### **GRADE 4- Unit 2: Energy & Energy Transfer**

#### Mission Statement

The primary goal of the Swedesboro-Woolwich School District is to prepare each student with the real life skills needed to compete in a highly competitive global economy. This will be achieved by providing a comprehensive curriculum, the integration of technology, and the professional services of a competent and dedicated faculty, administration, and support staff.

Guiding this mission will be Federal mandates, including No Child Left Behind, the New Jersey Core Curriculum Content Standards, and local initiatives addressing the individual needs of our students as determined by the Board of Education. The diverse resources of the school district, which includes a caring PTO and active adult community, contribute to a quality school system. They serve an integral role in supporting positive learning experiences that motivate, challenge and inspire children to learn.

### **Unit/Module Overview**

In this unit, students explore energy! Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct chain reaction machines to explore the many different ways that energy can be transferred.

# **Standards Covered in Current Unit/Module**

### **Related Standards & Learning Goals**

### **Priority Standards**

<u>SCI.3-5-ETS1-3</u>	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
<u>SCI.4-PS3-1</u>	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
<u>SCI.4-PS3-3</u>	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
<u>SCI.4-PS3-4</u>	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
	Learning Goals

### **Learning Goals**

# **Lesson 1: Speed & Energy**

I can explain the relationship between the energy of an object and the speed of the object.

# **Lesson 2: Gravitational Energy, Speed & Collisions**

I can explain how energy can be stored as height

# **Lesson 3: Collisions & Energy Transfer**

I can predict outcomes about changes in energy and transfer of energy that occurs when object collide.

# **Lesson 4: Energy Transfer & Engineering 1**

I can design a machine that stores, releases and transfers energy.

# **Lesson 5: Energy Transfer & Engineering 2**

I can design a machine that stores, releases and transfers energy.

Unit/Module Weekly Learning Activities and Pacing Guide			
Topic & # Days	NJ Standards	Critical Knowledge & Skills	Possible Resources & Activities
Week 1: Anchor Phenomen on: Rube Goldberg Machines	<ul> <li>4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.</li> <li>4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</li> <li>4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.</li> <li>4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts</li> </ul>	Obj. We are learning to:  • I can design a rube goldberg machine Suggested Formative Assessment(s):	Curriculum  Mystery Science  Day 1:  -Introduction Slides  -Class Discussion  -Complete See-Think-Wonder Worksheet  Day 2:  -Review Slides  -Complete Rube Goldberg Machine Model  Worksheet  -Class Discussion  Materials  Energy Everything Teach Guide:  Mystery Science Document #293  Rube Goldberg Machine Model:  Mystery Science Document #81  See-Think-Wonder Worksheet: Mystery  Science Document #2301

	energy from one form to another.		
Week 2: Lesson 1: Speed & Energy	• 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.	Obj. We are learning to:  I can explain the relationship between the energy of an object and the speed of the object.  Suggested Formative Assessment(s): Lesson 1: Speed & Energy Exit Ticket: Mystery Science Document #236 Answer Key: Mystery Science Document #237	Curriculum  Mystery Science  Day 1:  -Introduction Video  -Vocabulary Slides  -Class Discussion  Days 2 & 3:  -Review Introduction / Vocabulary  -Lab / Hands-on Activity  Day 4:  -Finish Video  -Wrap up Discussions  Day 5:  -Assessment  Materials  Twist-O-Matic Printout: Mystery Science  Document #89  Twist-O-Matic Challenges: Mystery  Science Document #93  Twist-O-Matic Challenges Answer Key:  Mystery Science Document #100  Caryons  Hardcover Books  Rules  Scissors  Rubber Bands Thin  Rubber Bands Thick  Small Binder Clips

