<table>
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<th>Content Area:</th>
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<tbody>
<tr>
<td><strong>Course Title:</strong> Science</td>
<td><strong>Grade Level:</strong> 8</td>
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<table>
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Created by: Laura Leskowits
Unit Lesson Plan – Matter and Its Properties

Teacher: Mrs. Leskowits
Grade: 8th Grade

| NJSLS/DCI | Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)  
Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3)  
Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)  
In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)  
Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)  
The changes of state that occur with variations in temperature or pressure can be described and predicted using these models matter. (MS-PS1-4) |

| Interdisciplinary Connections (NJSLS) | NJSLS Connections: ELA/Literacy – RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS1-2),(MSPS1-3)  
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)  
RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1),(MS-PS1-2),(MS-PS1-4),(MS-PS1-5)  
WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)  
WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)  
Mathematics – MP.2 Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)  
MP.4 Model with mathematics. (MS-PS1-1),(MS-PS1-5)  
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5) |
6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)
6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)
6.SP.B.5 Summarize numerical data sets in relation to their context (MS-PS1-2)

**Essential Questions**

What questions will the student be able to answer as a result of the instruction?

1. What is matter and how do we measure it?
2. What is an atom and how is it structured?
3. How is the Periodic Table of Elements arranged and what does an element’s placement tell you about the substance?
4. What is the difference between a physical and a chemical property and what are some examples of each?
5. What are the states of matter and what role does thermal energy play in changing matter’s state?

**Knowledge & Skills**

What skills are needed to achieve the desired results?

By the end of this unit, students will know:
- Everything in the universe is made of matter.
- Elements are composed of atoms which are simple substances that can’t be broken down into other substances.
- How the Periodic Table is arranged.
- Molecules are combinations of various elements that result in brand new substances.
- Examples of physical and chemical properties of matter and the difference between the two groups.
- How to calculate using the density formula, a physical property used to identify matter.
- Characteristics of solids, liquids and gases and that thermal energy is responsible for the changes of phases of matter.

By the end of this unit, students will be able to:
- Describe the basic structures of atoms and molecules
- Demonstrate how both mass and volume are measured and then use this information to calculate for density.
- Distinguish between weight and mass.
- Describe the difference between physical and chemical properties and give examples of each.
- Display the ability to read the Periodic Table of Elements and describe elements based on their location in the chart.
- Distinguish between solids, liquids and gases based on distinct characteristics

**Assessment**

What is acceptable evidence to show desired results (rubrics, exam, etc.)?

In correlation with the NJSLS, students must demonstrate the following as summative assessments:
- MS-PS1-1. Develop models to 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-PS1-4 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
Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

Formative Assessments include:

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

**Modifications**

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

**Integration of Technology:**

- Smartboard
- Computers
- Websites and digital interactives
- Multi-media presentations
- Video Streaming
- Software
- Ipads
- Microsoft 365
<table>
<thead>
<tr>
<th>Teacher:</th>
<th>Leskowits</th>
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<tbody>
<tr>
<td>Grade:</td>
<td>8th Grade</td>
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**NJSLS/DCI**  
**MS-PS1-B: Chemical Reactions**  
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)

The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)

**MS-PS3-A: Definitions of Energy**  
Some chemical reactions release energy, others store energy. (MS-PS1-6)

The term “heat” as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. (secondary to MS-PS1-4)

The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecules (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system’s total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)

**ETS1.B: Developing Possible Solutions**  
A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6)

Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6)

The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6)

[http://www.nextgenscience.org/msps1-matter-interactions](http://www.nextgenscience.org/msps1-matter-interactions)

**Interdisciplinary Connections (NJSLS)**  
**NJSLS Connections: ELA/Literacy** – RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS1-2),(MSPS1-3)
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1),(MS-PS1-2),(MS-PS1-4),(MS-PS1-5)
WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)
WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)
**Mathematics** – MP.2 Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)
MP.4 Model with mathematics. (MS-PS1-1),(MS-PS1-5)
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)
6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)
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6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)
6.SP.B.5 Summarize numerical data sets in relation to their context (MS-PS1-2)

