

# GED Science — Table of Contents

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## Science

The GED Science section evaluates the ability to understand and apply scientific concepts in life science, physical science, and earth/space science. This section also emphasizes scientific reasoning and data interpretation.

### 1 Life Science (40%)

#### 1. Cell Structure and Function

- Organelles and their functions (nucleus, mitochondria, ribosomes, etc.)
- Cell membrane and transport mechanisms
- Differences between prokaryotic and eukaryotic cells
- Cellular reproduction (mitosis and meiosis)

#### 2. Genetics and Heredity

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- Mutations and genetic variation

#### 3. Evolution and Natural Selection

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## **3 Earth and Space Science (20%)**

### **1. Earth's Systems**

- Geology (rocks, minerals, plate tectonics)
- Weather and climate systems
- Water cycle, atmosphere, and biosphere interactions

### **2. Solar System and Universe**

- Planets, moons, asteroids, comets
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- Stars, galaxies, and cosmology

### **3. Environmental Science**

- Natural resources (renewable vs. nonrenewable)
- Pollution and sustainability
- Human impacts on the environment
- Climate change and mitigation

## **4 Scientific Practices and Reasoning**

- Interpreting scientific data (graphs, tables, and charts)
- Formulating hypotheses and designing experiments
- Drawing conclusions based on evidence
- Applying scientific concepts to real-world problems

# GED Life Science — Cell Structure and Function

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## Life Science — Cell Structure and Function

Cells are the basic units of life. Understanding their structure and function is essential for studying biology and related sciences.

### Organelles and Their Functions

Cells contain specialized structures called organelles, each performing specific tasks:

- **Nucleus:** The control center of the cell, containing DNA and coordinating activities such as growth, metabolism, and reproduction.
- **Mitochondria:** Known as the powerhouse of the cell, mitochondria generate energy in the form of ATP through cellular respiration.
- **Ribosomes:** Small structures responsible for protein synthesis, found attached to the endoplasmic reticulum or floating freely in the cytoplasm.
- **Endoplasmic Reticulum (ER):** Rough ER is studded with ribosomes and helps in protein production, while Smooth ER synthesizes lipids and detoxifies chemicals.
- **Golgi Apparatus:** Modifies, sorts, and packages proteins and lipids for storage or transport out of the cell.
- **Lysosomes:** Contain digestive enzymes to break down macromolecules and old cell parts.
- **Cytoskeleton:** A network of fibers that provides shape, support, and facilitates movement.

### Cell Membrane and Transport Mechanisms

The cell membrane is a semi-permeable barrier that regulates what enters and exits the cell. Key transport mechanisms include:

- **Passive Transport:** Movement of molecules without energy input, including diffusion and osmosis.
- **Active Transport:** Movement of molecules against a concentration gradient using energy (ATP).

- **Endocytosis and Exocytosis:** Processes by which large molecules or particles are engulfed into the cell or expelled out.

## Differences Between Prokaryotic and Eukaryotic Cells

- **Prokaryotic Cells:** Simple cells without a nucleus or membrane-bound organelles (e.g., bacteria).
- **Eukaryotic Cells:** Complex cells with a nucleus and organelles, including plant, animal, fungal, and protist cells.
- Key differences include size, structure, and complexity of genetic material.

## Cellular Reproduction (Mitosis and Meiosis)

- **Mitosis:** A process of asexual cell division producing two identical daughter cells, important for growth, repair, and maintenance.
- **Meiosis:** A specialized form of cell division that produces four genetically unique gametes (sperm or egg), reducing chromosome number by half.
- Key stages include **Prophase, Metaphase, Anaphase, Telophase, and Cytokinesis**, with specific differences between mitosis and meiosis.

**Summary:** A thorough understanding of cell structure and function forms the foundation for all biological sciences. Knowing organelles, membrane dynamics, cell types, and reproductive processes allows learners to comprehend complex life processes, inheritance, and cellular activities.