Week 3:	• 4-PS3-1: Use evidence to	Obj. We are learning to:	Curriculum	
Lesson 2:	construct an explanation	I can explain how energy can be stored as	Mystery Science	
Gravitation	relating the speed of an object	height	Day 1:	
al Energy,	to the energy of that object.	Suggested Formative Assessment(s):	-Introduction Video	
Speed &	• <u>4-PS3-3:</u> Ask questions and	Lesson 2: Gravitational Energy, Speed & Collisions	-Vocabulary Slides	
Collisions	predict outcomes about the	Exit Ticket: Mystery Science Document #845	-Class Discussion	
	changes in energy that occur	Answer Key: Mystery Science Document #848	Days 2 & 3:	
	when objects collide.		-Review Introduction / Vocabulary	
			-Lab / Hands-on Activity	
			Day 4:	
			-Finish Video	
			-Wrap up Discussions	
			Day 5:	
			-Assessment	
			<u>Materials</u>	
			1. Alligator Printout: Mystery Science	
			Document #834	
			2. Bumper Coaster Part I Answer Key:	
			Mystery Science Document #837	
			3. Bumper Coaster Part I Tracks Printout:	
			Mystery Science Document #833	
			4. Collisions Experiments Worksheet:	
			Mystery Science Document #836	
			5. Distance & Height Experiments:	
			Mystery Science Document #835  6. Box	
			7. Pencil	
			8. Rulers	
			9. Scissors	
			10. File Folder Label	
			11. Paper Clips	
			12. Small Marbles	
			TZ. JIIIAII IVIAI DIES	

Meek 4:		1		T	
Collisions & Changes in energy that occur when objects collide.  Transfer  energy and transfer of energy that occurs when objects collide.  Suggested Formative Assessment(s): Lesson 3: Collision & Energy Transfer: -No Assessment Listed; Just Lab Activity- Bumper Jumper Game: Mystery Science Document #25572 Bumper Jumper Game with Foil: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game with Foil: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25572  Landing Zone: Mystery Science Document #25573  Landing Zone: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Scissors  Science Document #25571  Scissors  Landing Zone: Mystery Science Document #25571  Landing Zon	<u>Week 4</u> :	• <u>4-PS3-3:</u> Ask questions and	Obj. We are learning to:	<u>Curriculum</u>	
### when objects collide.  When objects collide.  Suggested Formative Assessment(s): Lesson 3: Collision & Energy Transfer: -No Assessment Listed; Just Lab Activity- Bumper Jumper Game: Mystery Science Document #25572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Assessment  Materials  1. Bumper Jumper Game: Mystery Science Document #25572 2. Bumper Jumper Game: Mystery Science Document #25572 2. Bumper Jumper Game: Mystery Science Document #25572 3. Collision Track Printout: Mystery Science Document #25573 3. Collision Track Printout: Mystery Science Document #25570 4. Landing Zone: Mystery Science Document #25571 5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels	Lesson 3:	predict outcomes about the	<ul> <li>I can predict outcomes about changes in</li> </ul>	<ul> <li>Mystery Science</li> </ul>	
Transfer  Suggested Formative Assessment(s): Lesson 3: Collision & Energy Transfer: -No Assessment Listed; Just Lab Activity- Bumper Jumper Game: Mystery Science Document #25572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document Materials  1. Bumper Jumper Game: Mystery Science Document #25572 2. Bumper Jumper Game: Mystery Science Document #25573 3. Collision Track Printout: Mystery Science Document #25570 4. Landing Zone: Mystery Science Document #25570 5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Errasers 12. Sticker Labels	Collisions &	changes in energy that occur	energy and transfer of energy that occurs	Day 1:	
Lesson 3: Collision & Energy Transfer: -No Assessment Listed; Just Lab Activity- Bumper Jumper Game: Mystery Science Document #125572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Scissors  Sciscoth Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels	Energy	when objects collide.	when objects collide.	-Introduction Video	
-No Assessment Listed; Just Lab Activity- Bumper Jumper Game: Mystery Science Document #25572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25571  Scissors  Collision Track Printout: Mystery Science Document #25572  Landing Zone: Mystery Science Document #25571  Scissors  Scotch Tape  Scape Paper  Aluminum Foil  10 20 30x Dixie Cups  11 Pencils w/ Erasers  12 Sticker Labels	Transfer		Suggested Formative Assessment(s):	-Vocabulary Slides	
Bumper Jumper Game: Mystery Science Document #25572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Scissors  Scissors  Scotch Tape Scape Paper Aluminum Foil 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels			Lesson 3: Collision & Energy Transfer:	-Class Discussion	
#25572 Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25571  Science Document #25571  Landing Zone: Mystery Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571			-No Assessment Listed; Just Lab Activity-	Days 2 & 3:	
Bumper Jumper Game with Foil: Mystery Science Document #25573 Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25571  Science Document #25571  Science Document #25570  Landing Zone: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25573  Collision Tra			Bumper Jumper Game: Mystery Science Document	-Review Introduction / Vocabulary	
Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Scissors  Sciscors  Scotch Tape  Scape Paper  Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels			<u>#25572</u>	-Lab / Hands-on Activity	
Collision Track Printout: Mystery Science Document #25570 Landing Zone: Mystery Science Document #25571  Landing Zone: Mystery Science Document #25571  Bumper Jumper Game: Mystery Science Document #25572  Bumper Jumper Game with Foil: Mystery Science Document #25573  Collision Track Printout: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25570  Landing Zone: Mystery Science Document #25571  Scissors  Science Document #25571  Scissors  Science Document #25571  Scissors  Auminum Foil  18 oz Cup  10. 3ox Dixie Cups  11. Pencils w/ Erasers  12. Sticker Labels			Bumper Jumper Game with Foil: Mystery Science	Day 4:	
#25570 Landing Zone: Mystery Science Document #25571  Day 5: -Assessment Materials  1. Bumper Jumper Game: Mystery Science Document #25572 2. Bumper Jumper Game with Foil: Mystery Science Document #25573 3. Collision Track Printout: Mystery Science Document #25570 4. Landing Zone: Mystery Science Document #25571 5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels			Document #25573	-Finish Video	
Landing Zone: Mystery Science Document #25571  -Assessment Materials  1. Bumper Jumper Game: Mystery Science Document #25572 2. Bumper Jumper Game with Foil: Mystery Science Document #25573 3. Collision Track Printout: Mystery Science Document #25570 4. Landing Zone: Mystery Science Document #25571 5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels			Collision Track Printout: Mystery Science Document	-Wrap up Discussions	
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Science Document #25572 2. Bumper Jumper Game with Foil:				<u>Materials</u>	
2. Bumper Jumper Game with Foil:  Mystery Science Document #25573  3. Collision Track Printout: Mystery Science Document #25570  4. Landing Zone: Mystery Science Document #25571  5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels				1. Bumper Jumper Game: Mystery	
Mystery Science Document #25573  3. Collision Track Printout: Mystery Science Document #25570  4. Landing Zone: Mystery Science Document #25571  5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels				Science Document #25572	
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Science Document #25570  4. Landing Zone: Mystery Science Document #25571  5. Scissors 6. Scotch Tape 7. Scape Paper 8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels				Mystery Science Document #25573	
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8. Aluminum Foil 9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels				6. Scotch Tape	
9. 18 oz Cup 10. 3ox Dixie Cups 11. Pencils w/ Erasers 12. Sticker Labels				7. Scape Paper	
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11. Pencils w/ Erasers 12. Sticker Labels				9. 18 oz Cup	
12. Sticker Labels				10. 3ox Dixie Cups	
				11. Pencils w/ Erasers	
13. Small Marbles				12. Sticker Labels	
				13. Small Marbles	