### Essential Questions
(What questions will the student be able to answer as a result of the instruction?)

1. What happens when substances react chemically?
2. What happens to atoms of the original substances when a reaction occurs?
3. Will the properties of the substance that is produced as part of a reaction be the same as those of the original substances?
4. What happens to the total mass of all atoms as a reaction takes place?
5. How does the amount of stored energy change during a chemical reaction?
6. How does the everyday definition of “heat” differ from the scientific definition?
7. When does heat transfer between two objects?
8. How are temperature and energy related?

### Knowledge & Skills
(What skills are needed to achieve the desired results?)

<table>
<thead>
<tr>
<th>By the end of this unit, students will know:</th>
<th>By the end of this unit, students will be able to:</th>
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<tbody>
<tr>
<td>● How to determine if a chemical reaction has occurred.</td>
<td>● Describe observable cues that a chemical reaction has occurred.</td>
</tr>
<tr>
<td>● How atoms can rearrange and combine to form new substances.</td>
<td>● Distinguish between chemical substances based on observable properties.</td>
</tr>
</tbody>
</table>
### Key, easily observable properties of chemical substances
- That properties of substances may change during a chemical reaction.
- That total mass in a reaction must be conserved.
- That some reactions can absorb energy.
- That some reactions can release energy.
- That heat is transferred from an object at higher temperature to an object at lower temperature.
- That heat transfer stops when the objects reach the same temperature.

### Develop an atomic level model to explain how atoms rearrange to form new substances during a chemical reaction.
- Distinguish between reactions that absorb energy and reactions that release energy.
- Explain when heat will transfer between two objects and in which direction the heat will flow.

### Assessment

**(What is acceptable evidence to show desired results (rubrics, exam, etc.)? Attach Copy)**

In correlation with the NJSL, students must demonstrate the following as summative assessments:

- MS-PS-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.
- MS-PS-1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- MS-PS-1-4 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-PS-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.
- MS-PS-1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

### Formative Assessments include:
- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

### Modifications

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among
various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

Integration of Technology:
- Smartboard
- Computers
- Websites and Digital Interactives
- Multi-media presentations
- Video Streaming
- Software
- Ipads
- Microsoft 365

Unit Lesson Plan - Forces and Motion

Teacher: Leskowits
Grade: 8th Grade

NJSLS/DCI MS-PS2: Forces and Interactions

For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)

The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)

All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)

http://www.nextgenscience.org/msps2-motion-stability-forces-interactions
<table>
<thead>
<tr>
<th>Interdisciplinary Connections (NJSLS)</th>
<th>NJSLS Connections: ELA/Literacy –</th>
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<tr>
<td>RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS2-1),(MSPS2-3)</td>
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<tr>
<td>RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)</td>
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<td>WHST.6-8.1 Write arguments focused on discipline-specific content. (MS-PS2-4)</td>
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<tr>
<td>WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)</td>
<td>WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)</td>
</tr>
<tr>
<td>Mathematics –</td>
<td>Mathematics –</td>
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<tr>
<td>MP.2 Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)</td>
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</tr>
<tr>
<td>6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)</td>
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<tr>
<td>6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)</td>
<td>6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)</td>
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<tr>
<td>7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2)</td>
<td>7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2)</td>
</tr>
<tr>
<td>7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1),(MS-PS2-2)</td>
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**Essential Questions**

(What questions will the student be able to answer as a result of the instruction?)