# GED Life Science — Genetics and Heredity

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## Genetics and Heredity

Genetics is the study of heredity, explaining how traits are passed from parents to offspring through DNA and genes.

### DNA Structure and Function

Deoxyribonucleic acid (DNA) carries the genetic instructions necessary for the growth, development, and reproduction of organisms.

- **Structure:** DNA is a double helix composed of nucleotides, each containing a sugar, phosphate group, and nitrogenous base (adenine, thymine, cytosine, guanine).
- **Base Pairing:** Adenine pairs with thymine, and cytosine pairs with guanine, forming complementary strands.
- **Function:** DNA stores hereditary information and directs protein synthesis via transcription and translation.

### Genes, Alleles, and Chromosomes

- **Gene:** A segment of DNA that codes for a specific trait or protein.
- **Allele:** Different forms of the same gene (e.g., blue vs. brown eye color).
- **Chromosome:** A thread-like structure of DNA and proteins carrying genetic information. Humans have 23 pairs of chromosomes.

### Patterns of Inheritance

Traits are inherited according to specific patterns:

- **Dominant and Recessive:** Dominant alleles mask recessive alleles in heterozygotes (e.g., Mendel's pea plant experiments).
- **Codominance:** Both alleles contribute equally to the phenotype (e.g., AB blood type).
- **Incomplete Dominance:** The heterozygous phenotype is intermediate between two homozygous phenotypes.

## Mutations and Genetic Variation

- **Mutations:** Changes in DNA sequences that may affect gene function; can be caused by errors in replication, radiation, or chemicals.
- **Types of Mutations:** Point mutations, insertions, deletions, and chromosomal rearrangements.
- **Genetic Variation:** Differences in DNA among individuals of a species; contributes to diversity and evolution.

**Summary:** Understanding genetics and heredity is essential for comprehending how traits are transmitted, how genetic disorders occur, and how variation arises within populations. DNA, genes, alleles, and chromosomes form the foundation of all biological inheritance.

# GED Life Science — Evolution and Natural Selection

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## Evolution and Natural Selection

Evolution explains how species change over time through mechanisms that alter genetic traits in populations.

### Principles of Evolution

- **Variation:** Within a population, individuals have differences in traits that can be inherited.
- **Overproduction:** Organisms produce more offspring than can survive, creating competition for resources.
- **Adaptation:** Traits that improve survival and reproduction become more common over generations.
- **Descent with Modification:** Over time, populations accumulate changes that may result in new species.

### Evidence for Evolution

- **Fossil Record:** Preserved remains show changes in species over geological time.
- **Comparative Anatomy:** Homologous structures suggest common ancestry; analogous structures show similar function but different ancestry.
- **Molecular Biology:** DNA and protein comparisons reveal genetic similarities among species.
- **Embryology:** Early developmental stages of related species show similar patterns.

### Natural Selection and Adaptation

- **Natural Selection:** The process where individuals with favorable traits survive and reproduce more successfully.
- **Adaptation:** Trait that increases an organism's fitness in its environment (e.g., camouflage, beak shape in birds).



- **Selective Pressure:** Environmental factors such as predators, climate, or food availability that influence survival.

## Speciation

- **Definition:** Formation of new species from a common ancestor.
- **Mechanisms:**
  - Allopatric speciation: geographic isolation leads to divergence.
  - Sympatric speciation: reproductive isolation within the same environment.
- **Outcome:** Over time, populations accumulate differences sufficient to prevent interbreeding.

**Summary:** Evolution through natural selection is a core principle of biology. It explains how species adapt to their environments, how traits are passed and modified across generations, and how new species arise over time.

# GED Life Science — Human Body Systems

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## Human Body Systems

The human body is composed of multiple interdependent systems that maintain life and respond to internal and external changes. Understanding these systems is essential for biology and health sciences.

### Digestive System

- **Function:** Breaks down food into nutrients that can be absorbed by the body.
- **Key Organs:** Mouth, esophagus, stomach, small intestine, large intestine, liver, pancreas, gallbladder.
- **Processes:** Ingestion, digestion (mechanical and chemical), absorption, elimination.

