COURSE INFORMATION

Grade Level: 6

Length: 1 Year

Period(s) Per Day: 1

ESSENTIAL UNDERSTANDING

Physical science involves the study of matter and energy. General topics that students will explore, discuss, and learn about this year include Scientific Problem Solving, Properties of Matter, Interactions of Matter, Waves, Electricity, Magnetism, Motion and Forces, and Energy and Matter. This course will involve student use of the scientific method and scientific inquiry. Students will be involved in hands on activities, labs, projects, assignments, quizzes, and tests.

THEME SAMPLES

1. Motion and Stability
2. Forces and Interactions
3. Matter and Its Interactions
4. Energy
5. Waves and Their Applications in Technology for Information Transfer

COURSE OBJECTIVES AND EXPECTATIONS

Students will apply the scientific method to further develop their understanding of the topics covered in Physical Science. Students will develop skills such as planning, organization, analysis, problem solving, data collection, communication, and inference through participation in class activities, group/individual work, and daily assignments. They will use the inquiry process to ask questions and learn about science and its importance in the modern world.

Student Skills:

- Problem solving
- Organization
- Time management
- Math skills
- Communication
- Safety
- Research
- Analyzing Data

- Technology implementation
- Observation
- Perseverance

STUDENT OBJECTIVES

1. I can apply Newton's Third Law of Motion to design a solution to a problem involving the motion of two colliding objects
2. 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.
3. 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
4. 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.
5. I can undertake a design project to construct, test, and modify a device that either *releases or absorbs thermal energy by chemical processes*
6. 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
7. 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
8. I can apply scientific principles to design, construct, and test a device that minimizes or maximizes *thermal energy transfer*
9. 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
10. 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*
11. I can develop and critique models that describe the atomic composition of simple molecules and extended structures.
12. 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
13. I can gather information to describe that synthetic materials come from natural resources and impact society
14. 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

15. 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
16. I can ask questions about data to determine the factors affecting electric and magnetic force strengths.
17. 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
18. I can develop and use a model to describe that waves are reflected, absorbed, or transmitted through various

PACING

Timeline	Montana Content Standards	Units / Lessons
Quarter 1	**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-PS2-4.** 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	UNIT 1 Motion and Forces 1 Describing Motion 1.1 Position and Motion 1.2 Speed and Velocity 1.3 Acceleration 2 The Laws of Motion 2.1 Gravity and Friction 2.2 Newton's First Law 2.3 Newton's Second Law 2.4 Newton's Third Law
	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-PS3-1.** construct and interpret graphic displays of data to describe the	UNIT 2 Energy and Matter 5 Energy and Energy Resources 5.1 Forms of Energy 5.2 Energy Transformations 5.3 Energy Resources

Timeline	Montana Content Standards	Units / Lessons
Quarter 2	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*	6 Thermal Energy 6.1 Thermal Energy, Temperature, and Heat 6.2 Thermal Energy Transfers 6.3 Using Thermal Energy 7 Foundations of Chemistry 7.1 Classifying Matter 7.2 Physical Properties 7.3 Physical Changes 7.4 Chemical Properties and Changes 8 States of Matter 8.1 Solids, Liquids, and Gases 8.2 Changes in State 8.3 The Behavior of Gases
	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	UNIT 3 Properties of Matter 9 Understanding the Atom 9.1 Discovering Parts of the Atom 9.2 Protons, Neutrons, and Electrons 10 The Periodic Table 10.1 Using the Periodic Table 10.2 Metals 10.3 Nonmetals and Metalloids 11 Elements and Chemical Bonds 11.1Electrons and Energy Levels

Timeline	Montana Content Standards	Units / Lessons
Quarter 3	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	11.2 Compounds, Chemical Formulas, and Covalent Bonds 11.3 Ionic and Metallic Bonds UNIT 4 Interactions of Matter 12 Chemical Reactions and Equations 12.1 Understanding Chemical Reactions 12.2 Types of Chemical Reactions 12.3 Energy Changes and Chemical Reactions 13 Mixtures, Solubility, and Acid/Base Solutions 13.1 Substances and Mixtures 13.2 Properties of Solutions 13.3 Acid and Base Solutions 14 Carbon Chemistry 14.1 Elemental Carbon and Simple Organic Compounds 14.2 Other Organic Compounds 14.3 Compounds of Life
Quarter 4	**MS-PS2-3**. Ask questions about data to determine the factors affecting electric and magnetic force strengths. **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,	UNIT 5 Waves, Electricity, and Magnetism 1 Waves 1.1 What are Waves 1.2 Wave Properties 1.3 Wave Interactions 2 Sound 2.1 Producing and Detecting Sound 2.2 Properties of Sound Waves

Timeline	Montana Content Standards	Units / Lessons
	absorbed, or transmitted through various materials	2.3 Using Sound Waves 3 Electromagnetic Waves 3.1 Electromagnetic Radiation 3.2 The Electromagnetic Spectrum 3.3 Using Electromagnetic Waves 4 Light 4.1 Light, Matter, and Color 4.2 Reflection and Mirrors 4.3 Refraction and Lenses 4.4 Optical Technology 5 Electricity 5.1 Electric Charge and Electric Forces 5.2 Electric Current and Simple Circuits 5.3 Describing Circuits 6 Magnetism 6.1 Magnets and Magnetic Fields 6.2 Making Magnets with an Electric Current Making Electric Current with Magnets
		3 Work and Simple Machines 3.1 Work and Power 3.2 Using Machines 3.3 Simple Machines 4 Forces and Fluids 4.1 Pressure and Density of Fluids 4.2 The Buoyant Force

Timeline	Montana Content Standards	Units / Lessons
		4.3 Other Effects of Fluid Forces

Montana Content Standards

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

Educators/Teaching-Learning/K-12-Content-Standards-Revision