

# **Middle Grades General Science**

## **5–9**

### **Section 04**

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## 1 Knowledge of the structure and behavior of matter

1. Identify the physical and chemical properties of matter (e.g., mass, volume, density, chemical reactivity).
2. Distinguish between the states of matter (e.g., solid, liquid, gas, plasma).
3. Apply knowledge of the gas laws (e.g., relationships between temperature, pressure, volume of gases).
4. Identify the major discoveries in the development of the atomic theory.
5. Identify the characteristics of elements, compounds, and mixtures.
6. Apply knowledge of symbols, formulas, and equations for common elements and compounds, and their reactions.
7. Identify characteristics and functions of the components of an atom.
8. Identify chemical or physical properties of elements based on their placement on the periodic table.
9. Identify characteristics of types of chemical bonding (e.g., covalent, ionic, metallic, hydrogen).
10. Identify types of chemical reactions and their characteristics.

## 2 Knowledge of forces and motion and their relationship

1. Differentiate between the types and characteristics of forces (e.g., electrical, magnetic, nuclear, gravitational, frictional).
2. Identify applications of Newton's laws of motion.
3. Solve problems involving force and motion.
4. Identify types, characteristics, and properties of waves (e.g., sound, electromagnetic, seismic, water).
5. Identify characteristics of wave phenomena (e.g., intensity, refraction, diffraction, interference, Doppler effect, wave-particle duality) as they apply to everyday situations.
6. Identify causes, characteristics, and examples of electricity (e.g., static, current).
7. Apply knowledge of currents, circuits, conductors, insulators, and resistors to everyday situations.

8. Identify types of magnets and characteristics of magnetic fields.
9. Apply knowledge of magnets and magnetic fields to everyday situations.
10. Identify characteristics of motion (e.g., speed, velocity, acceleration, distance, time, units of measurement).

### **3 Knowledge of energy and its effects**

1. Relate energy to transitions between states of matter.
2. Distinguish between temperature, heat, and thermal energy.
3. Distinguish between the types of thermal energy transfer (e.g., radiation, conduction, convection).
4. Apply the laws of thermodynamics to real-world situations.
5. Differentiate between potential and kinetic energy.
6. Identify characteristics of nuclear reactions.
7. Identify the regions of the electromagnetic spectrum and energy associated with each.
8. Identify the use of light and optics in practical applications (e.g., optical instruments, communication).
9. Solve problems involving energy, work, power, mechanical advantage, and efficiency.
10. Apply the law of conservation of mass and energy to chemical reactions, nuclear reactions, physical processes, and biological processes.
11. Identify types, characteristics, and measurement of electrical quantities.
12. Solve mathematical problems involving current, voltage, power, and energy in direct current (DC) circuits.

### **4 Knowledge of Earth and the processes that affect it**

1. Relate geologic processes to the movement of tectonic plates.
2. Identify characteristics of geologic structures and the mechanisms by which they were formed.
3. Identify the characteristics of geologic eras (e.g., geologic events, biotic factors, abiotic factors).

4. Apply methods for determining geologic age.
5. Interpret various map types, including topographic, geologic, and weather maps, that contain symbols, scales, legends, directions, time zones, elevations, latitudes, and longitudes.
6. Identify characteristics of ocean currents and their formations.
7. Identify characteristics of seafloors, shorelines, estuaries, and sea zones.
8. Identify chemical and physical properties of ocean water.
9. Identify major classifications of rocks, minerals, and fossils and processes by which each is formed.
10. Identify properties of major types of rocks, minerals, and soils.
11. Apply knowledge of the processes of weathering, erosion, and deposition.
12. Identify the features, functions, and characteristics of the atmospheric layers.
13. Relate atmospheric conditions to weather.
14. Identify the relationship between climate, landforms, and continental drift in both past and present.
15. Identify the movement of water in the hydrologic cycle, including sources of water, types of precipitation, and causes of condensation.
16. Identify ways in which earth and water interact (e.g., soil absorption, runoff, leaching, groundwater, karst topography).
17. Identify natural and man-made methods of water storage (e.g., aquifers, reservoirs, water sheds).
18. Interpret processes that affect Earth by applying chemical and physical laws.