### Circulatory System

- **Function:** Transports oxygen, nutrients, hormones, and waste products throughout the body.
- **Key Components:** Heart, blood vessels (arteries, veins, capillaries), blood.
- **Processes:** Pulmonary circulation (lungs), systemic circulation (body tissues).

### Respiratory System

- **Function:** Exchanges gases (oxygen and carbon dioxide) between the body and the environment.
- **Key Organs:** Nose, pharynx, larynx, trachea, bronchi, lungs, alveoli.
- **Processes:** Breathing (inhalation/exhalation), gas exchange at alveoli.

## Nervous System

- **Function:** Controls and coordinates body activities, responds to stimuli, and processes information.
- **Key Components:** Brain, spinal cord, peripheral nerves, sensory organs.
- **Processes:** Sensory input, integration, motor output, reflexes.

## Muscular and Skeletal Systems

- **Muscular System Function:** Movement, posture, heat production.
- **Skeletal System Function:** Support, protection, blood cell production, mineral storage.
- **Key Components:** Bones, joints, ligaments, tendons, skeletal muscles.
- **Interactions:** Muscles pull on bones to produce movement.

## Homeostasis and Regulation

- **Definition:** Maintenance of stable internal conditions despite external changes.
- **Examples:** Body temperature, blood glucose, water balance.
- **Mechanisms:** Negative feedback loops involving multiple organ systems.

## Interactions Among Body Systems

- Circulatory and respiratory systems cooperate to deliver oxygen and remove carbon dioxide.
- Nervous system coordinates the activities of muscular and endocrine systems.
- Digestive system provides nutrients necessary for energy, growth, and repair.
- Homeostasis relies on the integration of multiple systems to maintain health.

**Summary:** Human body systems function together to maintain life and respond to environmental changes. Understanding these systems is key to biology, medicine, and health studies.

# GED Life Science — Ecology and Ecosystems

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## Ecology and Ecosystems

Ecology is the study of interactions between organisms and their environment. Understanding ecosystems is essential for comprehending the balance of life on Earth.

### Levels of Organization

- **Individual:** A single organism.
- **Population:** A group of individuals of the same species living in a defined area.
- **Community:** All populations of different species living together in a particular area.
- **Ecosystem:** A community and its abiotic environment functioning together as a system.
- **Biosphere:** The global sum of all ecosystems; the part of Earth that supports life.

### Food Chains and Food Webs

- **Producers:** Organisms that make their own food via photosynthesis (plants, algae).
- **Consumers:** Organisms that obtain energy by eating other organisms (herbivores, carnivores, omnivores).
- **Decomposers:** Organisms that break down dead matter and recycle nutrients (fungi, bacteria).
- **Food Chains:** Linear sequence of organisms where energy flows from one to the next.
- **Food Webs:** Complex networks showing multiple feeding relationships in an ecosystem.

### Biogeochemical Cycles

- **Carbon Cycle:** Movement of carbon through the atmosphere, biosphere, oceans, and geosphere. Includes photosynthesis, respiration, decomposition, and fossil fuel combustion.
- **Nitrogen Cycle:** Conversion of nitrogen into usable forms for organisms. Includes nitrogen fixation, nitrification, assimilation, ammonification, and denitrification.

- **Water Cycle:** Circulation of water through evaporation, condensation, precipitation, infiltration, and runoff.

## Human Impact on Ecosystems

- **Pollution:** Contamination of air, water, and soil affecting organism health.
- **Deforestation:** Removal of trees reduces biodiversity and alters climate patterns.
- **Climate Change:** Rising temperatures and changing precipitation affect species distribution and ecosystem function.
- **Overexploitation:** Overhunting, overfishing, and resource depletion disrupt ecological balance.
- **Invasive Species:** Introduction of non-native species can outcompete native species and alter ecosystems.

