

Unit	Lesson	Lesson Objectives
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The Nature of Science**Designing Scientific Investigations**

Demonstrate how scientific questions are turned into investigations.

Science Practice: Design and conduct a laboratory experiment to answer a specific question.

Research in Science

Distinguish between current scientific consensus and emerging scientific questions and investigations.

Explain the balance between open-mindedness and skepticism in scientific practice.

Science Practice: Inspect resources for valid information to use in research.

Hypotheses, Theories, and Laws

Examine the relationship between observations, hypotheses, theories, and laws.

Explain how hypotheses are formed and tested.

Explain how theories may change as new areas of science and technology develop.

Science Practice: Give examples of how hypotheses lead to new experimental methods.

Scientific Inquiry

Apply the scientific process to given scenarios.

Science Practice: Describe how the scientific inquiry process uses the scientific method.

Laboratory Safety

Demonstrate safe practices during a scientific investigation.

Develop a plan to address specific safety concerns in the lab.

Science Practice: Give examples of safety problems in the lab and describe how to report those problems.

Collecting and Organizing Data

Construct charts, graphs, and tables to organize data in a systematic way.

Gather data through qualitative and quantitative observations.

Identify tools and technology that should be used to gather accurate measurements.

Science Practice: Distinguish between and give examples of observation and inference.

Analyzing Data and Drawing Conclusions

Analyze data to determine validity.

Create charts and graphs to analyze trends in data.

Formulate a conclusion based on observations, data, and inferences.

Science Practice: Describe various ways evidence can be interpreted or explained.

Science-Based Communication

Communicate results of a scientific investigation.

Identify sources of error and justify valid conclusions.

Science Practice: Justify the need for peer review in science.

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Evaluating Scientific Design

Evaluate possible limitations to current scientific design.

Explain how changing the variables, methods, and timing impacts scientific investigations.

Science Practice: Assess the possible impacts of different experimental design decisions.

Analyzing Evidence

Identify possible reasons for inconsistencies in scientific evidence.

Predict trends by analyzing and evaluating data.

Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

Use evidence to critique scientific arguments.

The Chemistry of Life**The Importance of Water**

Describe the steps of the water cycle.

Identify the unique chemical and physical properties of water.

Interpret the importance of water to living organisms.

Science Practice: Predict trends and outcomes based on a given set of data.

Carbohydrates

Compare the structures of monosaccharides, disaccharides, and polysaccharides.

Differentiate between the roles of monosaccharides, disaccharides, and polysaccharides in living organisms.

Identify the role of carbohydrates in living organisms.

Science Practice: Construct charts, graphs, and tables to organize data.

Lipids

Compare and contrast the structures of saturated and unsaturated lipids.

Explain the roles of lipids within living organisms.

Science Practice: Evaluate data to formulate a conclusion.

Proteins and Nucleic Acids

Explain the roles of proteins and nucleic acids in living organisms.

Identify the components of proteins and nucleic acids and discuss how they were discovered.

Recognize essential amino acids found in living organisms.

Science Practice: Evaluate the impact of science and technology on society.

Catalysts

Describe the "lock and key" mechanism of enzymes in chemical reactions.

Explain how catalysts affect the energy of a chemical reaction.

Relate changes in energy to the rate of a chemical reaction.

Science Practice: Create a laboratory experiment to answer a specific question.

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Cell Structure and Function**Cell Theory**

- Compare and contrast the functions of different types of microscopes.
- Describe the components of cell theory.
- Examine the role of microscopes in discovering cells.
- Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

Prokaryotic and Eukaryotic Cells

- Compare and contrast prokaryotic and eukaryotic cells.
- Describe the basic structure of a cell.
- Explain the endosymbiotic theory.
- Science Practice: Evaluate past research from investigations similar in design and purpose.

The Function of Organelles

- Describe the functions of each organelle.
- Identify the organelles of a cell.
- Science Practice: Construct charts, graphs, and tables to organize data.

Cell Homeostasis

- Describe the importance of homeostasis to living organisms.
- Differentiate between diffusion, osmosis, passive transport, and active transport.
- Explain how cells maintain homeostasis.
- Science Practice: Generate procedures to utilize charts, graphs, and tables to show data.

Lab: Diffusion Across a Semi-permeable Membrane

- Describe the process of diffusion.
- Identify materials that are able to pass across a semipermeable membrane by diffusion.
- Science Practice: Apply the scientific method to given scenarios.

Animal and Plant Cells

- Compare and contrast the structures of animal and plant cells.
- Differentiate between the cell membrane and the cell wall.
- Science Practice: Construct charts, graphs, and tables to organize data.

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Cellular Reproduction, Differentiation, and Energy**Mitosis**

Describe the steps of mitosis.