Week 5:	• <u>4-PS3-4:</u> Apply scientific	Obj. We are learning to:	Curriculum	
Lesson 4:	ideas to design, test, and	<ul> <li>I can design a machine that stores, releases</li> </ul>	Mystery Science	
Energy	refine a device that converts	and transfers energy.	Day 1:	
Transfer &	energy from one form to	Suggested Formative Assessment(s):	-Introduction Video	
Engineering	another.	Lesson 4: Energy Transfer & Engineering 1	-Vocabulary Slides	
	• <u>3-5-ETS1-1:</u> Define a simple	Exit Ticket: Mystery Science Document #572	-Class Discussion	
	design problem reflecting a	Answer Key: Mystery Science Document #123	Days 2 & 3:	
	need or a want that includes		-Review Introduction / Vocabulary	
	specified criteria for success		-Lab / Hands-on Activity	
	and constraints on materials,		Day 4:	
	time, or cost.		-Finish Video	
	, , , , , , , , , , , , , , , , , , , ,		-Wrap up Discussions	
			Day 5:	
			-Assessment	
			Materials	
			1. Chain-Reaction Starter Kit Printout:	
			Mystery Science Document #35	
			2. Marble Corral Printout: Mystery	
			Science Document #548	
			3. Markers	
			4. Rulers	
			5. Scissors	
			6. 3 oz Dixie Cups	
			7. File Folder Labels	
			8. Paper Clips	
			9. 8 oz Paper Cups	
			10. Rubber Bands	
			11. Small Marbles	
Week 6:	• <u>3-5-ETS1-1:</u> Define a simple	Obj. We are learning to:	Curriculum	
Lesson 5:	design problem reflecting a	I can design a machine that stores, releases	Mystery Science	
Energy	need or a want that includes	and transfers energy.	Day 1:	
Transfer &	specified criteria for success	Suggested Formative Assessment(s):	-Introduction Video	
Engineering	and constraints on materials,	Lesson 5: Energy Transfer & Engineering 2	-Vocabulary Slides	