**Summary:** Understanding the structure of ecosystems, energy flow, nutrient cycles, and human impacts is crucial for preserving biodiversity and maintaining ecological balance.

# GED Physical Science — Matter and Its Properties

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## Matter and Its Properties

Matter is anything that has mass and occupies space. Understanding its properties and behavior is fundamental in physical science.

### States of Matter

Matter exists in three primary states:

- **Solid:** Has definite shape and volume; particles are closely packed and vibrate in place.
- **Liquid:** Has definite volume but takes the shape of its container; particles are close but can move past one another.
- **Gas:** Has neither definite shape nor volume; particles are far apart and move freely.

### Physical and Chemical Properties

- **Physical Properties:** Characteristics observed without changing the substance (color, density, melting point, boiling point, solubility).
- **Chemical Properties:** Characteristics describing how a substance interacts with other substances (flammability, reactivity with acids/bases, oxidation).

### Changes in Matter

- **Physical Changes:** Alter the form but not the chemical identity (melting, freezing, cutting, dissolving).
- **Chemical Changes:** Produce new substances with different properties (rusting, burning, digestion, fermentation).

### Atomic Structure

Atoms are the basic building blocks of matter:

- **Protons:** Positively charged particles located in the nucleus; determine the element's identity.

- **Neutrons:** Neutral particles in the nucleus; contribute to atomic mass and isotopes.
- **Electrons:** Negatively charged particles orbiting the nucleus; involved in chemical bonding and reactions.

**Summary:** Understanding matter, its states, properties, and atomic structure provides a foundation for exploring chemical reactions, energy transformations, and the physical behavior of substances in everyday life.

# GED Physical Science — Chemical Reactions

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## Chemical Reactions

Chemical reactions occur when substances interact to form new substances with different properties. Understanding reactions is essential in chemistry and everyday life.

### Types of Reactions

Common types of chemical reactions include:

- **Synthesis (Combination) Reactions:** Two or more reactants combine to form a single product. *Example:*  $2H_2 + O_2 \rightarrow 2H_2O$
- **Decomposition Reactions:** A single compound breaks down into two or more simpler substances. *Example:*  $2H_2O_2 \rightarrow 2H_2O + O_2$
- **Combustion Reactions:** A substance reacts with oxygen, releasing energy, often in the form of heat and light. *Example:*  $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
- **Single Replacement Reactions:** An element replaces another element in a compound. *Example:*  $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
- **Double Replacement Reactions:** The ions of two compounds exchange places to form new compounds. *Example:*  $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

### Balancing Chemical Equations

Chemical equations must obey the **Law of Conservation of Mass**, which states that matter cannot be created or destroyed in a chemical reaction.

- Ensure the number of atoms of each element is the same on both sides of the equation.
- Use coefficients to balance the equation without altering the chemical formulas.

**Example:** Unbalanced:  $H_2 + O_2 \rightarrow H_2O$  Balanced:  $2H_2 + O_2 \rightarrow 2H_2O$

### Conservation of Mass

The total mass of reactants equals the total mass of products in a chemical reaction. This principle is fundamental in chemistry experiments and industrial processes.



## Acids, Bases, and pH Scale

- **Acids:** Substances that release hydrogen ions ( $\text{H}^+$ ) in solution; have a sour taste. *Example:*  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$
- **Bases:** Substances that release hydroxide ions ( $\text{OH}^-$ ) in solution; have a bitter taste and slippery feel. *Example:*  $\text{NaOH}$ ,  $\text{KOH}$
- **pH Scale:** Measures the acidity or basicity of a solution; ranges from 0 to 14.
  - $\text{pH} < 7$ : Acidic
  - $\text{pH} = 7$ : Neutral
  - $\text{pH} > 7$ : Basic

**Summary:** Chemical reactions describe the transformation of matter, following the conservation of mass. Recognizing reaction types, balancing equations, and understanding acids and bases are essential skills for GED Physical Science.

