Havre Public Schools Physical Science Sixth Grade

Course Information

Grade Level: 6
Length: 1 Year
Period(s) Per Day: 1

Essential Understanding:

PS1: Matter and its Interactions (The Structure and Properties of Matter, Chemical Reactions). Help students formulate an answer to the question "How do atomic and molecular interactions explain the properties of matter that we see and feel?"

PS2: Motion and Stability: Forces and Interactions (Forces and Motion, Types of Interactions). Help students formulate an answer to the question "How can one describe physical interactions between objects and within systems of objects?"

PS3: Energy (Definitions of Energy, Conservation of Energy and Energy Transfer, Relationship between Energy and Forces, Energy in Chemical Processes and Everyday Life). Help students formulate an answer to the question "How can energy be transferred from one object or system to another?"

Theme Samples:

1. **Motion and Forces**
   a. Describing Motion
   b. Laws of Motion
   c. Work & Simple Machines
   d. Forces & Fluids
2. **Energy & Matter**
   a. Energy & Energy Resources
   b. Thermal Energy
   c. Foundations of Chemistry
   d. States of Matter
3. **Properties of Matter**
   a. Understanding the Atom
   b. The Periodic Table
   c. Elements & Chemical Bonds
4. **Interactions of Matter**
   a. Chemical Reactions & Equations
   b. Mixtures, Solubility, and Acid/Base Solutions
   c. Carbon Chemistry
5. **Waves, Electricity, and Magnetism**
   a. Waves
   b. Sound
   c. Electromagnetic Waves
   d. Light
   e. Electricity
   f. Magnetism

Course Objectives and Expectations:

Students in middle school continue to develop understanding of four core ideas in the physical sciences. The middle school performance expectations in the Physical Sciences build on the K – 5 ideas and capabilities to allow learners to explain phenomena central to the physical sciences but also to the life sciences and earth and space science. There are three physical science disciplinary core ideas in middle school: 1.) Matter and Its Interactions, 2.) Motion and Stability, 3.) Energy. The performance expectations in physical science blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain real world phenomena in the physical, biological, and earth and space sciences.

Student Skills

- Planning & Conducting Investigations
- Developing and Using Models
- Engaging in Argument from Evidence
- Constructing Scientific Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information
- Analyzing and Interpreting Data
- Evaluating Competing Design Solutions
- Using Mathematics & Computational Thinking
- Asking Questions & Defining Problems
- Innovation
- Observation
- Perseverance
- Technology
- Research
- Safety
- Predicting

Student Objectives:

- I can apply Newton's Third Law of Motion to design a solution to a problem involving the motion of two colliding objects
- I can 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.
- I can construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the mass of interacting objects
- I can design and conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- I can undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes
- I can construct and interpret graphic displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object
- I can develop and critique models to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system
- I can apply scientific principles to design, construct, and test a device that minimizes or maximizes thermal energy transfer
- I can 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
- I can 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
- I can develop and critique models that describe the atomic composition of simple molecules and extended structures.
- I can analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred

- I can gather information to describe that synthetic materials come from natural resources and impact society
- I can 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
- I can develop, use, and critique a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved
- I can ask questions about data to determine the factors affecting electric and magnetic force strengths.
- I can use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave
- I can develop and use a model to describe that waves are reflected, absorbed, or transmitted through various

Pacing

PHYSICAL SCIENCE

Week	Topic/Unit	Chapter/pg. #s	Standards (performance expectations)
1	INTRODUCTION ACTIVITIES: NATURE OF SCIENCE	CCC, SEP, CER Lab Safety Chromatography Case of the Missing Lunch Evolution of the Spear (IEFA)	MS-ETS1-1 Define criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions
2			MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
3			MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
4			MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

5			MS-ETS1-1 Define criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions
6	ENERGY: What is Energy? Energy Transformation Conduction, Convection, Radiation	Ch. 5 Energy and Energy Resources	MS-PS 3-1 Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and to the speed of an object.
7		Ch. 6 Thermal Energy	MS-PS 3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
8			MS-PS 3-2 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.
9			MS-PS 3-4 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.
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12	MATTER Classifying Matter Mass & Volume Density	Ch. 7 Foundations of Chemistry	
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Thanksgiving Break			
16	States of Matter	Ch. 8 States of Matter	MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.
17			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.
18			MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
Christmas Break			
19	Physical Properties Chemical Properties Physical Changes Chemical Changes Mystery Substance		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.
20			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.
21			MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
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23			
24	UNDERSTANDING ATOMS Isotopes, Ions, Radioactivity Periodic Table Elements, Molecules, and Compounds	Ch. 9 Understanding the Atom	
25		Ch. 10 The Periodic Table	
26		Ch. 11 Elements and Chemical Bonds	
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31	WAVES Mechanical Electromagnetic	Ch. 15 Waves	MS-PS 4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy of a wave.
32		Ch. 16 Sound	MS-PS 4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

33			MS-PS 4-3 Integrate qualitative scientific and tea and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
34			
Easter Break			
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37	ELECTROMAGNETIC SPECTRUM	Ch. 18 Light	
38		Ch. 1 Describing Motion	MS-PS 2-2 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.
39		Ch. 2 The Laws of Motion	MS-PS 2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
40		Ch. 3 Work and Simple Machines	MS-PS 2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
41			MS-PS 2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. MS-PS 2-5 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.

Montana Content Standards (Disciplinary Core Ideas):

MS-PS1-1. Develop and critique models that describe the atomic composition of simple molecules and extended structures.

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-PS1-3. Gather information to describe that synthetic materials come from natural resources and impact society

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

MS-PS1-5. Develop, use, and critique a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes

MS-PS2-1. Apply Newton's Third Law of Motion to design a solution to a problem involving the motion of two colliding objects

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.

MS-PS2-3. Ask questions about data to determine the factors affecting electric and magnetic force strengths.

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the mass of interacting objects

MS-PS2-5. Design and conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact

MS-PS3-1. construct and interpret graphic displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object

MS-PS3-2. develop and critique models to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system
MS-PS3-3. apply scientific principles to design, construct, and test a device that 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

MS-PS4-1. use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave
MS-PS4-2. develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials

Resources
Kesler Science
Discovery Education
Boardworks

Bioman Interactive
https://betterlesson.com/
https://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards-Revision
Text Book: 2012 McGraw-Hill Glencoe Physical iScience
Science Standards- https://opi.mt.gov/LinkClick.aspx?fileticket=qHA5q8j-oGw%3d&portalid=182 Comparison MT Sci Content Standards and NGSS.pdf
Model Curriculum Guide https://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards/Science-Standards#88989482-resources

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