- What causes motion to occur?
- What do motion graphs look like for objects moving with constant velocity?
- What do graphs look like for objects that are accelerating?
- How is the speed of an object calculated?
- How is velocity similar / different from velocity?
- How is acceleration calculated?
- How do unbalanced forces affect the motion of an object?
- How does friction affect an object when at rest or in motion?
- What are the biggest factors that affect the force of gravity?
- How is weight calculated?
- What does Newton’s 1st law state about objects at rest or in motion?
- How does the mass of an object and the force acting on that object affect the object’s acceleration?
- How can Newton’s 3rd law of motion be used to explain the motion of a rocket?
- What factors affect the momentum of an object?
- How is momentum different from inertia?

**Knowledge & Skills**

(What skills are needed to achieve the desired results?)

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<thead>
<tr>
<th>By the end of this unit, students will know:</th>
<th>By the end of this unit, students will be able to:</th>
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</thead>
<tbody>
<tr>
<td>The causes of motion.</td>
<td>Interpret motion graphs</td>
</tr>
</tbody>
</table>
### Assessment

(What is acceptable evidence to show desired results (rubrics, exam, etc.)? Attach Copy)

In correlation with the NJSLS, students must demonstrate the following as summative assessments:

- **MS-PS-2-1** Apply Newton's Third Law 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.

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

**Formative Assessments include:**

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

### Modifications

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
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- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
# Unit Lesson Plan - Energy of Objects in Motion

**Teacher:** Leskowitz

**Grade:** 8th Grade

## NJSLS/DCI

**MS-PS3.A: Definitions of Energy**

Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)

**MS-PS3.B: Conservation of Energy and Energy Transfer**

A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3 2)

When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

http://www.nextgenscience.org/msps3-energy

## Interdisciplinary Connections (NJSLS)

**NJSLS Connections:**

- **ELA/Literacy** –
  - RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1),(MSPS3-5)
  - RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)
  - RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1) WHST.6-8.1 Write arguments focused on discipline content. (MS-PS3-5) WHST.6-8.7 Conduct
short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3),(MS-PS3-4)  
SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)  
**Mathematics** – MP.2 Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-4),(MS-PS3-5)  
6.RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5)  
6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1)  
7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5)  
8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)  
8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x² = p and x³ = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)  
8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5)  
6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-PS3-4)

### Essential Questions  
(What questions will the student be able to answer as a result of the instruction?)  
- What is work?  
- What types of energy make up mechanical energy?  
- How is mechanical energy transferred from one form to another?

### Knowledge & Skills  
(What skills are needed to achieve the desired results?)  
<table>
<thead>
<tr>
<th>By the end of this unit, students will know:</th>
<th>By the end of this unit, students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The difference between mechanical and non-Mechanical energy.</td>
<td>Calculate when work is done on a system.</td>
</tr>
<tr>
<td>The variables that kinetic energy depend upon.</td>
<td>Calculate kinetic energy.</td>
</tr>
<tr>
<td>The variables that gravitational potential energy depend upon.</td>
<td>Calculate gravitational potential energy.</td>
</tr>
<tr>
<td>The variables that elastic potential energy depend upon.</td>
<td>Calculate elastic potential energy.</td>
</tr>
<tr>
<td>The Law of Conservation of Energy states that energy can be transferred from one type to another, but cannot be created or destroyed.</td>
<td>Demonstrate understanding of mechanical energy transfer via diagrams.</td>
</tr>
<tr>
<td>The difference between renewable and non-renewable energy sources.</td>
<td></td>
</tr>
<tr>
<td>How different types of energy resources convert</td>
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</table>
mechanical energy into electrical energy.