# GED Physical Science — Force, Motion, and Energy

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## Force, Motion, and Energy

Understanding force, motion, and energy is essential for analyzing physical phenomena. These concepts explain how objects move, interact, and change energy forms.

### Newton's Laws of Motion

- **First Law (Law of Inertia):** An object remains at rest or in uniform motion unless acted upon by an external force. *Example:* A book on a table stays at rest until pushed.
- **Second Law:** Force equals mass times acceleration ( $F = ma$ ). This law quantifies how forces change motion. *Example:* Pushing a heavier object requires more force for the same acceleration.
- **Third Law:** For every action, there is an equal and opposite reaction. *Example:* A rocket launches upward as exhaust gases push downward.

### Gravity, Friction, and Other Forces

- **Gravity:** Attractive force between objects due to mass. Near Earth's surface,  $F_g = mg$ , where  $g \approx 9.8 \text{ m/s}^2$ .
- **Friction:** Resistive force opposing motion between surfaces. Types include static and kinetic friction.
- **Tension:** Force transmitted through a string, rope, or cable.
- **Normal Force:** Support force perpendicular to the contact surface.
- **Applied Force:** Any external push or pull acting on an object.

### Work, Power, and Energy

- **Work:** Occurs when a force moves an object in the direction of the force.

$$W = F \cdot d \cdot \cos \theta$$

Units: Joules (J)

- **Power:** Rate at which work is done.

$$P = \frac{W}{t}$$

Units: Watts (W)

- **Energy:** The capacity to do work. Types include:
  - **Kinetic Energy:** Energy of motion,  $KE = \frac{1}{2}mv^2$
  - **Potential Energy:** Stored energy due to position,  $PE = mgh$
  - **Thermal Energy:** Energy related to temperature and particle motion
  - **Chemical, Nuclear, and Electrical Energy** – Other forms of energy in various contexts

## Conservation of Energy

Energy cannot be created or destroyed; it only changes forms.

$$E_{total} = KE + PE + other\ form\ of\ energy = constant$$

*Example:* A pendulum converts potential energy at its peak to kinetic energy at its lowest point.

**Summary:** Force, motion, and energy principles explain how objects move and interact. Mastery of Newton's laws, understanding various forces, and applying energy concepts are essential for GED Physical Science.

# GED Physical Science — Electricity and Magnetism

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## Electricity and Magnetism

Electricity and magnetism are fundamental concepts in physics, describing the behavior of electric charges, currents, and magnetic fields, and their interactions.

### Electric Current, Voltage, and Resistance

- **Electric Current ( $I$ ):** The flow of electric charge through a conductor, measured in amperes (A). *Example:* Current flows through wires to power devices.
- **Voltage ( $V$ ):** The electric potential difference that drives current, measured in volts (V). *Example:* A 9V battery provides energy to move charges in a circuit.
- **Resistance ( $R$ ):** The opposition to the flow of current in a conductor, measured in ohms ( $\Omega$ ). *Example:* A resistor reduces current to prevent overheating.

### Ohm's Law

- Relates voltage, current, and resistance in a simple equation:

$$V = I \cdot R$$

- **Applications:** Calculate current if voltage and resistance are known, or determine required resistance to achieve a desired current.

### Circuits: Series and Parallel

- **Series Circuits:** Components connected end-to-end; the same current flows through each.

$$R_{total} = R_1 + R_2 + R_3 + \dots$$

- **Parallel Circuits:** Components connected across the same voltage; each branch receives the same voltage.

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

- **Power in Circuits:**

$$P = V \cdot I$$

Power represents the rate of energy usage in a circuit.

## Magnetic Fields and Electromagnetism

- **Magnetic Fields ( $\vec{B}$ ):** The region around a magnet or moving charge where magnetic forces are exerted. Field lines show direction from north to south poles.
- **Electromagnetism:** Electric currents generate magnetic fields, and changing magnetic fields induce electric currents (Faraday's Law). *Example:* Electric motors convert electric energy into mechanical motion using magnetic fields.
- **Applications:** Transformers, generators, electromagnets, and household electrical devices rely on these principles.

