# An At-Home Guide for Families

8th Grade Science in North Carolina Public Schools

## Course Outline

**At the end of the course, my child will know…**

- how to identify the distribution of water on earth and illustrate to explain the water cycle.
- how to understand that water is essential for life on earth and list ways to conserve it.
- how to explain the movement of water from land to the ocean and from the surface into the ground.
- how to Identify sources of drinking water in communities and how drinking water is treated before it is distributed.
- how to explain what happens to wastewater from homes including wastewater treatment plants and septic tanks.
- how to list indicators of water quality to include turbidity, pH, temperature, nitrates and phosphates.
- how to classify water as healthy or unhealthy from given characteristics.
- how to identify bioindicators and explain how they relate to water quality and explain laws that protect water quality.
- how to identify pollution as point source or non point source pollution and identify common sources of water pollution, including human activities.
- how to explain how excess levels of nitrates and phosphates affect water quality.
- how to give examples of estuaries, explain their importance and list unique characteristics.
- how to describe characteristics and identify organisms living in the intertidal zone.
- how to explain how the ocean changes in regards to temperature, light and pressures as you move down the water column.
- how to describe the unique characteristics of the neritic zone, identify organisms living there and why it is the most productive part of the ocean.
- how to describe the unique characteristics of the deep ocean to include hydrothermal vents and identify organisms that live in the deep ocean.
- how to describe what happens in areas of upwelling and explain why areas of upwelling include the world's major fisheries.
- how to describe technology used to study the ocean including satellites, sonar and infrared.
- how to list characteristics of the three types of rock and the processes involved in formation: igneous, sedimentary and metamorphic rock.
- how to identify fossils based on how they were formed and understand the conditions necessary for fossils to form, providing evidence of how life and environmental conditions have changed.
- how to define and differentiate between relative age and absolute age and give examples of relative and absolute dating.

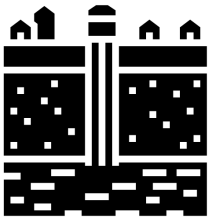
- how to describe events that can impact the formation of rock layers including faults, earthquakes, erosion and movement of tectonic plates.
- how to explain how geologists use radioactive dating to find the absolute age of rocks and fossils.
- how to identify characteristics of index fossils and understand how index fossils are used to determine the age of rock layers.
- how to use index fossils, radioactive dating of intrusions and extrusions and the Law of Superposition to identify the order of rock layers.
- how to explain how ice cores provide evidence of past climate.
- how to explain how fossil evidence supports the geological time scale and how the geological time scale shows the major events and diversity of life forms in Earth's history.
- how to identify the four main time eras and the events that characterize them.
- how to provide examples of natural selection.
- how to explain the adaptation of organisms over time due to changes in their environment.
- how to differentiate between biotic and abiotic factors and identify factors that influence organisms.
- how to identify producers, consumers, and decomposers in a food chain or web.
- how to explain how organisms are affected by symbiotic relationships and give examples.
- how to illustrate how energy flows from the sun to producers to consumers to decomposers.
- how to illustrate a food chain and differentiate between a food web and a food chain.
- how to explain the process involved in the nitrogen cycle and illustrate the carbon cycle
- how to summarize how food provides energy to organisms and describe how glucose is used for building cellular structures.
- how to identify organic compounds and their use for growth and survival.
- how to explain the relationship between respiration and digestion.
- how to identify cancer causing agents and how viruses spread in the human body.
- how to classify the three types of bacteria based on shape and differentiate between a virus and bacteria.
- how to explain how parasites can cause disease and describe how a mutagen might occur.
- how to explain different types of treatments for diseases caused by viruses, bacteria, and fungi.
- how to explain the difference between an epidemic and a pandemic.
- how to identify ways to treat diseases and explain methods of preventing diseases.
- how to explore careers in biotechnology and identify economic benefits of biotechnology in North Carolina.
- how to create a model of an atom by identifying and describing its parts.
- how atoms combine to make compounds and how to differentiate between an element and a compound and write a chemical formula.
- how to differentiate between a homogeneous and heterogeneous mixture.
- how to explain how Mendeleev contributed to the periodic table, identify groups on it, and use the periodic table to identify characteristics of elements.
- how to classify elements as a metal, nonmetal, or metalloid and differentiate between them.
- how to use the periodic table to find out the number of electrons, protons, and neutrons in an element's atom.