<table>
<thead>
<tr>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>In correlation with the NJSLS, students must demonstrate the following as summative assessments:</td>
</tr>
<tr>
<td>MS-PS 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.</td>
</tr>
<tr>
<td>MS-PS 3-2 Develop a model to describe that when the arrangements of objects interacting at a distance changes, different amounts of potential energy are stored in the system.</td>
</tr>
<tr>
<td>MS-PS-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.</td>
</tr>
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<td>Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.</td>
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<td>● Vocabulary Review</td>
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<tr>
<td>● Science Starters/Do Now</td>
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<tr>
<td>● Open Ended Responses</td>
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**Modifications**

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

**Integration of Technology:**

- Smartboard
### Unit Lesson Plan  Thermal Energy

**Teacher:** Leskowits

**Grade:** 8th Grade

<table>
<thead>
<tr>
<th>NJSLS/DCI</th>
<th>Interdisciplinary Connections (NJSLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MS-PS3.A: Definitions of Energy</strong></td>
<td><strong>NJSLS Connections:</strong></td>
</tr>
<tr>
<td>Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)</td>
<td><strong>ELA/Literacy –</strong></td>
</tr>
<tr>
<td></td>
<td><strong>RST.6-8.1</strong> Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1),(MSPS3-5)</td>
</tr>
<tr>
<td></td>
<td><strong>RST.6-8.3</strong> Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)</td>
</tr>
<tr>
<td></td>
<td><strong>RST.6-8.7</strong> Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)</td>
</tr>
<tr>
<td></td>
<td><strong>WHST.6-8.1</strong> Write arguments focused on discipline content. (MS-PS3-5)</td>
</tr>
<tr>
<td><strong>MS-PS3.B: Conservation of Energy and Energy Transfer</strong></td>
<td><strong>MS-PS3-3),(MS-PS3-4)</strong></td>
</tr>
<tr>
<td>The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)</td>
<td><strong>Interdisciplinary Connections (NJSLS)</strong></td>
</tr>
<tr>
<td>Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)</td>
<td><strong>NJSLS Connections:</strong></td>
</tr>
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<td></td>
<td><strong>ELA/Literacy –</strong></td>
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<td><strong>WHST.6-8.1</strong> Write arguments focused on discipline content. (MS-PS3-5)</td>
</tr>
<tr>
<td><strong>MS-PS3.C: Relationship Between Energy and Forces</strong></td>
<td><strong>Interdisciplinary Connections (NJSLS)</strong></td>
</tr>
<tr>
<td>When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)</td>
<td><strong>NJSLS Connections:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ELA/Literacy –</strong></td>
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**Interdisciplinary Connections (NJSLS)**

**NJSLS Connections:**

**ELA/Literacy –**

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1),(MSPS3-5)

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)

WHST.6-8.1 Write arguments focused on discipline content. (MS-PS3-5)
### Essential Questions

**What questions will the student be able to answer as a result of the instruction?**

1. How is temperature related to kinetic energy?
2. What are three scales commonly used to measure temperature and how do they relate to one another?
3. Why do things feel hot or cold?
4. What is the definition of thermal energy and how does it relate to heat?
5. How do conductors and insulators differ?

### Knowledge & Skills

**What skills are needed to achieve the desired results?**

<table>
<thead>
<tr>
<th>By the end of this unit, students will know:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● The temperature of a substance is proportional to the average kinetic energy of the substance's molecules.</td>
</tr>
<tr>
<td>● Things expand when heated and contract when cooled due to the increase/decrease in kinetic energy.</td>
</tr>
<tr>
<td>● The three common scales to measure temperature (Kelvin, Celsius, and Fahrenheit)</td>
</tr>
<tr>
<td>● The difference between temperature and thermal energy</td>
</tr>
<tr>
<td>● Three methods of heat transfer: convection,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>By the end of this unit, students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Relate the motion and spacing of a substance’s particles to the substance’s temperature.</td>
</tr>
<tr>
<td>● Describe why object’s expand or contract in terms of the temperature change of the object as well as the motion of the object’s particles.</td>
</tr>
<tr>
<td>● Measure a substance’s temperature using a standard thermometer and convert between Kelvin, Celsius and Fahrenheit.</td>
</tr>
<tr>
<td>● Relate thermal expansion/contraction to how thermometers work.</td>
</tr>
<tr>
<td>● Identify when substances can have the same temperature but possess different amounts of</td>
</tr>
</tbody>
</table>
conduction and radiation

- How conductors and insulators differ
- The variables that affect temperature change in an object.
- The definition of specific heat (capacity).

thermal energy.

