Mississippi Science

Grade Seven

Life Science L

3 Ecology and Interdependence L.7.3

Conceptual Understanding: The emphasis is on predicting consistent patterns of interactions among different cycling systems in terms of the relationships between organisms and abiotic components within ecosystems. Rearrangement of food molecules through chemical processes in cellular respiration and photosynthesis is an important part of energy cycling in all life systems. Preservation of biodiversity and consideration of human impacts are themes in maintaining ecosystem services.

A Students will demonstrate an understanding of the importance that matter cycles between living and non-living parts of the ecosystem to sustain life on Earth. L.7.3A

1 Analyze diagrams to provide evidence of the importance of the cycling of water, oxygen, carbon, and nitrogen through ecosystems to organisms. L.7.3A.1

2 Analyze and interpret data to explain how the processes of photosynthesis, and cellular respiration (aerobic and anaerobic) work together to meet the needs of plants and animals. L.7.3A.2

3 Use models to describe how food molecules (carbohydrates, lipids, proteins) are processed through chemical reactions using oxygen (aerobic) to form new molecules. L.7.3A.3

4 Explain how disruptions in cycles (e.g., water, oxygen, carbon, and nitrogen) affect biodiversity and ecosystem services (e.g., water, food, and medications) which are needed to sustain human life on Earth. L.7.3A.4

5 Design solutions for sustaining the health of ecosystems to maintain biodiversity and the resources needed by humans for survival (e.g., water purification, nutrient recycling, prevention of soil erosion, and prevention or management of invasive species). * L.7.3A.5

Physical Science P

5 Organization of Matter and Chemical Interactions P.7.5

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Conceptual Understanding: Matter and its interactions can be distinguished by investigating physical properties (e.g., mass, density, solubility) using chemical processes and experimentation. Changes to substances can either be physical or chemical.

A Students will demonstrate an understanding of the physical and chemical properties of matter. P.7.5A

1 Collect and evaluate qualitative data to describe substances using physical properties (state, boiling/melting point, density, heat/electrical conductivity, color, and magnetic properties). P.7.5A.1

2 Analyze and interpret qualitative data to describe substances using chemical properties (the ability to burn or rust). P.7.5A.2

3 Compare and contrast chemical and physical properties (e.g., combustion, oxidation, pH, solubility, reaction with water). P.7.5A.3

Conceptual Understanding: Matter is made of atoms and/or molecules that are in constant motion. The movement of the atoms and molecules depends on the amount of energy in the system at the time. The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

B Students will demonstrate an understanding about the effects of temperature and pressure on physical state, molecular motion, and molecular interactions. P.7.5B

1 Make predictions about the effect of temperature and pressure on the relative motion of atoms and molecules (speed, expansion, and condensation) relative to recent breakthroughs in polymer and materials science (e.g., self-healing protective films, silicone computer processors, previous/porous concrete). P.7.5B.1

2 Use evidence from multiple scientific investigations to communicate the relationships between pressure, volume, density, and temperature of a gas. P.7.5B.2

3 Ask questions to explain how density of matter (observable in various objects) is affected by a change in heat and/or pressure. P.7.5B.3

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Conceptual Understanding: Atoms are the basic building blocks of ordinary elements. Compounds are substances composed of two or more elements. Chemical formulas can be used to describe compounds. The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The element position on the periodic table can also be used to predict the type of bonding that most commonly occurs between the elements.

C Students will demonstrate an understanding of the proper use of the periodic table to predict and identify elemental properties and how elements interact. P.7.5C

1 Develop and use models that explain the structure of an atom. P.7.5C.1

2 Use informational text to sequence the major discoveries leading to the current atomic model. P.7.5C.2

3 Collect, organize, and interpret data from investigations to identify and analyze the relationships between the physical and chemical properties of elements, atoms, molecules, compounds, solutions, and mixtures. P.7.5C.3

4 Predict the properties and interactions of elements using the periodic table (metals, non-metals, reactivity, and conductors). P.7.5C.4

5 Describe concepts used to construct chemical formulas (e.g., CH4, H2O) to determine the number of atoms in a chemical formula. P.7.5C.5

6 Using the periodic table, make predictions to explain how bonds (ionic and covalent) form between groups of elements (e.g., oxygen gas, ozone, water, table salt, and methane). P.7.5C.6

Conceptual Understanding: Changes to substances can either be physical or chemical. Many substances react chemically with other substances to form new substances with different properties. Substances (such as metals or acids) are identified according to their physical or chemical properties. Some chemical reactions release energy and others store energy.