Explain the importance of mitosis to living organisms.

Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

Meiosis

Describe the roles of crossing over and independent assortment in meiosis.

Explain the importance of meiosis to living organisms.

Illustrate the steps of meiosis.

Science Practice: Examine how a scientist's creativity can lead to scientific discovery.

Asexual and Sexual Reproduction

Compare and contrast sexual and asexual reproduction.

Differentiate between mitosis and meiosis.

Relate the processes of mitosis and meiosis to reproduction.

Science Practice: Outline how to formulate scientific questions using reproduction as a model.

Cell Differentiation and Specialization

Analyze the effect of changing external conditions on specialized cells.

Describe specialized cells found within living organisms.

Explain the role of differentiation in the creation of specialized cells.

Science Practice: Examine how two different scientists could use different experimental designs and have the same outcome.

Light Dependent Reactions in Photosynthesis

Outline the steps of the light-dependent reactions in photosynthesis.

Science Practice: Distinguish between and give examples of observation and inference.

Light Independent Reactions in Photosynthesis

Compare and contrast the light-dependent and the light-independent reactions of photosynthesis.

Outline the steps of the light-independent reactions in photosynthesis.

Science Practice: Apply the scientific method to given scenarios.

Cellular Respiration

Compare and contrast aerobic and anaerobic cellular respiration.

Describe how cellular respiration converts glucose to energy in the form of ATP.

Explain the importance of cellular respiration to living organisms.

Science Practice: Organize data using specific grouping methods.

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DNA and Protein Synthesis**Genetic Code**

- Describe the relationship between DNA, genes, and chromosomes.
- Describe the role of DNA replication in transmitting genetic information.
- Science Practice: Evaluate the impact of science and technology on society.
- Summarize the experiments that led to the discovery of the genetic code.

DNA and RNA Structure

- Analyze the similarities and differences between DNA and RNA.
- Explain how the base pairing in DNA and RNA was discovered.
- Science Practice: Give examples of how research affects science, society, and the environment.

Chromosomes

- Create and label a diagram of homologous chromosome pairs with heterozygous alleles.
- Explain how a karyotype can be used to identify genetic defects.
- Illustrate the structure of a chromosome and its relationship to DNA.
- Science Practice: Apply the components of a scientific report.

Protein Synthesis

- Explain the relationship between transcription and gene expression.
- Explain the relationship between translation and gene expression.
- Science Practice: Give examples of how hypotheses lead to new experimental methods.

Lab: Building Proteins from RNA

- Demonstrate how base pairing builds proteins from RNA.
- Describe the role of RNA in the creation of proteins.
- Science Practice: Conduct a laboratory experiment to answer a specific question.

DNA Mutations

- Analyze the effect of harmful environmental factors on DNA.
- Describe common types of DNA mutations.
- Explain the effects of DNA mutations on the characteristics of living organisms.
- Science Practice: Discriminate scientific claims that are socially accepted but not scientifically based.

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Genetics and Heredity**Introduction to Genetics**

- Describe the role of nucleic acids in transmitting genetic information.
- Explain the importance of Gregor Mendel to the field of genetics.
- Science Practice: Give examples of how hypotheses lead to new experimental methods.

Laws of Inheritance

- Apply the law of independent assortment.
- Describe how the principle of dominance applies to genes.
- Science Practice: Differentiate scientific hypotheses, theories, and laws.
- Summarize the law of segregation.

Probability of Inheritance

- Determine genotype and phenotype probabilities from Punnett squares.
- Predict possible allele combinations of offspring based on the genetics of the parent.
- Science Practice: Explain how changing the variables, methods, and timing impacts scientific investigation.
- Use Punnett squares to create monohybrid and dihybrid crosses.

Lab: Mouse Genetics (One Trait)

- Demonstrate how dominant and recessive alleles are passed from parents to offspring.
- Science Practice: Evaluate data to formulate a conclusion.
- Use the laws of inheritance to breed mice with desired genotypes for fur color.

Lab: Mouse Genetics (Two Traits)

- Demonstrate how alleles are passed independently of one another.
- Science Practice: Evaluate data to formulate a conclusion.
- Use the laws of inheritance to describe how two separate traits are inherited in an organism.

Non-Mendelian Inheritance

- Analyze examples of polygenic traits.
- Differentiate between incomplete dominance and codominance.
- Explain how blood type is determined.
- Science Practice: Assess how science and society impact each other.

Sex-linked Inheritance

- Analyze a pedigree to determine sex-linked traits.
- Science Practice: Give examples of how research affects science, society, and the environment.
- Summarize the process of sex-linked inheritance.