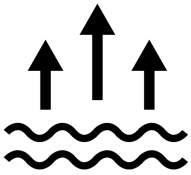
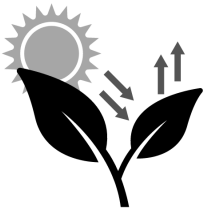
- how to use the periodic table to determine valence electrons.
- how to illustrate how atoms combine by sharing valence electrons.
- how to identify chemical/physical properties and changes and identify evidence that a chemical change has occurred.
- how to calculate the density of an object and identify the three states of matter.
- how to demonstrate the law of conservation of mass through balancing chemical equations.
- how to model how atoms are conserved during a chemical reaction.
- how to measure the mass before and after a chemical reaction to show the conservation of mass.
- how to compare and contrast the different kinds of energy sources, the effects on the environment and identify the many forms of energy that we use in our daily lives.
- how to identify ways to use energy from the sun and list ways to conserve energy.
- how to discuss the implications of the depletion of renewable and nonrenewable resources.
- how to give examples of the environmental impacts of using fossil fuels in the future
- how to list the organic and inorganic compounds necessary for growth and survival.
- how to describe how organic compounds are the building blocks for cell structures.
- how to explain the process in which photosynthesis transforms light energy into chemical energy.
- how to explain cellular respiration and describe the relationship between respiration and digestion.
- how to summarize ways in which food provides energy and necessary nutrients to organisms through cellular respiration.
- how to explain how healthy diets and exercise relate to good health among humans.

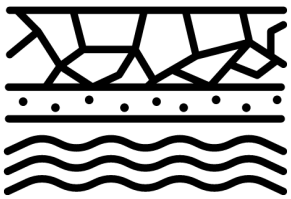
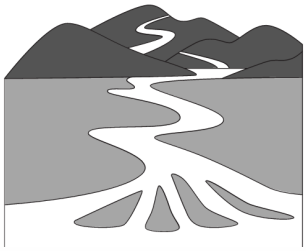
**Curious what the specific standards are for [X] Grade [Content Area] in North Carolina?**

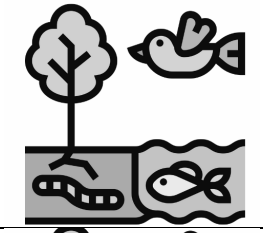
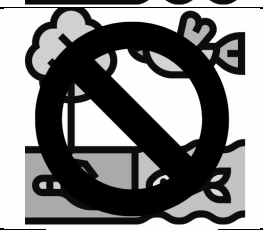
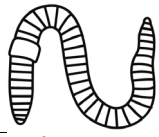
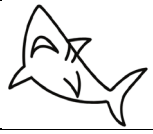
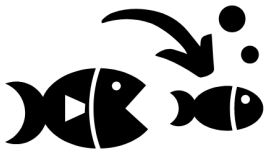
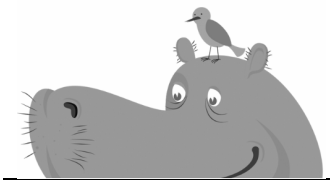
Check out the North Carolina Standard Course of Study to learn more. Looking for additional explanations about what students should be able to do at the end of this course? Check out NC DPI's unpacked contents document aligned to the course standards.

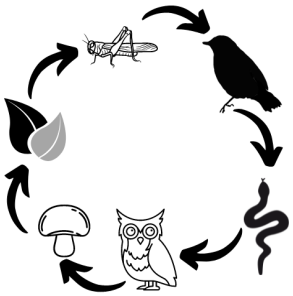
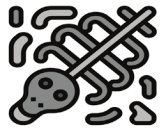
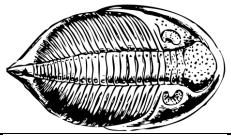
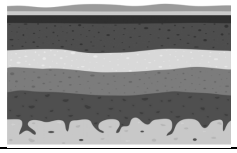
# Key Vocabulary