- Differentiate between examples of convection, conduction and radiation.
- Use their knowledge of conductors and insulators to maximize and minimize thermal energy transfer.
- Determine temperature changes between two objects that exchange thermal energy.
- Be able to describe what happens to usable energy in a system.
- Describe the relationship between energy transferred, type/amount of matter, and temperature.
- Use the thermal energy/specific heat equation to calculate: temperature change, heat added or lost, mass of objects, and specific heats.
- Determine qualitatively the relative temperature of objects given a heat input and the objects’ specific heat capacity.

Assessment

(What is acceptable evidence to show desired results (rubrics, exam, etc.)?)

In correlation with the NJSLS, students must demonstrate the following as summative assessments:
MS-PS- 3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
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.
MS-PS-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.
Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

Formative Assessments include:

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

Modifications

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables,
multimedia, modeling).

- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

### Integration of Technology:
- Smartboard
- Computers
- Internet
- Multi-media presentations
- Video Streaming
- Software
- Ipad
- Microsoft 365

## Unit Lesson Plan - Types of Interactions

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>Leskowits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade:</td>
<td>8th Grade</td>
</tr>
</tbody>
</table>

**NJSLS/DCI**

**MS-PS2.B**

**Types of Interactions**

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)

- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)

- Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). (MS-PS2-
### Interdisciplinary (NJSLS)

**NJSLS Connections: ELA/Literacy** –
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS2-1),(MSPS2-3)
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)
- WHST.6-8.1 Write arguments focused on discipline-specific content. (MS-PS2-4)
- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)

**Mathematics** –
- MP.2 Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)
- 6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)
- 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)
- 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2)
- 7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1),(MS-PS2-2)

### Essential Questions

**What questions will the student be able to answer as a result of the instruction?**

- How are forces exerted over a distance?
- What causes a) gravitational field, b) electric field, and a c) magnetic field?
- What are the three types of fields discussed in this unit? How are they similar? How are they different?
- What happens to the strength of a field as we move farther away from its source?

### Knowledge & Skills

**What skills are needed to achieve the desired results?**

<table>
<thead>
<tr>
<th>By the end of this unit, students will know:</th>
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<tbody>
<tr>
<td>- Source and factors that affect gravitation.</td>
<td>- Differentiate between the transfers of force via direct contact vs. fields.</td>
</tr>
<tr>
<td>- Source and factors that affect electrical forces.</td>
<td>- Explain that mass and distance of separation affect the magnitude of gravitational attraction.</td>
</tr>
<tr>
<td>- Sources and factors that affect magnetic forces.</td>
<td>- Diagram/explain charge distribution in positive and negative objects.</td>
</tr>
<tr>
<td></td>
<td>- Sketch/explain electric fields.</td>
</tr>
<tr>
<td></td>
<td>- Explain that charge strength and distance of separation affect the magnitude of electrical forces.</td>
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</table>
The interrelationships between electricity & magnetism.

Diagram/explain the source of magnetism in terms of magnetic domains.

Sketch/explain magnetic fields.

Explain that magnetic strength and distance of separation affect the magnitude of magnetic forces.

Identify the fact that moving electric charge produces magnetic fields and vice versa.

### Assessment

**(What is acceptable evidence to show desired results (rubrics, exam, etc.)?)**

In correlation with the NJSLS, students must demonstrate the following as summative assessments:

**MS-PS-2-3** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

**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.

**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.

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

**Formative Assessments include:**

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

### Modifications

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
• Provide ELL students with multiple literacy strategies.

