



## MIDDLE SCHOOL PHYSICAL SCIENCE

### NGSS Physical Science Standards:

#### PS1: Matter and its Interactions

- 1-1 Develop models to describe the atomic composition of simple molecules and extended structures.
- 1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- 1-3 Gather and make sense of information to describe that synthetic materials come from natural resources.
- 1-4. Develop a model that predicts and describes changes in particle motion, temperature and state of pure substances when thermal energy is added or removed.
- 1-5. 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.
- 1-6. Undertake a design project to construct, test and modify a device that either releases or absorbs thermal energy.

#### PS2: Motion and Stability: Forces and Interactions

- 2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- 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.
- 2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- 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.



- 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.

### **PS3: Energy**

- 3-1.** 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.
- 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.
- 3-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- 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.
- 3-5.** 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.

### **PS4: Waves and Their Applications in Technologies for Information Transfer**

- 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 in a wave.
- 4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- 4-3.** 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.

Unit	Lesson Outline	NGSS
<b>Unit 1:</b> Lab Skills	1-1 Lab equipment 1-2 Drawing Scientifically 1-3 Lab Safety 1-4 Lab Procedures 1-5 Making Observations 1-6 Measuring 1-7 Planning an Investigation 1-8 Writing up an Investigation	MS-PS1-2 MS-PS2-2
<b>Unit 2:</b> Structure and Properties of Matter	2-1 Nature of Matter 2-2 Mass 2-3 Density 2-4 Properties and uses of substances 2-5 Changes of State 2-6 Particle Theory of Matter 2-7 Using Particle Theory 2-8 Mixtures 2-9 Solubility 2-10 Separating Techniques	MS-PS1-1 MS-PS1-3 MS-PS1-4 MS-PS1-6 MS-PS3-4
<b>Unit 3:</b> Chemical Reactions	3-1 Atoms and Molecules 3-2 Models of the Atom 3-3 Elements and the Periodic Table 3-4 Compounds 3-5 Chemistry of Gases 3-6 Chemical and Physical Change 3-7 Chemical Equations 3-8 Properties of Acids and Bases 3-9 Indicators 3-10 The pH Scale 3-11 Reactions of Acids and Bases 3-12 Neutralization	MS-PS1-1 MS-PS1-2 MS-PS1-3 MS-PS1-5 MS-PS1-6
<b>Unit 4:</b> Metals	4-1 Properties of Metals 4-2 Uses of Metals 4-3 The Activity Series 4-4 Reactions of Metals 4-5 Corrosion and Rusting	MS-PS1-1 MS-PS1-2 MS-PS1-3 MS-PS1-5 MS-PS1-6
<b>Unit 5:</b> Energy	5-1 The Forms of Energy 5-2 Measuring Energy 5-3 Energy Conservation 5-4 Heat Energy and Transfer	MS-PS3-2 MS-PS3-3 MS-PS3-4

	5-5 Conduction 5-6 Convection 5-7 Radiation 5-8 Heat and Particle Theory	MS-PS3-5
<b>Unit 6:</b> Fuels	6-1 Types of Fuels 6-2 Hydrocarbons 6-3 Complete Combustion 6-4 Incomplete Combustion 6-5 Fuels and Energy 6-6 Combustion and Pollution 6-7 Biofuels	MS-PS1-2 MS-PS1-3  MS-PS3-4
<b>Unit 7:</b> Forces	7-1 Speed 7-2 Acceleration 7-3 Forces 7-4 Balanced and Unbalanced Forces 7-5 Force, mass, and acceleration 7-6 Gravity and Weight force 7-7 Action and Reaction 7-8 Friction 7-9 Pressure 7-10 Work and Energy 7-11 Work and Power 7-12 Simple Machines	MS-PS2-1 MS-PS2-2 MS-PS2-4  MS-PS3-1 MS-PS3-2
<b>Unit 8:</b> Interactions	8-1 Electrical Charge 8-2 Electrical Current 8-3 Electrical Circuits 8-4 Resistance 8-5 Power and Energy 8-6 Magnetism and Electricity	MS-PS2-3 MS-PS2-5  MS-PS3-2
<b>Unit 9:</b> Waves and Electromagnetic Radiation	9-1 The Electromagnetic Spectrum 9-2 The Nature of Light 9-3 Reflection 9-4 Refraction 9-5 Color 9-6 The Eye 9-7 The Nature of Sound 9-8 The Ear 9-9 Waves for Communication	MS-PS4-1 MS-PS4-2 MS-PS4-3