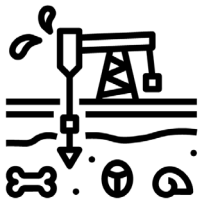
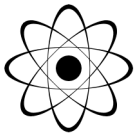
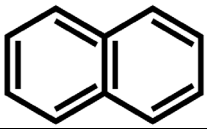
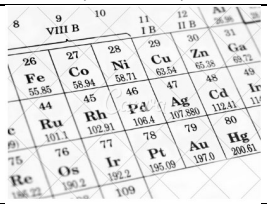
| Visual | Term | Definition |
|---|---|---|
|  | **Groundwater** | Water found in the spaces between soil particles and cracks in rocks underground. Groundwater is a natural resource that is used for drinking, recreation, industry, and growing crops. |

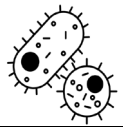
| Visual | Term | Definition |
|---|---|---|
|  | **Precipitation** | Rain, snow, sleet or hail that falls to the ground. |
|  | **Condensation** | The process where water vapor becomes a liquid. |
|  | **Evaporation** | The process where a material changes from its liquid state to its gas state. |
|  | **Photosynthesis** | A process carried out by green plants and other organisms where plants use sunlight to make food from carbon dioxide and water. |
|  | **Transpiration** | The process where plants exhale water vapor through pores in their leaves. |
|  | **Hydrosphere** | All water on Earth |
|  | **River Basin** | A group of watersheds all running together; an area of land drained by a river and its tributaries |
|  | **Watershed** | Collects all water within the drainage area and channeling it into a stream, river, or lake |

| Visual | Term | Definition |
|---|---|---|
|  | **Aquifer** | Any underground layer of permeable rock or sediment that holds water. |
|  | **Estuary** | The place where freshwater and saltwater meet. Usually water is brackish and contains many organisms. |
|  | **Water Cycle** | The movement of water from oceans and rivers, into the atmosphere, and back to the Earth as precipitation. |
|  | **Point Source Pollution** | Pollution where you can identify the source. |
|  | **Non-Point Source Pollution** | Pollution where you cannot identify the source. |
|  | **Ecosystem** | a community of organisms in an environment interacting with one another, including weather |

| Visual | Term | Definition |
|---|---|---|
|  | **Biotic Factor** | Living things that are found in an ecosystem |
|  | **Abiotic Factor** | Non-living things that are found in an ecosystem. |
|  | **Producer** | Any organism that makes its own food. |
|  | **Consumer** | Any organism that gets its energy from other sources. |
|  | **Decomposer** | Organisms that break down once living materials. |
|  | **Predator** | An organism that hunts and kills other organisms for food. |
|  | **Prey** | The organism that is hunted by a predator. |
|  | **Parasitism** | Symbiotic relationship where one organism benefits and the other is harmed. |
|  | **Commensalism** | Symbiotic relationship where one organism benefits and the other is neither helped nor harmed. |

| Visual | Term | Definition |
|---|---|---|
|  | **Mutualism** | Symbiotic relationship where both organisms benefit. |
|  | **Food Web** | Interactions of organisms showing the flow of energy and transfer of matter within an ecosystem. |
|  | **Extinction** | When all members of a species die off. |
|  | **Relative Dating** | Determining age based on surrounding rock layers. |
|  | **Radioactive Dating** | Determining age based on measuring radioactive elements. |
|  | **Fossil** | Preserved remains of once living organisms. |
|  | **Law of Superposition** | Law that states that younger rock layers are found above older rock layers when observing sedimentary rock layers. |
|  | **Energy** | The ability to do work. |
|  | **Renewable Energy** | Energy from resources that can be easily replenished. |
|  | **Nonrenewable Energy** | Energy from resources that are used faster than they can be replenished. |

