Wicomico Day School

6TH GRADE SCIENCE CURRICULUM

PLATE TECTONICS

- The surface of the earth
  - The surface of the earth is in constant movement.
  - iThe present features of earth come from its ongoing history. After the sun was formed, matter cooled creating the planets. The continent were once joined (Pangaea).
- Layered structure of the earth
  - Crust: surface layer of mainly basalt or granite, 5 to 25 miles thick
  - Mantle: 1,800 miles thick, rock of intermediate density, moves very slowly
  - Outer core: liquid iron and nickel; Inner core: solid iron and nickel, 800 miles thick, about 7,000 degrees C

PLATE TECTONICS

Crust movements

- The surface of earth is made up of rigid plates that are in constant motion.
- Plates move because molten rock rises and falls under the crust causing slowly flowing currents under the plates.
- Plates move at speeds ranging from 1 to 4 inches (5-10 centimeters) per year. Earthquakes usually occur where stress has been built up by plates moving in opposite directions against each other. Earthquakes cause waves (vibrations) which have:
  - focus, the point below the surface where the quake begins.
  - epicenter, the point on the surface above the focus
  - Severity of ground shaking is measured on the Richter scale; each unit on the scale represents a tenfold severity increase
- Volcanoes usually occur where plates are pulling apart or coming together, but some occur at holes (hot spots) in the crust away from plate boundaries. As plates move over these hot spots, they cause chains of volcanoes and island chains like the Hawaiian Islands.
- Evidence for long-term movement of plates includes fit of continents and matches of rock types, fossils, and structures; ocean floor age and topography; ancient climate zones; locations of earthquakes, volcanoes, and mountain ranges; magnetic directions in ancient rocks.
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OCEANS

- Surface
  - The world ocean covers most of the earth’s surface (71 per cent).
  - Three major subdivisions of the world ocean: Atlantic, Pacific, and Indian Oceans
  - Islands consist of high parts of submerged continents, volcanic peaks, coral atolls.
- Subsurface land features
  - Continental shelf, continental slope, continental rise, abyssal plains
  - Mid-ocean ridges and trenches, plate tectonics
  - Mid-Atlantic Ridge, Mariana Trench
- Ocean bottom: average depth of sediment .3 mile, consists of rock particles and organic remains.
- Composition of seawater: dilute solution of salts which come from weathering and erosion of continental rocks.
  - Sodium chloride is the main salt.

OCEANS

- Currents, tides, and waves
  - Surface currents: large circular streams kept in motion by prevailing winds and rotation of the earth; Gulf Stream (North Atlantic), Kuroshio (North Pacific)
  - Subsurface currents are caused by upwelling from prevailing offshore winds (Peru, Chile) and density differences (Antarctica); the upwelling pushes up nutrients from the ocean floor.
  - Tides are caused by gravitational forces of the sun and moon; there are two tides daily.
  - Waves are caused by wind on the ocean’s surface.
  - Water molecules tend to move up and down in place and not move with the wave. Crest and trough, wave height and wavelength, shoreline friction
  - Tsunamis: destructive, fast-moving large waves caused mainly by earthquakes

OCEANS

- Marine life
  - Life zones are determined by the depth to which light can penetrate making photosynthesis possible, and by the availability of nutrients.
  - The bottom (benthic zone) extends from sunlit continental shelf to dark sparsely populated depths. Shallow lighted water extending over continental shelf contains 90% of marine species.
  - Pelagic zone: water in open oceans
  - Classification of marine life
    Bottom-living (benthic) such as kelp and mollusks
    Free-swimming (nekton) such as fish and whales
  - Small drifting plants and animals (plankton), which are the dominant life and food source of the ocean.
  - The basis for most marine life is phytoplankton (plant-plankton), which carry on photosynthesis near surface; contrast zooplankton (animal plankton).
  - Most deep-water life depends on rain of organic matter from above. The densest concentration of marine life is found in surface waters, such as those off Chile, where nutrient-rich water wells up to the bright surface.

ASTRONOMY: GRAVITY, STARS, AND GALAXIES

- Gravity: an attractive force between objects
  - Newton's law of universal gravitation: Between any two objects in the universe there is an attractive force, gravity, which grows greater as the objects move closer to each other.
  - How gravity keeps the planets in orbit
- Stars
  - The sun is a star.
  - Kinds of stars (by size): giants, dwarfs, pulsars
  - Supernova: black holes Apparent movement of stars caused by rotation of the earth
  - Constellations: visual groupings of stars, for example, Big Dipper, Orion
  - Astronomical distance measured in light years.
- Galaxies
  - The Milky Way is our galaxy; the Andromeda Galaxy is closest to the Milky Way.
  - Quasars are the most distant visible objects (because the brightest).