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Applications of DNA Technology

- Analyze applications of DNA technology in the field of agriculture.
- Describe uses of DNA technology in the field of forensics.
- Explain how DNA technology is utilized in the field of medicine.
- Science Practice: Examine careers in science fields.

Consequences of DNA Technology

- Analyze consequences of utilizing DNA technology in fields such as forensics, medicine, and agriculture.
- Science Practice: Compare the economic, human, and environmental losses to the benefit of a specific scientific example.
- Summarize the advantages and disadvantages of utilizing DNA technology.

Evolutionary Theory**Darwin's Theory**

- Explain how natural selection acts as a mechanism of evolution.
- Science Practice: Describe how scientific investigations lead to new scientific questions.
- Summarize the main points of Darwin's theory.
- Summarize the major concepts of natural selection.

Lab: Natural Selection

- Identify natural selection as a mechanism for the evolution of a population.
- Science Practice: Decide whether specific questions can be answered using scientific investigation.

Factors Affecting Genetic Variation

- Describe genetic drift and gene flow as mechanisms of evolution.
- Give examples of how environmental factors affect genetic variation and influence natural selection.
- Science Practice: Predict trends and outcomes based on a given set of data.

Factors Affecting Biological Diversity

- Examine how directional, disruptive, and stabilizing selection affect biological diversity.
- Explain how new or varied species originate via natural selection.
- Science Practice: Judge claims made by scientific explanations, data, or arguments.

Biogeographic Isolation

- Analyze how new species are formed by reproductive and geographic isolation.
- Analyze the relationship between biogeographic isolation and the theory of evolution.
- Explain the concept of biogeographic isolation.
- Science Practice: Give examples of how hypotheses lead to new experimental methods.

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Biological Evidence and the Fossil Record

Assess the comparative anatomies among organisms.

Describe how the fossil record shows common ancestry between organisms.

Distinguish scientific evidence that supports the theory of evolution.

Science Practice: Explain the role of scientific argumentation in evaluating the validity of data, claims, hypotheses, and observations.

Evolutionary Relationships

Analyze the relationships among organisms based on a variety of shared characteristics.

Explain how understanding evolutionary history impacts classification of organisms.

Interpret evolutionary relationships among organisms on a cladogram.

Science Practice: Describe various ways evidence can be interpreted or explained.

Organisms**Methods of Classification**

Describe how organisms are classified.

Explain reasons why systems of classification may change.

Explain the purpose of biological taxonomy.

Science Practice: Organize data using specific grouping methods.

The Kingdoms

Compare characteristics of taxonomic groups.

Distinguish the six kingdoms of living organisms.

Science Practice: Organize data using specific grouping methods.

Summarize the levels of biological classification.

Bacteria

Characterize three common forms of bacteria.

Compare modes of bacterial reproduction.

Explain how bacteria infects other organisms.

Science Practice: Examine the contributions of scientists from various scientific disciplines.

Protists and Fungi

Characterize the three common types of protists.

Distinguish between the five phyla of fungi.

Relate the structures found in protists and fungi to their functions.

Science Practice: Show how scientific evidence can affect societal decisions.

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Types of Plants

- Differentiate between gymnosperms and angiosperms.
- Distinguish ways that plants are grouped.
- Science Practice: Organize data using specific grouping methods.
- Summarize the origin and evolution of land plants.

Plant Structures

- Describe the interactions among plant systems that allow transport, reproduction, and response.
- Identify the three types of plant tissue.
- Relate the structures of major plant organs and tissues to their functions.
- Science Practice: Give examples of how research affects science, society, and the environment.

The Life Cycles of Plants

- Compare the life cycles of seed and seedless plants.
- Explain the concept of alternation of generations.
- Science Practice: Examine careers in science fields.

Overview of Animals

- Compare and contrast the characteristics of invertebrate and vertebrate animals.
- Examine the characteristics that are common to most animals.
- Identify the main functions that allow animals to meet their basic needs.

Introduction to Ecology**Populations and the Environment**

- Compare and contrast positive and negative interactions between organisms and their environment.
- Demonstrate how an organism's habitat determines its niche.
- Determine biotic and abiotic factors within an ecosystem.
- Science Practice: Distinguish between and give examples of observation and inference.

The Cycles of Matter

- Demonstrate the importance of water, carbon, nitrogen, and phosphorus in ecosystems.
- Describe how water, carbon, nitrogen, and phosphorus are cycled through ecosystems.
- Science Practice: Compare the economic, human, and environmental losses to the benefits of a specific scientific example.

Relationships Among Organisms

- Describe the five major types of interactions between organisms.
- Examine how symbiotic relationships can create dependency among species.
- Explain how invasive species affect the environment they occupy.
- Science Practice: Describe various ways evidence can be interpreted or explained.