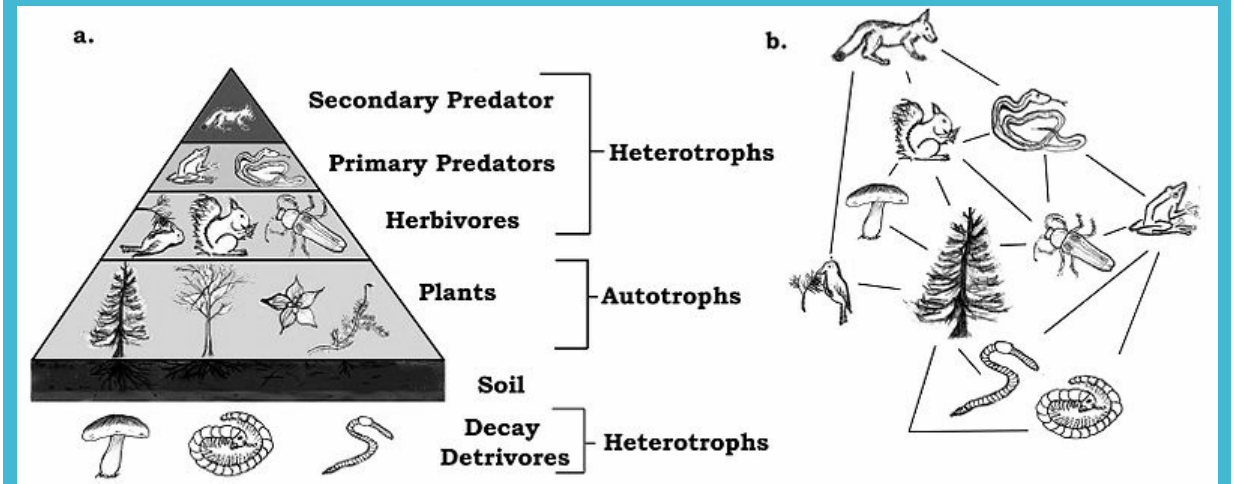
| Visual | Term | Definition |
|---|---|---|
|  | **Fossil Fuel** | Nonrenewable resources from the remains of living organisms (coal, natural gas, and petroleum). |
|  | **Conservation** | Preserving resources and maintaining our planet. |
|  | **Atom** | Smallest unit of an element |
|  | **Element** | Basic building block of matter |
|  | **Molecule** | A group of atoms joined together. |
|  | **Compound** | Chemical substance composed of two or more atoms of different elements. |
|  | **Periodic Table** | A chart with elements arranged according to their atomic number. |
|  | **Solid** | State of matter composed of tightly packed molecules. This results in a solid surface. |
|  | **Liquid** | State of matter composed of freely moving molecules. |
|  | **Gas** | State of matter composed freely moving molecules capable of infinite expansion |

| Visual | Term | Definition |
|---|---|---|
|  | **Mass** | The amount of matter in an object |
|  | **DNA** | Deoxyribonucleic Acid. Carries all the genetic information for all organisms. |
|  | **Virus** | Nonliving disease-causing agent |
|  | **Bacteria** | Prokaryotic organisms found on Earth that are capable of causing disease and treated with an antibiotic. |

# Learning in Action: Grade Level Skills

## Examples of Grade Level Skills

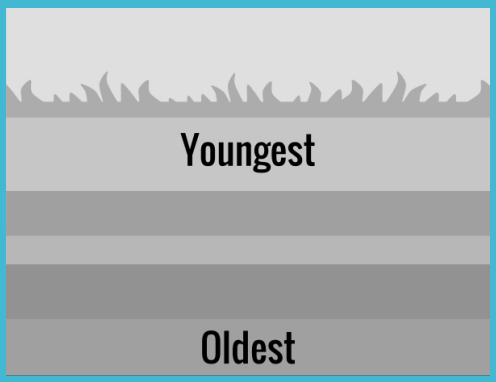
Students should be able to ask questions about the natural and human built world and design a way to test to answer question or solve problem.




