

Florida Middle School Grade 8 Science Tutorials offer targeted instruction, practice, and review designed to help students develop scientific literacy, deepen conceptual understanding, and apply scientific practices. Students explore concepts such as the nature of the universe, how matter and energy move through living systems, and the physical and chemical properties of matter.

Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By continually honing their ability to apply knowledge in real-world scenarios, students build the depth of knowledge and higher-order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students as they explore the nature of science through focused content, interactive mini investigations, multi-modal representations, and personalized feedback. The Review It offers a high-impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

These Tutorials are built to the Next Generation Science Standards for middle school science.

## 1. NATURE OF SCIENCE

### • WHAT IS SCIENCE?

- **SC.8.N.1.A** *Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation.*
- **SC.8.N.1.D** *Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.*
- **SC.8.N.2.A** *Scientific knowledge is based on empirical evidence, and is appropriate for understanding the natural world, but it provides only a limited understanding of the supernatural, aesthetic, or other ways of knowing, such as art, philosophy, or religion.*
- **SC.8.N.2.1** *Distinguish between scientific and pseudoscientific ideas.*
- **SC.8.N.4.1** *Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.*
- **SC.8.N.4.2** *Explain how political, social, and economic concerns can affect science, and vice versa.*
- **SC.8.E.5.10** *Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.*
- **SC.8.N.1.B** *The processes of science frequently do not correspond to the traditional portrayal of "the scientific method."*
- **SC.8.N.1.3** *Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.*
- **SC.8.N.1.4** *Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.*
- **SC.8.N.2.C** *Because science is based on empirical evidence it strives for objectivity, but as it is a human endeavor the processes, methods, and knowledge of science include subjectivity, as well as creativity and discovery.*
- **SC.8.N.2.2** *Discuss what characterizes science and its methods.*
- **SC.8.N.2.B** *Scientific knowledge is durable and robust, but open to change.*
- **SC.8.N.3.2** *Explain why theories may be modified but are rarely discarded.*

### • TYPES OF INVESTIGATIONS

- **SC.8.N.1.A** *Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of*

*the meaning of those data, and the communication of this evaluation.*

- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- **SC.8.N.1.6** Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
- **SC.8.N.2.2** Discuss what characterizes science and its methods.
- **SC.8.E.5.10** Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- **SC.8.N.1.2** Design and conduct a study using repeated trials and replication.
- **SC.8.N.1.5** Analyze the methods used to develop a scientific explanation as seen in different fields of science.
- **SC.8.N.1.3** Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.
- **SC.8.N.2.C** Because science is based on empirical evidence it strives for objectivity, but as it is a human endeavor the processes, methods, and knowledge of science include subjectivity, as well as creativity and discovery.

#### ● USING MODELS

- **SC.8.N.1.3** Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

## 2. MEASUREMENT AND DATA

#### ● TOOLS AND MEASUREMENT

- **SC.8.N.1.A** Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation.
- **SC.8.E.5.10** Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- **SC.8.P.8.2** Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.
- **SC.8.P.8.3** Explore and describe the densities of various materials through measurement of their masses and volumes.
- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

#### ● DISPLAYING AND INTERPRETING DATA

- **SC.8.N.1.A** Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation.
- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

## 3. NATURE OF MATTER

#### ● WHAT IS MATTER?

- **SC.8.P.8.A** All objects and substances in the world are made of matter. Matter has two fundamental properties: matter takes up space and matter has mass which gives it inertia.
- **SC.8.P.8.5** Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
- **SC.8.P.8.7** Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and

neutrons).

- **SC.8.P.8.9** Distinguish among mixtures (including solutions) and pure substances.
- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

- **ATOMIC STRUCTURE**

- **SC.8.N.2.B** Scientific knowledge is durable and robust, but open to change.
- **SC.8.N.3.2** Explain why theories may be modified but are rarely discarded.
- **SC.8.P.8.7** Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).

- **ELEMENTS AND THE PERIODIC TABLE**

- **SC.8.P.8.7** Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).
- **SC.8.P.8.6** Recognize that elements are grouped in the periodic table according to similarities of their properties.
- **SC.8.P.8.5** Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
- **SC.8.P.9.C** When matter changes chemically, a rearrangement of bonds between the atoms occurs. This results in new substances with new properties.

## 4. DESCRIBING MATTER

- **PHYSICAL AND CHEMICAL PROPERTIES**

- **SC.8.P.8.B** Objects and substances can be classified by their physical and chemical properties. Mass is the amount of matter (or "stuff") in an object. Weight, on the other hand, is the measure of force of attraction (gravitational force) between an object and Earth.
- **SC.8.P.8.3** Explore and describe the densities of various materials through measurement of their masses and volumes.
- **SC.8.P.8.4** Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.
- **SC.8.P.8.2** Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

- **SOLIDS, LIQUIDS, AND GASES**

- **SC.8.P.8.1** Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.

- **MIXTURES OF MATTER**

- **SC.8.P.8.9** Distinguish among mixtures (including solutions) and pure substances.

