

Middle School Grade 7 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 classification and conservation of matter, organization in living systems, heredity and variation of traits, and interactions of living systems and the environment.

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?

- **7.S.1A.4.2** support hypotheses, explanations, claims, or designs.
- **7.S.1A.8.4** evaluate hypotheses, explanations, claims, or designs or
- **7.S.1A.1.1** generate hypotheses for scientific investigations,
- **7.S.1A.3.1** formulate scientific questions and testable hypotheses,
- **7.S.1A.1.2** refine models, explanations, or designs, or

• TYPES OF INVESTIGATIONS

- **7.S.1A.1.1** generate hypotheses for scientific investigations,
- **7.S.1A.3.1** formulate scientific questions and testable hypotheses,
- **7.S.1A.4.1** reveal patterns and construct meaning or
- **7.S.1A.4.2** support hypotheses, explanations, claims, or designs.
- **7.S.1A.1.3** extend the results of investigations or challenge claims.
- **7.S.1A.3.2** identify materials, procedures, and variables,
- **7.S.1A.3.3** select and use appropriate tools or instruments to collect qualitative and quantitative data, and

• USING MODELS

- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,
- **7.S.1A.5.3** express relationships between variables for models and investigations, or
- **7.S.1A.6.1** primary or secondary scientific evidence and models,
- **7.S.1A.6.3** predictions based on observations and measurements, or
- **7.S.1A.8.3** develop models,
- **7.S.1A.1.2** refine models, explanations, or designs, or
- **7.S.1A.8.4** evaluate hypotheses, explanations, claims, or designs or

2. MEASUREMENT AND DATA

- **TOOLS AND MEASUREMENT**

- **7.S.1A.3.3** select and use appropriate tools or instruments to collect qualitative and quantitative data, and
- **7.S.1A.5.1** use and manipulate appropriate metric units,
- **7.S.1A.5.2** collect and analyze data,
- **7.P.2B.2** Use mathematical and computational thinking to describe the relationship between the mass, volume, and density of a given substance.
- **7.S.1A.3.4** record and represent data in an appropriate form. Use appropriate safety procedures.

- **DISPLAYING AND INTERPRETING DATA**

- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,
- **7.S.1A.3.3** select and use appropriate tools or instruments to collect qualitative and quantitative data, and
- **7.S.1A.3.4** record and represent data in an appropriate form. Use appropriate safety procedures.
- **7.S.1A.4.1** reveal patterns and construct meaning or
- **7.S.1A.5.2** collect and analyze data,
- **7.S.1A.5.3** express relationships between variables for models and investigations, or
- **7.S.1A.5.4** use grade-level appropriate statistics to analyze data.
- **7.S.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.

3. NATURE OF MATTER

- **WHAT IS MATTER?**

- **7.S.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
- **7.P.2A.3** Analyze and interpret data to describe and classify matter as pure substances (elements or compounds) or mixtures (heterogeneous or homogeneous) based on composition.
- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,
- **7.S.1A.6.4** data communicated in graphs, tables, or diagrams.
- **7.P.2A.1** Develop and use simple atomic models to illustrate the components of elements (including the relative position and charge of protons, neutrons, and electrons).

- **ATOMIC STRUCTURE**

- **7.S.1A.1.2** refine models, explanations, or designs, or
- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,
- **7.S.1A.8.3** develop models,
- **7.P.2A.1** Develop and use simple atomic models to illustrate the components of elements (including the relative position and charge of protons, neutrons, and electrons).
- **7.P.2A.2** Obtain and use information about elements (including chemical symbol, atomic number, atomic mass, and group or family) to describe the organization of the periodic table.

- **ELEMENTS AND THE PERIODIC TABLE**

- **7.P.2A.2** Obtain and use information about elements (including chemical symbol, atomic number, atomic mass, and group or family) to describe the organization of the periodic table.
- **7.S.1A.4.1** reveal patterns and construct meaning or
- **7.S.1A.8.1** answer questions,
- **7.P.2A.4** Construct explanations for how compounds are classified as ionic (metal bonded to nonmetal) or covalent (nonmetals bonded together) using chemical formulas.