**Summary:** Mastery of electricity and magnetism involves understanding the relationship between voltage, current, and resistance, analyzing series and parallel circuits, and applying the principles of magnetic fields and electromagnetism in practical applications.

# GED Earth & Space Science — Earth's Systems

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## Earth's Systems

Earth is a complex, dynamic system made up of interacting spheres: geosphere, atmosphere, hydrosphere, and biosphere. Understanding these systems is essential for analyzing natural phenomena and human impact on the planet.

## Geology: Rocks, Minerals, and Plate Tectonics

- **Rocks and Minerals:**

- *Igneous Rocks:* Formed from cooled lava or magma (e.g., granite, basalt).
- *Sedimentary Rocks:* Formed by compaction and cementation of sediments (e.g., sandstone, limestone).
- *Metamorphic Rocks:* Formed by heat and pressure altering existing rocks (e.g., marble, slate).
- **Minerals:** Naturally occurring inorganic substances with a specific chemical composition and crystalline structure.

- **Plate Tectonics:** Earth's lithosphere is divided into plates that move over the mantle. Plate interactions cause:

- *Earthquakes* along fault lines.
- *Volcanic activity* at divergent and convergent boundaries.
- *Mountain formation* at convergent boundaries.

## Weather and Climate Systems

- **Weather:** Short-term atmospheric conditions including temperature, precipitation, humidity, wind, and pressure.
- **Climate:** Long-term patterns of temperature and precipitation in a region.
- **Atmospheric Processes:**
  - Air masses and fronts
  - High and low-pressure systems
  - Global wind patterns

## Water Cycle, Atmosphere, and Biosphere Interactions

- **Water Cycle:** Continuous movement of water through evaporation, condensation, precipitation, infiltration, and runoff.
- **Atmosphere:** Layers of gases surrounding Earth, regulating temperature and protecting life from solar radiation.
- **Biosphere Interactions:** Plants, animals, and humans interact with the geosphere, hydrosphere, and atmosphere to sustain life.
- **Example:** Deforestation affects the water cycle, reduces oxygen production, and increases erosion.

**Summary:** Earth's systems are interconnected. Geological processes, weather and climate systems, and the water cycle influence life on Earth. Understanding these processes helps predict natural events and manage Earth's resources responsibly.

# GED Earth & Space Science — Solar System and Universe

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## Solar System and Universe

The Solar System and the Universe encompass celestial bodies and phenomena beyond Earth. Understanding their structures, interactions, and behaviors provides insight into fundamental scientific principles.

### Planets, Moons, Asteroids, and Comets

- **Planets:** Large celestial bodies orbiting the Sun. Divided into:
  - *Terrestrial planets:* Mercury, Venus, Earth, Mars – rocky surfaces.
  - *Gas giants:* Jupiter, Saturn – massive, gaseous.
  - *Ice giants:* Uranus, Neptune – icy composition with thick atmospheres.
- **Moons:** Natural satellites orbiting planets. Examples: Earth's Moon, Jupiter's Europa.
- **Asteroids:** Rocky bodies, mostly in the asteroid belt between Mars and Jupiter.
- **Comets:** Icy bodies that release gas and dust when near the Sun, forming tails.

### Sun-Earth-Moon Relationships

- **Earth's Rotation:** Causes day and night.
- **Earth's Revolution:** Orbital movement around the Sun causes seasons.
- **Moon Phases:** Result from the relative positions of the Earth, Moon, and Sun.
- **Eclipses:**
  - *Solar eclipse:* Moon blocks sunlight from reaching Earth.
  - *Lunar eclipse:* Earth's shadow falls on the Moon.