Integration of Technology:
- Smartboard
- Computers
- Internet
- Multi-media presentations
- Video Streaming
- Software
- Ipads
- Microsoft 365

Unit Lesson Plan - Wave Properties

| Teacher: | Leskowits |
| Grade: | 8th Grade |

NJSLS/DCI
MS-PS4, Wave Properties

<table>
<thead>
<tr>
<th>PS4.A: Wave Properties</th>
</tr>
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<tbody>
<tr>
<td>A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)</td>
</tr>
<tr>
<td>A sound wave needs a medium through which it is transmitted. (MS-PS4-2)</td>
</tr>
</tbody>
</table>

Interdisciplinary Connections (NJSLS)

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<td>RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)</td>
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<td>WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)</td>
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<td>SL.8.5 Integrate multimedia and visual displays into presentations to clarify information,</td>
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strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)

**Mathematics –** MP.2 Reason abstractly and quantitatively. (MS-PS4-1)
MP.4 Model with mathematics. (MS-PS4-1)
6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)
7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS4-1)
8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)

### Essential Questions
(What questions will the student be able to answer as a result of the instruction?)

- What causes a wave?
- What are the basic “parts” of a wave?
- What are the properties that all waves exhibit?
- What is a mechanical wave?
- How do pitch and loudness correspond to the structure of a wave?
- How does the Human ear detect sound?
- What happens to the pitch of a sound wave when the sound source is in motion?
- What happens to the sound waves of a plane that travels faster than the speed of sound?

### Knowledge & Skills
(What skills are needed to achieve the desired results?)

**By the end of this unit, students will know:**

- The source of waves
- The parts of a wave including wavelength, amplitude, frequency, crest, trough, and equilibrium position.
- The calculation of a wave’s velocity.
- How pitch and loudness are a function of a wave’s structure.
- The behavior of waves according to the law of reflection.
- The speed and direction of a wave changes when it undergoes refraction.
- Waves spread out as they pass through an opening during diffraction.
- Waves can add up to become stronger and cancel each other out during constructive and destructive interference.
- Sound is caused by a vibrating object and requires a medium to move.
- Smaller objects produce higher pitched sounds.
- Loudness is a measure of the amplitude of a wave and is measured in decibels.
- Sound waves vibrate parts of the ear and the ear sends that information to the brain during hearing.

**By the end of this unit, students will be able to:**

- Describe the source of a wave.
- Label diagrams of basic sound waves.
- Calculated the velocity of a wave utilizing the wave equation.
- Label and explain diagrams of refraction.
- Label and explain diagrams of diffraction.
- Sketch and explain constructive and destructive interference.
- Describe the source of a longitudinal sound wave as cause by a vibrating object.
- Label longitudinal waves parts including compressions and rarefactions and relate a vibrating object to the source of each part.
- Relate the frequency of a sound wave to the observed pitch of that wave.
- Relate the amplitude of a sound wave to the observed loudness of that wave.
- Describe the basics of hearing and the structure of the outer, middle, and inner ear.
- Describe how the speed of sound is affected on warmer and cooler days.
- Describe the observed pitch that originates from a moving sound source.
- Describe the arrangement of sound waves
The speed of sound varies in air according to the temperature of the air.

produced when a sound source is moving faster than the speed of sound.

### Assessment

**What is acceptable evidence to show desired results (rubrics, exam, etc.)?**

In correlation with the NJSLS, students must demonstrate the following as summative assessments:

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

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

**Formative Assessments include:**

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

### Modifications

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
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- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

### Integration of Technology:

- Smartboard
When light shines on an object, it is reflected, absorbed or transmitted through the object, depending on the object’s material and the frequency (color) of the light.

The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g. air and water, air and glass) where the light path bends.

A wave model of light is useful for explaining brightness, color and the frequency-dependent bending of light at a surface between media.

However, because light can travel through space, it cannot be a matter wave, like sound or water waves.

http://www.nextgenscience.org/*

NJSLS Connections:

ELA/Literacy – RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)

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6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical
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7.RP.A.2 Recognize and represent proportional relationships between
quantities. (MS-PS4-1)
8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose
graph is a straight line; give examples of functions that are not linear. (MS-
PS4-1)

Essential Questions
(What questions will the student be able to answer as a result of the instruction?)