4. DESCRIBING MATTER

- **PHYSICAL AND CHEMICAL PROPERTIES**

- **7.P.2B.2** Use mathematical and computational thinking to describe the relationship between the mass, volume, and density of a given substance.

- **7.P.2B.1** Analyze and interpret data to describe substances using physical properties (including state, boiling/melting point, density, conductivity, color, hardness, and magnetic properties) and chemical properties (the ability to burn or rust).
- **7.S.1A.5.2** collect and analyze data,
- **7.S.1A.8.1** answer questions,
- **7.P.2B.3** Analyze and interpret data to compare the physical properties, chemical properties (neutralization to form a salt, reaction with metals), and pH of various solutions and classify solutions as acids or bases.

- **SOLIDS, LIQUIDS, AND GASES**

- **7.P.2B.1** Analyze and interpret data to describe substances using physical properties (including state, boiling/melting point, density, conductivity, color, hardness, and magnetic properties) and chemical properties (the ability to burn or rust).
- **7.P.2B.4** Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

- **MIXTURES OF MATTER**

- **7.S.1A.5.2** collect and analyze data,
- **7.S.1A.8.1** answer questions,
- **7.P.2A.3** Analyze and interpret data to describe and classify matter as pure substances (elements or compounds) or mixtures (heterogeneous or homogeneous) based on composition.
- **7.S.1A.4.1** reveal patterns and construct meaning or
- **7.S.1A.5.3** express relationships between variables for models and investigations, or
- **7.S.1A.6.3** predictions based on observations and measurements, or
- **7.S.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
- **7.S.1A.8.2** explain or describe phenomena,

5. CHANGES IN MATTER

- **HOW CAN MATTER CHANGE?**

- **7.S.1A.6.1** primary or secondary scientific evidence and models,
- **7.S.1A.6.2** conclusions from scientific investigations,
- **7.S.1A.6.3** predictions based on observations and measurements, or
- **7.S.1A.6.4** data communicated in graphs, tables, or diagrams.
- **7.S.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
- **7.S.1A.8.1** answer questions,
- **7.S.1A.8.2** explain or describe phenomena,
- **7.P.2B.3** Analyze and interpret data to compare the physical properties, chemical properties (neutralization to form a salt, reaction with metals), and pH of various solutions and classify solutions as acids or bases.
- **7.P.2B.4** Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

- **CHANGES OF STATE**

- **7.S.1A.6.4** data communicated in graphs, tables, or diagrams.
- **7.S.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
- **7.S.1A.6.1** primary or secondary scientific evidence and models,
- **7.S.1A.6.3** predictions based on observations and measurements, or
- **7.S.1A.8.1** answer questions,
- **7.S.1A.8.2** explain or describe phenomena,
- **7.P.2B.4** Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

- **CHEMICAL EQUATIONS**

- **7.S.1A.6.1** *primary or secondary scientific evidence and models,*
- **7.S.1A.8.1** *answer questions,*
- **7.S.1A.8.2** *explain or describe phenomena,*
- **7.S.1A.8.4** *evaluate hypotheses, explanations, claims, or designs or*
- **7.P.2B.5** *Develop and use models to explain how chemical reactions are supported by the law of conservation of matter.*

6. EARTH'S MATTER

• MINERALS

- **7.S.1A.6.2** *conclusions from scientific investigations,*
- **7.S.1A.8.1** *answer questions,*
- **7.P.2A.3** *Analyze and interpret data to describe and classify matter as pure substances (elements or compounds) or mixtures (heterogeneous or homogeneous) based on composition.*
- **7.P.2B.1** *Analyze and interpret data to describe substances using physical properties (including state, boiling/melting point, density, conductivity, color, hardness, and magnetic properties) and chemical properties (the ability to burn or rust).*
- **7.P.2B.2** *Use mathematical and computational thinking to describe the relationship between the mass, volume, and density of a given substance.*