Tropic Web by Thomasina https://upload.wikimedia.org/wikipedia/commons/1/13/TrophicWeb.jpg This file is licensed under the Creative Commons Attribution 3.0 Unported license

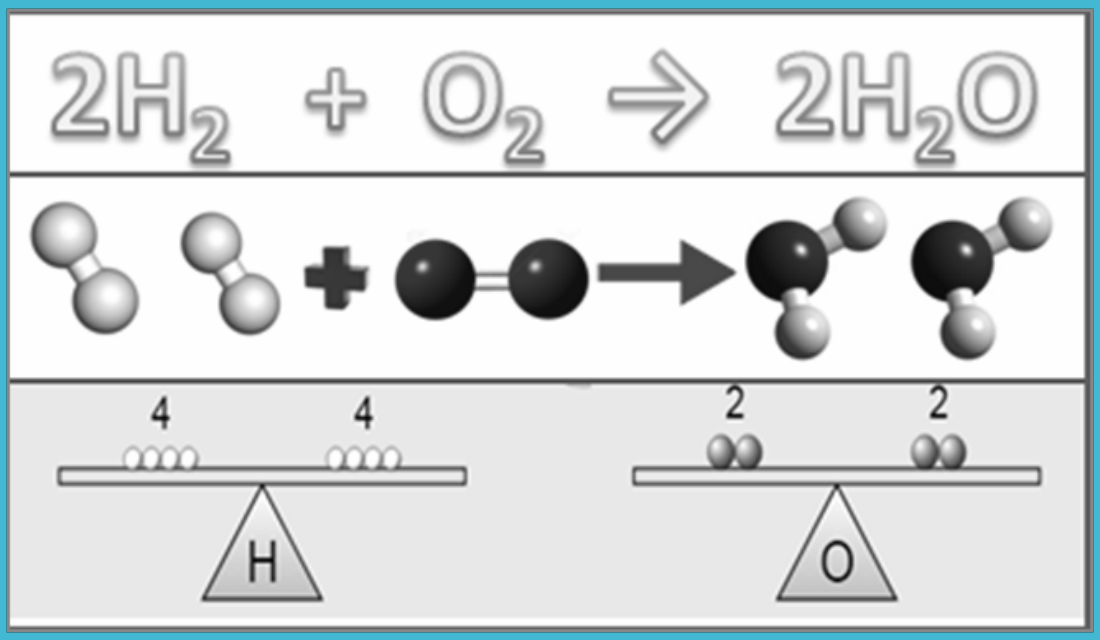
Students need to understand that in an ecosystem there are producers that are capable of producing their own food through the processes of Photosynthesis or Chemosynthesis. These organisms are then eaten by consumers (herbivores-plant eaters and omnivores-both plant and animal eaters. This allows for energy to transfer between organisms as they move through the trophic levels. The movement of this energy from organism to organism

is demonstrated in a food chain as you can see on the right. The arrows in a food chain demonstrate the flow of energy with the arrow pointing towards the organism receiving the energy. This is not an efficient process as most of the energy is lost to the environment and only 10% reaches the next level.




Schematic view of the superposition of rock layers. Public Domain License

The Law of Superposition states that the youngest layers of rock will be on the top and the oldest on the bottom when looking at sedimentary rock layers. Scientists are able to use this information when looking at fossils to determine relative age of the rock layers. Relative age is not exact but by using Index Fossils or fossils of organisms that lived only in a specific time frame, they can determine a relative age of the layer of rock.




Balancing Chemical Equations and the formation of water by Kvr.lohith from the website: https://upload.wikimedia.org/wikipedia/commons/5/53/Balancing_chemical_equation_-

Students need to understand that the law of conservation of mass states that matter can neither be created or destroyed. This means that the matter you start with should equal the matter you end with but it may change forms. As you look at the equation above for the creation of water you know that Hydrogen and Oxygen combine to form Water. To balance an equation you have to take the amount of each element using the subscripts. For example to build water you have one 2 Hydrogen and 2 Oxygen in the reactants to form one molecule of water (H2O). If we write down under the equation what we have.

| **Reactants** | **Products** | |
|---|---|---|
| H-2 | H-2 | *The reactants and the products do not equal* |
| O-2 | O-1 | |

In order to balance the equation you use coefficients before the term to multiply by the subscript until you are equal on both sides for each element.

| **Reactants** | **Products** |
|---|---|
| 2 X H2 = 4H | 2 X H2O = 4 H and 2 O |
| 1 X O2 = 2O | |

*Now you can say that the equation is balanced because you have the same amount of each element on each side of the equation.*

Students need to understand that both viruses and bacteria can cause a person to become sick, how you treat them is different. Bacteria infections such as Strep Throat can and should be treated with an antibiotic while viral infections such as the cold, Influenza (Flu) and COVID should not be treated with an antibiotic as these do not work on viruses. Diseases can be localized, in a small region (epidemic), or across the world (pandemic).

