PHYSICAL SCIENCE ALTERNATE CONTENT EXPECTATIONS – MIDDLE SCHOOL (GRADES 6-8)

Topic Bundle 1: Structure and Properties of Matter

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.			
EE.MS-PS1-1: Develop and/or use models to describe the composition of a substance (solid, liquid, gas) at the atomic or molecular level.	**EE.MS-PS1-H.1:** Develop and/or use models to describe the composition of a substance (solid, liquid, gas) at the atomic or molecular level.	**EE.MS-PS1-M.1:** Given a model, identify substances/materials as solid, liquid, or gas.	**EE.MS-PS1-L.1:** Given an object from the student's environment, identify the object as a solid or liquid.

Topic Bundle 1: Structure and Properties of Matter

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan K-12 Science Content Standard: MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.			
EE.MS-PS1-3: Use sources of information to identify which natural materials are used to make given synthetic materials or identify the impact to society from the use of synthetic materials.	**EE.MS-PS1-H.3:** Use sources of information to identify which natural materials are used to make given synthetic materials or identify the impact to society from the use of synthetic materials.	**EE.MS-PS1-M.3:** Given information or concrete objects, identify materials made by humans used in the student's daily life and the natural materials that they come from.	**EE.MS-PS1-L.3:** Given concrete objects, identify which are made by humans or which are made in nature.

Topic Bundle 1: Structure and Properties of Matter

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.			
EE.MS-PS1-4: Develop and/or use a model to make predictions about how adding or removing heat from pure substances impacts particles and the state of matter.	**EE.MS-PS1-H.4:** Develop and/or use a model to make predictions about how adding or removing heat from pure substances impacts particles and the state of matter.	**EE.MS-PS1-M.4:** Given a model, predict how a substance will change state between solid, liquid, gas when the temperature is increased/decreased.	**EE.MS-PS1-L.4:** Participate in heating and cooling objects to identify the change in state (solid, liquid, gas/steam).

Topic Bundle 2: Chemical Reactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standards: MS-PS1-2 and MS-PS1-5. **MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** **MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.**			
EE.MS-PS1-2-5: Use data about the physical and chemical properties of substances before and after an interaction to determine if a chemical reaction occurred.	**EE.MS-PS1-H.2-5:** Use data about the physical and chemical properties of substances before and after an interaction to determine if a chemical reaction occurred.	**EE.MS-PS1-M.2-5:** Participate in an investigation to identify one or more properties of a substance that changed during the chemical reaction.	**EE.MS-PS1-L.2-5:** Participate in an investigation to identify whether a substance/object is the same or different after a chemical reaction.

Topic Bundle 2: Chemical Reactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.			
EE.MS-PS1-6: Participate in the design of a project to test a substance or device to determine if there is absorption or a release of heat through chemical reactions.	**EE.MS-PS1-H.6:** Participate in the design of a project to test a substance or device to determine if there is absorption or a release of heat through a chemical reaction.	**EE.MS-PS1-M.6:** Participate in testing a substance to identify if the substance absorbs or releases heat through a chemical reaction.	**EE.MS-PS1-L.6:** Given a chemical reaction, identify if the substance or container for the substances is hot or cold by touch.

Topic Bundle 3: Forces and Interactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan K-12 Science Content Standard: MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.			
EE.MS-PS2-1: Identify a question to ask to determine cause and effect relationships between colliding objects.	**EE.MS-PS2-H.1:** Identify a question to ask to determine cause and effect relationships between colliding objects.	**EE.MS-PS2-M.1:** Participate in modeling a collision between two objects to predict how each object will respond to the impact.	**EE.MS-PS2-L.1:** Given a model of a collision between two objects, identify how the motion of one object changed.

Topic Bundle 3: Forces and Interactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.			
EE.MS-PS2-2: Participate in planning and/or conducting an investigation to identify that the forces acting on an object and the mass of the object affect the change in the object's motion.	**EE.MS-PS2-H.2:** Participate in planning and/or conducting an investigation to identify that the forces acting on an object and the mass of the object affect the change in the object's motion.	**EE.MS-PS2-M.2:** Participate in an investigation to identify that speed and direction of an object change when a force is applied.	**EE.MS-PS2-L.2:** Identify that the speed or direction of an object changes when a force is applied.