## Stars, Galaxies, and Cosmology

- **Stars:** Luminous celestial bodies producing energy via nuclear fusion. Classified by size, color, and life cycle stages (e.g., main sequence, red giant, supernova).
- **Galaxies:** Large systems of stars, gas, and dust. Types include spiral, elliptical, and irregular galaxies.
- **Cosmology:** Study of the Universe's origin, evolution, and structure. Includes the Big Bang theory, expansion of the Universe, and dark matter/energy.

**Summary:** The Solar System and Universe involve complex interactions between celestial bodies. Understanding planetary motions, orbital dynamics, and cosmic structures enables predictions of astronomical events and exploration of space science.

# GED Earth & Space Science — Environmental Science

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## Environmental Science

Environmental science examines the interactions between humans and the natural world, emphasizing sustainable practices and the impact of human activity on ecosystems.

### Natural Resources

- **Renewable Resources:** Resources that can be replenished naturally over short periods. Examples include solar energy, wind energy, water, and forests.
- **Nonrenewable Resources:** Resources that exist in finite amounts and cannot be replaced on a human time scale. Examples include fossil fuels (coal, oil, natural gas) and minerals.
- **Resource Management:** Sustainable use and conservation of resources to ensure long-term availability.

### Pollution and Sustainability

- **Pollution Types:**
  - Air pollution (smog, greenhouse gases)
  - Water pollution (chemicals, sewage)
  - Soil pollution (pesticides, industrial waste)
- **Sustainability Principles:** Meeting current needs without compromising the ability of future generations to meet their own needs. This includes energy efficiency, waste reduction, and sustainable agriculture.

### Human Impacts on the Environment

- Deforestation and habitat loss
- Overfishing and depletion of marine life
- Urbanization and land use changes

- Pollution and ecosystem disruption
- Biodiversity loss and species extinction

## Climate Change and Mitigation

- **Causes:** Increased greenhouse gas emissions from human activities ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ )
- **Effects:** Global warming, rising sea levels, extreme weather, melting glaciers
- **Mitigation Strategies:** Renewable energy, energy efficiency, reforestation, sustainable transportation, international agreements (e.g., Paris Agreement)

**Summary:** Environmental science emphasizes understanding natural systems, assessing human impact, and applying strategies to mitigate negative effects. Knowledge of natural resources, pollution, sustainability, and climate change is critical for promoting a balanced relationship between humans and the environment.

# GED Science — Scientific Practices and Reasoning

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## Scientific Practices and Reasoning

Scientific practices are the skills and methods scientists use to investigate phenomena, analyze data, and apply findings to real-world situations. These practices are critical for success in all areas of GED Science.

### Interpreting Scientific Data

- **Graphs, Tables, and Charts:** Scientists often organize data visually to reveal patterns, trends, and relationships.
- **Reading and Analysis:** Determine the independent and dependent variables, identify scales, units, and trends, and summarize findings accurately.
- **Example:** In a line graph showing temperature changes over time, the slope indicates the rate of temperature change.

### Formulating Hypotheses and Designing Experiments

- **Hypothesis Development:** A testable statement predicting the outcome of an experiment based on prior knowledge.
- **Experimental Design:** Define variables, control conditions, and replicate experiments to ensure valid and reliable results.
- **Example:** Predicting that increasing sunlight will speed up plant growth, and designing an experiment with plants under different light levels while keeping water and soil constant.

### Drawing Conclusions Based on Evidence

- Use collected data to support or refute the hypothesis.
- Distinguish between correlation and causation.
- Identify possible sources of error and limitations in the study.
- **Example:** Concluding that increased sunlight correlates with faster plant growth, but acknowledging other factors may also influence results.

## Applying Scientific Concepts to Real-World Problems

- Transfer scientific knowledge from experiments and theory to practical applications.
- Examples include using genetics to develop crops resistant to pests, applying physics principles to engineering, or using environmental science to guide policy decisions.
- Evaluate potential solutions for feasibility, sustainability, and ethical impact.

**Summary:** Scientific reasoning requires interpreting data, designing and conducting experiments, drawing evidence-based conclusions, and applying concepts to real-world challenges. Mastery of these practices is essential for GED Science success.