Students need to know that water covers most of the Earth. However, most of this water is saltwater found in oceans and is not suitable for drinking. Our freshwater is found in rivers, lakes, and streams with the highest percentage being frozen in glaciers. Due to the human body's need for water, it is imperative that we take care of freshwater on Earth and need to look at water quality and how to maintain water quality.

Energy can either be renewable (can replenish quickly) or nonrenewable (is used quicker than can be replenished). We use a lot of fossil fuels or fuel from the remains of once living organisms (petroleum, coal, and natural gas). However, these resources are nonrenewable and contribute greatly to global warming. There are some renewable energy resources such as solar, wind, nuclear, and geothermal, but each of these come with advantages and disadvantages.

# Resources

Links and online resources to allow you to support your child's learning.

- Khan Academy Science
- CK-12 Earth Science for Middle School
- CK-12 Physical Science for Middle School
- CK-12 Life Science for Middle School
- Quizlet 8th Grade Science Vocabulary

# At-Home Connections

- Have students talk about pollution that they see whether it be from trash on the ground to runoff entering local bodies of water.
- Talk about rocks they see on the ground. Have students examine the rocks and try to identify the type of rock.
- Have students write children's books on some of the topics to help them be able to explain a concept to others.
- Examine data from COVID or the Flu for your region. Talk about the differences between bacteria and viruses. Help students understand a vaccine and why it is important if you are prescribed antibiotics, you take them like you should.
- Look at your carbon footprint for how much you use of fossil fuels. As a family, decide ways you can reduce your carbon footprint or conserve natural resources. Look for alternative energy sources in your area and discuss the advantages and disadvantages (Ex. electric cars do not emit carbon dioxide but the batteries are expensive and hard to find a place to charge when needed)
- Have students look around at ecosystems near your home. See if they can identify a food chain. Use this to discuss the flow of energy. Talk about producers and consumers and what the difference is.

# Challenges to Anticipate

Students have a hard time with balancing equations. Students need to practice this concept by identifying each element in both the reactants and products. Subscripts will tell students how many they have in the beginning equation but you cannot add subscripts to balance. Students must then add a coefficient before the element or compound and multiple by the subscript for each element. If there is no subscript, it is an understood 1.

Students also get viruses and bacteria confused. You do not use an antibiotic on a viral infection because a virus is non-living. Antibiotics are only used with bacterial infections. Bacteria are living.

Students miscalculate the energy as they move from trophic level to trophic level. Only 10% moves which means if you start with 1000 only 100 moves to the next level. From there only 10 moves to the next level, and finally, 1 moves to the next level. This is why we have to eat so much in order to have the energy our bodies need.

Understand chemical and physical changes. Physical changes may change the physical structure of the item. For example ripping paper. You can put the paper back together with tape and it is still paper. Chemical changes will change the chemical composition. If I take that same piece of paper and set it on fire, I have changed its chemical composition and I cannot put it back to a piece of paper.

# Communicating with Your Child's Teacher

Still feeling stuck? Reach out to your child's teacher to discuss what you can do further your child's learning. Some questions that might guide your discussion:

- What resources would you suggest I use to support my child?
- Where do you see my child struggling? What can we do together to help?
- What should my child practice at home?
- What collective message can we send together to help my child learn?

**Need Technical Help?**

Reach out to your student's home school for technical assistance. Include the type of device (PC, Mac, Chromebook, etc.) and browser (Chrome, Firefox, Safari, etc.).

## Citations

Images created using Canva.

(2022). Wikimedia.org. https://upload.wikimedia.org/wikipedia/commons/5/53/Balancing_chemical_equation_-_formation_of_water.png?20170603105922

(2022). Freesvg.org. https://freesvg.org/img/Law-of-Superposition.png

(2022). Wikimedia.org. https://upload.wikimedia.org/wikipedia/commons/1/13/TrophicWeb.jpg

McGraw-Hill encyclopedia of science & technology. (2007). New York :McGraw-Hill