• SOIL

- **7.EC.5A.2** *Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.*
- **7.S.1A.6.2** *conclusions from scientific investigations,*
- **7.S.1A.6.4** *data communicated in graphs, tables, or diagrams.*
- **7.S.1A.8.1** *answer questions,*

7. MOVEMENT OF MATTER THROUGH ECOSYSTEMS

• CHARACTERISTICS OF ECOSYSTEMS

- **7.EC.5A.1** *Develop and use models to describe the characteristics of the levels of organization within ecosystems (including species, populations, communities, ecosystems, and biomes).*
- **7.L.3A.4** *Construct scientific arguments to support claims that bacteria are both helpful and harmful to other organisms and the environment.*
- **7.EC.5A.2** *Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.*

• INTERACTIONS IN ECOSYSTEMS

- **7.L.3A.4** *Construct scientific arguments to support claims that bacteria are both helpful and harmful to other organisms and the environment.*
- **7.EC.5B.1** *Develop and use models to explain how organisms interact in a competitive or mutually beneficial relationship for food, shelter, or space (including competition, mutualism, commensalism, parasitism, and predator-prey relationships).*
- **7.S.1A.2.1** *understand or represent phenomena, processes, and relationships,*
- **7.S.1A.6.1** *primary or secondary scientific evidence and models,*
- **7.EC.5A.3** *Analyze and interpret data to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).*
- **7.S.1A.6.4** *data communicated in graphs, tables, or diagrams.*
- **7.EC.5B.2** *Develop and use models (food webs and energy pyramids) to exemplify how the transfer of energy in an ecosystem supports the concept that energy is conserved.*

8. CHANGING ECOSYSTEMS

• SUCCESSION AND ECOSYSTEM STABILITY

- **7.EC.5A.2** *Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.*
- **7.EC.5B.4** *Define problems caused by the introduction of a new species in an environment and design devices or solutions*

to minimize the impact(s) to the balance of an ecosystem.

- **7.EC.5B.3** Analyze and interpret data to predict how changes in the number of organisms of one species affects the balance of an ecosystem.
- **7.EC.5A.3** Analyze and interpret data to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).

- **IMPACTS OF HUMANS**

- **7.S.1A.6.1** primary or secondary scientific evidence and models,
- **7.S.1A.3.3** select and use appropriate tools or instruments to collect qualitative and quantitative data, and
- **7.S.1A.6.4** data communicated in graphs, tables, or diagrams.
- **7.P.2B.3** Analyze and interpret data to compare the physical properties, chemical properties (neutralization to form a salt, reaction with metals), and pH of various solutions and classify solutions as acids or bases.
- **7.EC.5A.2** Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.
- **7.S.1A.1.2** refine models, explanations, or designs, or
- **7.S.1A.4.2** support hypotheses, explanations, claims, or designs.
- **7.S.1B.1.2** ask questions about the criteria and constraints of the device or solutions,
- **7.S.1B.1.3** generate and communicate ideas for possible devices or solutions,
- **7.EC.5A.3** Analyze and interpret data to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).
- **7.EC.5B.3** Analyze and interpret data to predict how changes in the number of organisms of one species affects the balance of an ecosystem.

9. CELLS AND DIVERSITY OF LIFE

- **CELL STRUCTURE**

- **7.S.1A.1.2** refine models, explanations, or designs, or
- **7.L.3A.1.1** organisms are made of one or more cells,
- **7.L.3A.1.2** cells are the basic unit of structure and function of organisms, and
- **7.L.3A.1.3** cells come only from existing cells.
- **7.L.3A.2** Analyze and interpret data from observations to describe different types of cells and classify cells as plant, animal, protist, or bacteria.
- **7.L.3A.3** Develop and use models to explain how the relevant structures within cells (including cytoplasm, cell membrane, cell wall, nucleus, mitochondria, chloroplasts, lysosomes, and vacuoles) function to support the life of plant, animal, and bacterial cells.
- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,

- **DOMAINS AND KINGDOMS OF LIFE**

- **7.L.3A.2** Analyze and interpret data from observations to describe different types of cells and classify cells as plant, animal, protist, or bacteria.
- **7.L.3B.1** Develop and use models to explain how the structural organizations within multicellular organisms function to serve the needs of the organism.