Energy, Heat, and Energy Transfer

- Energy
  - Six forms of energy: mechanical, heat, electrical, wave, chemical, nuclear
  - The many forms of energy are interchangeable, for example, gasoline in a car, windmills, hydroelectric plants.
  - Sources of energy: for example, heat (coal, natural gas, solar, atomic, geothermal, and thermonuclear), mechanical motion (such as falling water, wind)
  - Fossil fuels: a finite resource
    - Carbon, coal, oil, natural gas
    - Environmental impact of fossil fuels: carbon dioxide and global warming theory, greenhouse effect, oil spills, acid rain
  - Nuclear energy
    - Uranium, fission, nuclear reactor, radioactive waste
  - Nuclear power plants: safety and accidents (for example, Three Mile Island, Chernobyl)

Energy, Heat, and Energy Transfer

- Heat
  - Heat and temperature: how vigorously atoms are moving and colliding.
  - Three ways that heat energy can be transferred: conduction, convection, radiation.
  - The direction of heat transfer

Energy, Heat, and Energy Transfer

- Physical Change: Energy Transfer
  - States of matter (solid, liquid, gas) in terms of molecular motion
    - In gases, loosely packed atoms and molecules move independently and collide often. Volume and shape change readily.
    - In liquids, atoms and molecules are more loosely packed than in solids and can move past each other. Liquids change shape readily but resist change in volume. In solids, atoms and molecules are more tightly packed and can only vibrate. Solids resist change in shape and volume
- Most substances are solid at low temperatures, liquid at medium
- temperatures, and gaseous at high temperatures.
    - A change of phase is a physical change (no new substance is produced).
    - Matter can be made to change phases by adding or removing energy.
    - Expansion and contraction
      - Expansion is adding heat energy to a substance, which causes the molecules to move more quickly and the substance to expand.
      - Contraction is when a substance loses heat energy, the molecules slow down, and the substance contracts.
      - Water as a special case: water expands when it changes from a liquid to a solid.
    - Changing phases: condensation; freezing; melting; boiling
      - Different amounts of energy are required to change the phase of different substances.
      - Each substance has its own melting and boiling point.
      - The freezing point and boiling point of water (in degrees Celsius and Fahrenheit)
      - Distillation: separation of mixtures of liquids with different boiling points.

THE HUMAN BODY

- Nervous System – The brain is the reason you can learn, and the reason you can remember what you learn. It also lets you move, and it keeps your body working the way it should.
  - Sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
  - Cause and effect relationships may be used to predict phenomena in natural systems.
  - Gather, read, and synthesize information from multiple sources and assess the credibility, accuracy, and the possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.
  - Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

THE HUMAN BODY

- Digestive System – The digestive system breaks down all your food into nutrients your body needs to function.
  - Food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
  - Unobservable mechanisms
  - Matter is conserved because atoms are conserved in physical and chemical processes.
  - Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to rom new molecules, to support growth, or to release energy.
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.

THE HUMAN BODY

- Excretory System – Your body needs to get rid of waste in the same way that it needs to take in nutrients.
- Integumentary System – Your skin, hair and nails protect your body against damage, germs, and cold.
  - Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.
  - Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
  - Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- Endocrine System – Hormones signal your body to maintain itself.
  - Sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
  - Each sense receptor responds to different inputs transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in

THE HUMAN BODY

- Respiratory System
- Skeletal System
- The circulatory and lymphatic systems - the heart works with arteries, veins, and capillaries to bring nutrients to the cells.
- Lymph, lymph nodes, white cells, tonsils Blood pressure, hardening and clogging of arteries
- Immune System – The immune systems works to rid your body of germs and other invaders to keep you healthy. The immune system fights infections from bacteria, viruses, fungi.
  - White cells, antibodies, antigens
  - Vaccines, communicable and non-communicable diseases, epidemics
  - Bacterial diseases: tetanus, typhoid, tuberculosis; antibiotics like penicillin, discovered by Alexander Fleming
  - Viral diseases: common cold, chicken pox, mononucleosis, rabies, polio, AIDS

SCIENCE BIOGRAPHIES

- Marie Curie (advances in science of radioactivity; discovered the elements polonium and radium)
- Lewis Howard Latimer (worked with Alexander Graham Bell on drawings of Bell's invention, the telephone; improved Thomas Edison's light bulb)
- Isaac Newton (known for advances in physics; outlined laws of gravity and invented the telescope)
- Alfred Wegener (known for theory that the continents were once joined together and split apart to form the continents; now known as "the continental drift")