Topic Bundle 3: Forces and Interactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan K-12 Science Content Standards: MS-PS2-3 and MS-PS2-5. **MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.** ***MS-PS2-5.*** **Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.** **Caution – Do not use magnets in the vicinity of a student with a Vagus Nerve Stimulator (VNS).**			
EE.MS-PS2-3-5: Identify a question to use in an investigation to determine how the size of objects or the distance between them can impact the strength of magnetic forces, or how the amount of charge on objects can affect the strength of electric forces.	**EE.MS-PS2-H.3-5:** Identify a question to use in an investigation to determine how the size of objects or the distance between them can impact the strength of magnetic forces, or how the amount of charge on objects can affect the strength of electric forces.	**EE.MS-PS2-M.3-5:** Participate in an investigation to compare the strength of magnetic or electric forces, including size and distance.	**EE.MS-PS2-L.3-5:** Identify that magnetic or electric forces can move objects without touching them.

Topic Bundle 3: Forces and Interactions

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.			
EE.MS-PS2-4: Use one or more pieces of evidence to support the claim that all objects are attracted (pulled) toward each other by the force of gravity and that the strength of the pull is dependent on their masses.	**EE.MS-PS2-H.4:** Use one or more pieces of evidence to support the claim that all objects are attracted (pulled) toward each other by the force of gravity and that the strength of the pull is dependent on their masses.	**EE.MS-PS2-M.4:** Participate in an investigation to support the claim that all objects are affected by the force of gravity.	**EE.MS-PS2-L.4:** Identify the effect of gravity on objects.

Topic Bundle 4: Energy

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.			
EE.MS-PS3-1: Organize given data in a graphical display and use the data to describe the relationship between kinetic energy and the mass or speed of an object.	**EE.MS-PS3-H.1:** Organize given data in a graphical display and use the data to describe the relationship between kinetic energy and the mass or speed of an object.	**EE.MS-PS3-M.1:** Use data in bar or picture graphs to compare the kinetic energy (speed) of objects.	**EE.MS-PS3-L.1:** Observe two objects in motion to identify which moves faster/slower.

Topic Bundle 4: Energy

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.			
EE.MS-PS3-2: Use one or more pieces of evidence to explain that the amount of potential energy in an object is dependent on the position of the object.	**EE.MS-PS3-H.2:** Use one or more pieces of evidence to explain that the amount of potential energy in an object is dependent on the position of the object.	**EE.MS-PS3-M.2:** Use one piece of evidence to identify that the higher/lower an object is from the ground, the more/less potential energy it has.	**EE.MS-PS3-L.2:** Given the position of an object, identify at which height an object has the greatest/least potential energy.

Topic Bundle 4: Energy

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standards: MS-PS3-3, MS-PS3-4, MS-PS3-5. **MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.** **MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.** **MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.**			
EE.MS-PS3-3-4-5: Participate in an investigation to determine how the transfer of either thermal or kinetic energy changes the heat or motion of an object and/or explain how the type or amount of matter affects this relationship.	**EE.MS-PS3-H.3-4-5:** Participate in an investigation to determine how the transfer of either thermal or kinetic energy changes the heat or motion of an object and/or explain how the type or amount of matter affects this relationship.	**EE.MS-PS3-M.3-4-5:** Participate in an investigation to identify what type of energy (thermal or kinetic) is transferred between two or more objects.	**EE.MS-PS3-L.3-4-5:** Observe and identify that energy is transferred in every-day objects in the form of heat or motion.

Topic Bundle 5: Waves and Electromagnetic Radiation

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan K-12 Science Content Standard: MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.			
EE.MS-PS4-1: Measure the amplitude (size) of different waves to show that the amount of energy in waves is related to their size.	**EE.MS-PS4-H.1:** Measure the amplitude (size) of different waves to show that the amount of energy in waves is related to their size.	**EE.MS-PS4-M.1:** Compare the energy of two or more different waves using wave height.	**EE.MS-PS4-L.1:** Given two waves with extreme differences in height, identify which wave has more energy.

Topic Bundle 5: Waves and Electromagnetic Radiation

Target Alternate Content Expectation	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan K-12 Science Content Standards: MS-PS4-2 and MS-PS4-3. **MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.** **MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.**			
EE.MS-PS4-2-3: Participate in an investigation to describe how sound, light, or water waves are reflected, absorbed, and transmitted through different media.	**EE.MS-PS4-H.2-3:** Participate in an investigation to describe how sound, light, or water waves are reflected, absorbed, and transmitted through different media.	**EE.MS-PS4-M.2-3:** Participate in an investigation to identify whether sound, light, or water waves are reflected, absorbed, or transmitted through different media.	**EE.MS-PS4-L.2-3:** Identify if sound or light is absorbed or reflected by different media.