## **5 Knowledge of space science**

1. Identify consequences of Earth's motions and orientation (e.g., seasons, tides, lunar phases).
2. Compare characteristics of stars.
3. Identify devices and techniques for collecting and analyzing data about stars and other celestial objects.

4. Interpret astronomical data (e.g., spectral analysis, retrograde motion).
5. Identify the components of the solar system (e.g., Kuiper belt, Oort cloud), their individual characteristics, and how they interact (e.g., solar winds, impacts, gravitation attraction).
6. Identify structures in the universe in terms of formation, age, location, characteristics, and evolution of the universe.

## **6 Knowledge of processes of life**

1. Identify the relationships between biological processes and the chemical nature of life.
2. Distinguish between prokaryotes and eukaryotes.
3. Relate cell organelles to their functions.
4. Identify the sequence of events, the significance of the process, and the consequences of irregularities of mitosis and meiosis.
5. Apply principles of Mendelian genetics in working monohybrid and dihybrid crosses and crosses involving linked genes.
6. Apply principles of human genetics, including relationships between genotypes and phenotypes and causes and effects of disorders.
7. Identify the role of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) in protein synthesis and replication.
8. Classify organisms based on the levels of biological taxonomy.
9. Identify microorganisms and their characteristics.
10. Differentiate between structures and functions of plant and animal cells and their organelles.
11. Identify plant structures and their functions.
12. Identify the major steps of plant processes (e.g., photosynthesis, respiration, transpiration, reproduction).
13. Identify the major steps of animal physiological processes (e.g., digestion, respiration, circulation, reproduction).
14. Identify the structures and functions of the organs and organ systems of various kinds of animals, including humans.
15. Identify patterns of animal behavior (e.g., territorial, social communication, learned, instinctive).

**7 Knowledge of the effects of physical and biological factors on the environment**

1. Identify components and sequences of biogeochemical cycles (e.g., carbon, oxygen, hydrogen, nitrogen).
2. Identify issues related to the development, use, and conservation of natural resources.
3. Relate environmental factors to the adaptation and survival rates of organisms.
4. Identify the major characteristics of world biomes and communities, including succession and interrelationships of organisms.
5. Identify how biotic and abiotic factors influence environmental conditions (e.g., population density, ozone depletion, greenhouse effect).
6. Identify interactions between microorganisms and the environment.
7. Identify the effects of homeostasis on the survivability of a biologic entity.
8. Relate the interactions of biotic and abiotic factors within a system to the flow of matter and energy.
9. Identify the relationship between physical and biological factors and Florida's ecosystems.

**8 Knowledge of classroom and laboratory management**

1. Identify procedures for proper use, care, and handling of organisms.
2. Identify the appropriate use and management of laboratory equipment for specified activities.
3. Identify appropriate alternative sources of and substitutions for laboratory materials.
4. Identify the accepted State and local procedures for safe preparation, use, storage, and disposal of chemicals and other materials.

**9 Knowledge of process skills and application of scientific inquiry**

1. Apply knowledge of the science processes of observing, inferring, communicating, classifying, and predicting.
2. Apply knowledge of the science processes of measuring and graphing.
3. Apply knowledge of designing and performing scientific investigations (e.g., forming hypotheses, controlling variables, defining operationally, interpreting data).
4. Apply knowledge of using indirect evidence and models.

5. Identify historical figures and their contributions to the development of scientific thought.
6. Apply knowledge of mathematics and technology to scientific investigation.
7. Identify student misconceptions by analyzing student work.
8. Identify appropriate strategies for teaching scientific inquiry.