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Lab: Interdependence of Organisms

Describe the interdependent relationship between two organisms.
Science Practice: Formulate explanations by using logic and evidence.

Energy Flow in Ecosystems

Distinguish between producers, consumers, and decomposers.
Explain the energy flow in a food web.
Illustrate the flow of energy through an ecosystem.
Science Practice: Locate data on a table and relate that data to a corresponding graph.

Population Size and Structure

Describe the limiting factors that affect a population in a given environment.
Differentiate between density-dependent and density-independent factors.
Explain how birth rate, death rate, immigration, and emigration affect population size.
Science Practice: Evaluate the impact of science and technology on society.

Population Growth

Compare and contrast exponential and logistic growth models.
Determine factors that influence a species' carrying capacity.
Identify factors that affect population growth.
Science Practice: Predict trends and outcomes based on a given set of data.

Succession and Extinction

Assess the importance of biodiversity in an ecosystem.
Identify and explain the stages of succession in an ecosystem.
Identify factors that may disturb ecosystem stability.
Science Practice: Locate data on a table and relate that data to a corresponding graph.

Human Impact on the Environment

Analyze how human populations affect resources.
Give examples of human activities that have been beneficial and detrimental to the environment.
Relate the greenhouse effect to global warming and explain its impact on the environment.
Science Practice: Give examples of science contributions impacting sustainability.

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The Human Organism: Part I**Types of Tissue**

Describe the role of skin.

Differentiate the four types of human tissue.

Explain the functions of each type of human tissue.

Science Practice: Give examples of how research affects science, society, and the environment.

The Human Skeleton

Describe the functions of the skeletal system.

Differentiate between the axial and appendicular skeleton.

Illustrate bone markings and joint types.

Science Practice: Compare and contrast different scientific disciplines.

Muscle Structure and Function

Describe the physiological process of a muscle contraction.

Differentiate skeletal, smooth, and cardiac muscles by structure and function.

Illustrate the major structures and functions of the muscular system.

Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

The Central Nervous System

Examine the different parts of the brain and spinal cord, and their functions.

Illustrate the major structures and functions of the central nervous system.

Science Practice: Describe various ways evidence can be interpreted or explained.

The Peripheral Nervous System

Identify the major functions associated with the sympathetic and parasympathetic nervous systems.

Identify the roles of sensory neurons, interneurons, and motor neurons.

Illustrate the major structures and functions of the peripheral nervous system.

Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

The Cardiovascular System

Explain the functions of the cardiovascular system.

Identify factors that affect blood flow.

Illustrate structures of the cardiovascular system, including the anatomical structure of the heart.

Science Practice: Analyze how new technologies and experiments affect previous scientific explanations.

The Respiratory System

Explain the functions of the respiratory system.

Illustrate the different structures of the respiratory system.

Science Practice: Give examples of the positive and negative impacts of science on society.

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The Digestive System

- Explain the functions of the digestive system.
- Identify the different structures of the digestive system.
- Identify the functions and secretion sites of different digestive enzymes.
- Science Practice: Predict trends and outcomes based on a given set of data.

The Excretory System

- Explain the functions of the excretory system.
- Illustrate the different structures of the excretory system.
- Science Practice: Describe the characteristics of science and its methods.

The Human Organism: Part II

The Endocrine and Exocrine Systems

- Describe the role of hormones in maintaining homeostasis.
- Explain the functions of the endocrine and exocrine systems.
- Illustrate the different structures of the endocrine and exocrine systems.
- Science Practice: Conduct research using a variety of sources.

The Reproductive System

- Investigate the structures and functions of the female reproductive system.
- Investigate the structures and functions of the male reproductive system.
- Science Practice: Evaluate data to formulate a conclusion.

The Lymphatic System

- Explain the functions of the lymphatic system.
- Illustrate the different structures of the lymphatic system.
- Science Practice: Describe various ways evidence can be interpreted or explained.

The Immune System

- Describe immune responses.
- Explain why an individual with a compromised immune system may not be able to fight infection.
- Identify the components that contribute to immune responses.
- Science Practice: Discriminate scientific claims that are socially accepted but not scientifically based.

Viruses

- Compare the structure of a virus to a cell.
- Describe how the structure of a virus contributes to its ability to cause infection.
- Differentiate between the lytic and lysogenic cycles of viral reproduction.
- Science Practice: Use scientific evidence to support an argument.

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Human Health

Describe the germ theory of disease.

Examine how people's genetic makeup or environmental conditions can contribute to their susceptibility to diseases.

Explain how diseases are spread.

Science Practice: Evaluate the impact of science and technology on society.