2	time, or cost.	Exit Ticket: Mystery Science Document #572	-Class Discussion	
	3-5-ETS1-2: Generate and	Answer Key: Mystery Science Document #123	Days 2 & 3:	
	compare multiple possible		-Review Introduction / Vocabulary	
	solutions to a problem based		-Lab / Hands-on Activity	
	on how well each is likely to		Day 4:	
	meet the criteria and		-Finish Video	
	constraints of the problem.		-Wrap up Discussions	
	3-5-ETS1-3: Plan and carry out		Day 5:	
	fair tests in which variables		-Assessment	
	are controlled and failure		<u>Materials</u>	
	points are considered to		1. Chain-Reaction Starter Kit Printout:	
	identify aspects of a model or		Mystery Science Document #35	
	prototype that can be		2. Pop-Up Sign Printout: Mystery Science	
	improved.		Document #40	
	• 4-PS3-4: Apply scientific		3. Hardcover Books	
	ideas to design, test, and		4. Lever from previous lessons	
	refine a device that converts		5. Markers	
	energy from one form to		6. Ramp from previous lessons	
	another.		7. Rulers	
			8. Scissors	
			9. 3 oz Dixie Cups	
			10. File Folder Labels	
			11. 3x5 Index Cards	
			12. Jumbo Paper Clips	
			13. 8 oz Paper Cups	
			14. Rubber Bands	
			15. Small Marbles	
<u>Week 7</u> :	• 4-PS3-1: Use evidence to	Obj. We are learning to:	Curriculum	
Unit Review	construct an explanation	<ul> <li>I can design a rube goldberg machine</li> </ul>	Mystery Science	
&	relating the speed of an object	<ul> <li>I can explain the relationship between the</li> </ul>	Day 1-2	
Summative	to the energy of that object.	energy of an object and the speed of the	-Review Units	
Assessment	• 4-PS3-2: Make observations	object.	Days 3-4:	
	to provide evidence that	<ul> <li>I can explain how energy can be stored as</li> </ul>	-Summative Assessment	

	energy can be transferred from place to place by sound, light, heat, and electric currents.  • 4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.  • 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to	height  I can predict outcomes about changes in energy and transfer of energy that occurs when object collide.  I can design a machine that stores, releases and transfers energy.  Suggested Formative Assessment(s): Unit 2: Energy & Energy Transfer  Summative Assessment: Mystery Science Document #183  Answer Key: Mystery Science Document #186	Materials
	another.		
Week 8: Performanc e Task: Energy & Engineering	• 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.  3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.  3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	<ul> <li>Obj. We are learning to:         <ul> <li>In the Performance Task, students will design a Rube Goldberg machine that utilizes energy transfers and conversions to complete a goal of the student's choosing.</li> </ul> </li> <li>Suggested Formative Assessment(s):         <ul> <li>Performance Task: Energy &amp; Engineering</li> </ul> </li> <li>Chain-Reaction Starter Kit: Mystery Science</li> </ul> <li>Document #35</li> <li>Rube Goldberg Conceptual Model: Mystery Science</li> <li>Document #645</li> <li>Rube Goldberg Final Project: Mystery Science</li> <li>Document #579</li> <li>Rube Goldberg Final Project Rubric: Mystery</li> <li>Science Document #646</li>	Curriculum
	• <u>4-PS3-4:</u> Apply scientific ideas to design, test, and		

refine a devic	hat converts	
energy from	e form to	
another.		

**Google Form Versions of Mystery Science Assessments** 

<u>Link to Additional Components including Cross Curricular Connections, Accommodations, Assessments, Etc ELA Enduring Understanding Statements</u>