1. What is radiation?
2. How are light waves and mechanical waves different?
3. What is the relationship between wavelength, frequency and energy of electromagnetic radiation?
4. What are the different types of electromagnetic radiation?
5. What are the different types of reflection?
6. How does the absorption of light result in the different colors that we see?
7. How do objects refract through different mediums?

Knowledge & Skills
(What skills are needed to achieve the desired results?)

By the end of this unit, students will know:
- How electromagnetic radiation acts as a wave
- The different types of electromagnetic radiation that compose the electromagnetic spectrum
- The different interactions of radiation with matter, including reflection, absorption and refraction
- How we perceive different colors

By the end of this unit, students will be able to:
- Complete calculations based on wavelength, frequency and energy
- Differentiate between the different properties and uses of electromagnetic radiation
- Compare and contrast specular and diffuse reflection
- Explain how absorption results in changes in temperature of objects and different perceived colors
- Explain how refraction occurs and estimate angles of reflection and refraction

Assessment
(What is acceptable evidence to show desired results (rubrics, exam, etc.)?)
In correlation with the NJSLS, students must demonstrate the following as summative assessments:
MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed or transmitted through various materials.

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

Formative Assessments include:

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

**Modifications**

- Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.
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**Integration of Technology:**

- Smartboard
- Computers
- Internet
- Multi-media presentations
- Video Streaming
- Software
- Ipads
- Microsoft 365
# Unit Lesson Plan: Information Technologies and Instrumentation

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<th>Teacher:</th>
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**NJSLS/DCI**

**MS-PS4.C: Information Technologies and Instrumentation**

Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information (MS-PS4-3)

http://www.nextgenscience.org/msps4-waves-applications-technologies-information-transfer

**Interdisciplinary Connections (NJSLS)**

**NJSLS Connections:**

**ELA/Literacy –**

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)
- RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)
- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)

**Mathematics –**

- MP.2 Reason abstractly and quantitatively. (MS-PS4-1)
- MP.4 Model with mathematics. (MS-PS4-1)
- 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS4-1)
- 8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)
## Essential Questions

*(What questions will the student be able to answer as a result of the instruction?)*

1. What are older, less reliable methods of communication?
2. What are the advantages of using digitized signals (electromagnetic waves) for communication over older methods?
3. Why are electromagnetic waves a more reliable method for transmitting information?
4. Which waves on the electromagnetic spectrum are primarily used for communication?
5. How are radio and light waves used for communication? What are some examples of items that use these forms of EM waves for communication?
6. Why is digital communication of information in society?

## Knowledge & Skills

*(What skills are needed to achieve the desired results?)*

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<thead>
<tr>
<th>By the end of this unit, students will know:</th>
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<td>● Older methods of long distance communication</td>
<td>● Describe how the basics of how a telegraph and telephone work</td>
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<td>● Why using EM waves for communication is more reliable</td>
<td>● Explain the advantages of using digital communication over older forms of communication</td>
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<td>● Identify the waves on the EM spectrum that are used primarily for communication</td>
<td>● Describe how characteristics of EM waves help make it reliable form of communication</td>
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<td>● Identify items that use EM waves for communication</td>
<td>● List items that either use radio or light waves for communication</td>
</tr>
<tr>
<td>● The role of communication technology in society</td>
<td>● Explain generally how fiber optics are used for communication</td>
</tr>
<tr>
<td></td>
<td>● Analyze the importance of communication technology in society</td>
</tr>
<tr>
<td></td>
<td>● Recognize that communication technology is not always positive</td>
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## Assessment

*(What is acceptable evidence to show desired results (rubrics, exam, etc.)? Attach Copy)*

In correlation with the NJSLS, students must demonstrate the following as summative assessments:

MS-PS-4-3 Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a MORE RELIABLE way to encode and transmit information.

Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, and vocabulary quizzes.

Formative Assessments include:

- Exit questions
- Teacher observations
- Class discussions
- Lab Activities
- Vocabulary Review
- Science Starters/Do Now
- Open Ended Responses

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**MODIFICATIONS**

*Based on Students’ Individual Needs*

(Special Education Students, English Language Learners, Students at-Risk)

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| - Provide extended time  
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### Career Ready Practices

#### Standards

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- **CRP1. Act as a responsible and contributing citizen and employee.**
  Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

- **CRP2. Apply appropriate academic and technical skills.**
  Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights
about when it is appropriate to apply the use of an academic skill in a workplace situation

- CRP3. **Attend to personal health and financial well-being.**
  Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

- CRP4. **Communicate clearly and effectively and with reason.**
  Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

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  Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others’ action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management’s actions and attitudes can have on productivity, morals and organizational culture.

- CRP10. **Plan education and career paths aligned to personal goals.**
  Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

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  Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
Educational Technology

Standards

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  - Identify the basic features of a computer and explain how to use them effectively.
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- **Digital Citizenship**
  - Model legal and ethical behaviors when using both print and non-print information by citing resources.

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  - Use digital tools and online resources to explore a problem or issue affecting children, and discuss possible solutions.

- **Critical Thinking, Problem Solving, and Decision-Making**
  - Use mapping tools to plan and choose alternate routes to and from various locations.

ELL Strategies

- Provide explicit, systematic instruction in vocabulary.
- Ensure that ELLs have ample opportunities to talk with both adults and peers and provide
ongoing feedback and encouragement.

- Expose ELLs to rich language input.
- Scaffolding for ELLs language learning.
- Encourage continued L1 language development.
- Alphabet knowledge
- Phonological awareness
- Print awareness
- Design instruction that focuses on all of the foundational literacy skills.
- Recognize that many literacy skills can transfer across languages.
- English literacy development by helping ELLs make the connection between what they know in their first language and what they need to know in English.

- Graphic organizers
- Modified texts
- Modified assessments
- Written/audio instruction
- Shorter paragraph/essay length
- Homogeneously grouped by level

### Enrichment

**Accommodate Based on Students Individual Needs: Strategies**

- Evaluate vocabulary
- Elevate Text Complexity
- Incorporate inquiry based assignments and projects
- Extend curriculum
- Balance individual, small group and whole group instruction
- Provide tiered/multi-level activities
- Include purposeful learning centers
- Provide open-ended activities and projects
- Offer opportunities for heterogeneous grouping to work with age and social peers as well as homogeneous grouping to provide time to work with individual peers
- Provide pupils with experiences outside the ‘regular’ curriculum
- Alter the pace the student uses to cover regular curriculum in order to explore topics of interest in greater depth/breadth within their own grade level
- Require a higher quality of work than the norm for the given age group
- Promote higher level of thinking and making connections.
• Focus on process learning skills such as brainstorming, decision making and social skills
• Use supplementary materials in addition to the normal range of resources.
• Encourage peer to peer mentoring
• Integrate cross-curricular lessons
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• Facilitate student-led questioning and discussions

Digital Resources Science Grade 8

www.readworks.org - informational text
www.newsela.com - informational text
www.brainpop.com - videos and simulations
https://phet.colorado.edu/ - videos and simulations
www.sciencespot.net - lesson plans and worksheets
www.quizlet.com - review and reinforcement
www.kahoot.com - review and reinforcement
www.bozemanscience.com - videos
https://www.ted.com/talks/just_how_small_is_an_atom - video
https://middleschoolscience.com/ - lesson plans and worksheets
http://www.middleschoolchemistry.com/lessonplans/ - lesson plans and worksheets
http://www.rsc.org/periodic-table/ - Interactive periodic table
www.kesslerscience.com - lesson plans, lab stations, worksheets

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