10. CELL PROCESSES

- **CELL NUTRITION AND TRANSPORT**

- **7.L.3A.3** Develop and use models to explain how the relevant structures within cells (including cytoplasm, cell membrane, cell wall, nucleus, mitochondria, chloroplasts, lysosomes, and vacuoles) function to support the life of plant, animal, and bacterial cells.
- **7.S.1A.2.1** understand or represent phenomena, processes, and relationships,
- **7.S.1A.6.1** primary or secondary scientific evidence and models,
- **7.S.1A.6.2** conclusions from scientific investigations,
- **7.S.1A.8.1** answer questions,

- **CELL GROWTH AND REPRODUCTION**

- **7.L.3A.1.3** *cells come only from existing cells.*

11. MULTICELLULAR SYSTEMS

- **SPECIALIZED CELLS AND TISSUES**

- **7.S.1A.2.1** *understand or represent phenomena, processes, and relationships,*
- **7.L.3B.1** *Develop and use models to explain how the structural organizations within multicellular organisms function to serve the needs of the organism.*

- **ORGANS AND ORGAN SYSTEMS**

- **7.L.3B.1** *Develop and use models to explain how the structural organizations within multicellular organisms function to serve the needs of the organism.*

12. THE HUMAN BODY

- **HUMAN ORGAN SYSTEMS**

- **7.L.3B.2** *Construct explanations for how systems in the human body (including circulatory, respiratory, digestive, excretory, nervous, and musculoskeletal systems) work together to support the essential life functions of the body.*
- **7.L.3B.1** *Develop and use models to explain how the structural organizations within multicellular organisms function to serve the needs of the organism.*

- **DISEASE AND HUMAN HEALTH**

- **7.L.3A.4** *Construct scientific arguments to support claims that bacteria are both helpful and harmful to other organisms and the environment.*

13. GENETICS

- **INHERITANCE**

- **7.L.4A.1** *Obtain and communicate information about the relationship between genes and chromosomes to construct explanations of their relationship to inherited characteristics.*
- **7.S.1A.2.1** *understand or represent phenomena, processes, and relationships,*
- **7.S.1A.6.1** *primary or secondary scientific evidence and models,*
- **7.L.4A.2** *Construct explanations for how genetic information is transferred from parent to offspring in organisms that reproduce sexually.*
- **7.L.4A.3** *Develop and use models (Punnett squares) to describe and predict patterns of the inheritance of single genetic traits from parent to offspring (including dominant and recessive traits, incomplete dominance, and codominance).*
- **7.L.4A.4** *Use mathematical and computational thinking to predict the probability of phenotypes and genotypes based on patterns of inheritance.*

- **GENES AND DNA**

- **7.L.4A.1** *Obtain and communicate information about the relationship between genes and chromosomes to construct explanations of their relationship to inherited characteristics.*
- **7.S.1A.2.1** *understand or represent phenomena, processes, and relationships,*
- **7.S.1A.6.1** *primary or secondary scientific evidence and models,*
- **7.L.4A.5** *Construct scientific arguments using evidence to support claims for how changes in genes (mutations) may have beneficial, harmful, or neutral effects on organisms.*

- **BIOTECHNOLOGY**

- **7.L.4A.6** *Construct scientific arguments using evidence to support claims concerning the advantages and disadvantages of the use of technology (such as selective breeding, genetic engineering, or biomedical research) in influencing the transfer of genetic information.*