## 5. CHANGES IN MATTER

- **HOW CAN MATTER CHANGE?**

- **SC.8.P.8.A** All objects and substances in the world are made of matter. Matter has two fundamental properties: matter takes up space and matter has mass which gives it inertia.
- **SC.8.P.8.B** Objects and substances can be classified by their physical and chemical properties. Mass is the amount of matter (or "stuff") in an object. Weight, on the other hand, is the measure of force of attraction (gravitational force) between an object and Earth.
- **SC.8.P.9.A** Matter can undergo a variety of changes.
- **SC.8.P.9.C** When matter changes chemically, a rearrangement of bonds between the atoms occurs. This results in new

substances with new properties.

- **SC.8.P.9.3** Investigate and describe how temperature influences chemical changes.
- **SC.8.P.8.8** Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
- **SC.8.P.9.2** Differentiate between physical changes and chemical changes.

#### ● CHANGES OF STATE

- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- **SC.8.P.9.1** Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

#### ● CHEMICAL EQUATIONS

- **SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- **SC.8.P.9.1** Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

## 6. FORCES

#### ● EFFECTS OF FORCES

- **SC.8.P.8.A** All objects and substances in the world are made of matter. Matter has two fundamental properties: matter takes up space and matter has mass which gives it inertia.

#### ● GRAVITATIONAL FORCE

- **SC.8.E.5.7** Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
- **SC.8.P.8.B** Objects and substances can be classified by their physical and chemical properties. Mass is the amount of matter (or "stuff") in an object. Weight, on the other hand, is the measure of force of attraction (gravitational force) between an object and Earth.
- **SC.8.P.8.2** Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

## 7. FORCES IN THE SOLAR SYSTEM

#### ● SUN-EARTH-MOON SYSTEM

- **SC.8.E.5.9.2** the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.
- **SC.8.E.5.9.1** the Sun on the Earth including seasons and gravitational attraction

#### ● OUR SOLAR SYSTEM

- **SC.8.E.5.8** Compare various historical models of the Solar System, including geocentric and heliocentric.
- **SC.8.E.5.4** Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.
- **SC.8.E.5.7** Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
- **SC.8.E.5.9.1** the Sun on the Earth including seasons and gravitational attraction
- **SC.8.E.5.3** Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.

## 8. BEYOND OUR SOLAR SYSTEM

### • THE UNIVERSE

- **SC.8.E.5.1** Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
- **SC.8.E.5.2** Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
- **SC.8.E.5.3** Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.
- **SC.8.E.5.4** Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

### • OUR SUN AND OTHER STARS

- **SC.8.E.5.6** Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
- **SC.8.E.5.5** Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
- **SC.8.E.5.4** Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

## 9. SPACE EXPLORATION TECHNOLOGY

### • ELECTROMAGNETIC WAVES

- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

### • WAVES AND TECHNOLOGY

- **SC.8.N.4.2** Explain how political, social, and economic concerns can affect science, and vice versa.
- **SC.8.E.5.10** Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

### • SPACE EXPLORATION

- **SC.8.E.5.12** Summarize the effects of space exploration on the economy and culture of Florida.
- **SC.8.E.5.1** Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
- **SC.8.E.5.10** Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.
- **SC.8.N.4.2** Explain how political, social, and economic concerns can affect science, and vice versa.

## 10. PLANET EARTH

### • THE EARTH SYSTEM

- **SC.8.E.5.4** Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.
- **SC.8.L.18.C** Matter and energy are recycled through cycles such as the carbon cycle.
- **SC.8.L.18.3** Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.

- **SC.8.L.18.4** Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

- **SEVERE WEATHER**

- **SC.8.N.1.6** Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
- **SC.8.N.4.2** Explain how political, social, and economic concerns can affect science, and vice versa.
- **SC.8.E.5.10** Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- **SC.8.E.5.11** Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

- **MINERALS**

- **SC.8.P.8.4** Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

## 11. EARTH'S LIVING SYSTEMS

- **CHARACTERISTICS OF LIFE**

- **SC.8.L.18.A** Living things all share basic needs for life.
- **SC.8.L.18.B** Living organisms acquire the energy they need for life processes through various metabolic pathways (photosynthesis and cellular respiration).

- **INTERACTIONS IN ECOSYSTEMS**

- **SC.8.L.18.C** Matter and energy are recycled through cycles such as the carbon cycle.
- **SC.8.L.18.3** Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.
- **SC.8.L.18.4** Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

## 12. MATTER AND ENERGY OF LIVING SYSTEMS

- **CHEMISTRY OF LIFE**

- **SC.8.P.8.5** Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
- **SC.8.L.18.A** Living things all share basic needs for life.
- **SC.8.L.18.B** Living organisms acquire the energy they need for life processes through various metabolic pathways (photosynthesis and cellular respiration).
- **SC.8.L.18.1** Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
- **SC.8.L.18.2** Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

- **CELL NUTRITION AND TRANSPORT**

- **SC.8.L.18.B** Living organisms acquire the energy they need for life processes through various metabolic pathways (photosynthesis and cellular respiration).
- **SC.8.L.18.1** Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.
- **SC.8.L.18.2** Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

- **PLANT RESPONSES**

- **SC.8.L.18.1** Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and

*chlorophyll; production of food; release of oxygen.*

- **SC.8.L.18.2** *Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.*