilized egg cell, carrying genetic information from each parent, multiplies to form the complete organism. Cultivated plants are plants that have been changed somewhat to promote survival in different conditions due to intentional human activity. Agriculture, forestry and horticulture use these cultivated plants.

7.L.2.2

A pedigree is a diagram of family relationships that uses symbols to represent people and lines to represent genetic relationships. These diagrams make it easier to visualize relationships within families. Pedigrees are often used to determine the mode of inheritance (dominate, recessive, etc.) of genetic diseases. A Punnett Square is a chart wherein all possible gene combinations are shown in a cross of parents. Reginald Punnett was an English Geneticist who discovered some very basic principles of genetics including the determination of sex and linkage. His work involved using the color characteristics of a chicken's feathers, efficiently separating the female gender of the chicken from the male. In plants, a tall plant is considered dominant over a short plant. In using Punnett Squares, you can easily predict genotype and phenotypes of any offspring.

7.L.2.3

Individual organisms with traits conducive to the environment's stressors are more likely than others to survive and have offspring. Changes in environmental conditions can affect the survival of individual organisms and entire species. Analysis of the patterns of genetic traits enhances the understanding of genetic diseases and allows for predictions to be made by studying pedigrees. Some traits are inherited and others result from interactions with the environment, life style choices, and environmental influence human characteristics that may or may not be passed on to future generations. Some animal species are limited to a repertoire of genetically determined behaviors; other have more complex brains and can learn and modify a wide variety of behaviors. All behavior is affected by both inheritance and experience. The length and quality of human life are influenced by many factors, including sanitation, diet, medical care, sex, genes, environmental conditions, and personal health behaviors. Faulty genes can cause body parts or systems to work poorly. Some genetic diseases appear only when an individual has inherited a certain faulty gene from both parents.