D Students will demonstrate an understanding of chemical formulas and common chemical substances to predict the types of reactions and possible outcomes of the reactions. P.7.5D

1 Analyze evidence from scientific investigations to predict likely outcomes of chemical reactions. P.7.5D.1

2 Design and conduct scientific investigations to support evidence that chemical reactions (e.g., cooking, combustion, rusting, decomposition, photosynthesis, and cellular respiration) have occurred. P.7.5D.2

3 Collect, organize, and interpret data using various tools (e.g., litmus paper, pH paper, cabbage juice) regarding neutralization of acids and bases using common substances. P.7.5D.3

4 Build a model to explain that chemical reactions can store (formation of bonds) or release energy (breaking of bonds). P.7.5D.4

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Conceptual Understanding: In a chemical process, the atoms that make up original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and the mass does not change. As these chemical combinations take place, substances react in various ways, yet matter is always conserved in a reaction.

E Students will demonstrate an understanding of the law of conservation of mass. P.7.5E

1 Conduct simple scientific investigations to show that total mass is not altered during a chemical reaction in a closed system. Compare results of investigations to Antoine-Laurent Lavoisier's discovery of the law of conservation of mass. P.7.5E.1

2 Analyze data from investigations to explain why the total mass of the product in an open system appears to be less than the mass of reactants. P.7.5E.2

3 Compare and contrast balanced and unbalanced chemical equations to demonstrate the number of atoms does not change in the reaction. P.7.5E.3

Earth and Space Science E

9 Earth's Systems and Cycles E.7.9

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Conceptual Understanding: Complex patterns in the movement of air and water in the atmosphere are major determinants of local weather. Global movements of water and its changes in form are propelled by sunlight and gravity. Variations in temperature drive a global pattern of interconnected currents. Interactions between sunlight, oceans, atmosphere, ice, landforms, and living things vary with latitude, altitude, and local and regional geography. Weather is difficult to predict; however, large scale patterns and trends in global climate, such as the gradual increase in average temperature, are more easily observed and predicted.

A Students will demonstrate an understanding of how complex changes in the movement and patterns of air and water molecules caused by the sun, winds, landforms, ocean temperatures, and currents in the atmosphere are major determinants of local and global weather patterns. E.7.9A

1 Analyze and interpret weather patterns from various regions to differentiate between weather and climate. E.7.9A.1

2 Analyze evidence to explain the weather conditions that result from the relationship between the movement of water and air masses. E.7.9A.2

3 Interpret atmospheric data from satellites, radar, and weather maps to predict weather patterns and conditions. E.7.9A.3

4 Construct an explanation for how climate is determined in an area using global and surface features (e.g., latitude, elevation, shape of the land, distance from water, global winds, and ocean currents). E.7.9A.4

5 Analyze models to explain the cause-and-effect relationship between solar energy and convection and the resulting weather patterns and climate conditions. E.7.9A.5

6 Research and use models to explain what type of weather (thunderstorms, hurricanes, and tornadoes) results from the movement and interactions of air masses, high- and low-pressure systems, and frontal boundaries. E.7.9A.6

7 Interpret topographic maps to predict how local and regional geography affect weather patterns and make them difficult to predict. E.7.9A.7

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Conceptual Understanding: Climate changes are defined as significant and persistent changes in an area's average or extreme weather conditions. Changes can occur if any of Earth's systems change (e.g., composition of the atmosphere, reflectivity of Earth's surface). The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. Greenhouse gases in the atmosphere absorb and retain the energy radiated from land and ocean surfaces, thereby regulating Earth's average surface temperature and keeping it habitable. Excess greenhouse gases could cause a detrimental impact on climate over time.

B Students will demonstrate an understanding of the relationship between natural phenomena, human activity, and global climate change. E.7.9B

1 Read and evaluate scientific or technical information assessing the evidence and bias of each source to explain the causes and effects of climate change. E.7.9B.1

2 Interpret data about the relationship between the release of carbon dioxide from burning fossil fuels into the atmosphere and the presence of greenhouse gases. E.7.9B.2

3 Engage in scientific argument based on current evidence to determine whether climate change happens naturally or is being accelerated through the influence of man. E.7.9B.3

Conceptual Understanding: The tilt of Earth's spin axis with respect to the plane of its orbit around the sun is important for a habitable Earth. The Earth's spin axis is tilted 23.5 degrees. Earth's axis points in the same direction in space no matter where Earth is in relation to the sun. The seasons are a result of this tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.

C Students will demonstrate an understanding that the seasons are the direct result of the Earth's tilt and the intensity of sunlight on the Earth's hemispheres. E.7.9C

1 Construct models and diagrams to illustrate how the tilt of Earth's axis results in differences in intensity of sunlight on the Earth's hemispheres throughout the course of one full revolution around the Sun. E.7.9C.1

2 Investigate how variations of sunlight intensity experienced by each hemisphere (to include the equator and poles) create the four seasons. E.7.9C.2