Englewood Public School District
Science
Grade 8
Second Marking Period

Unit 3: Chemical Reactions

Overview: Students provide molecular-level accounts of states of matters and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and of how atoms rearrange during chemical reactions. Students also apply their understanding of optimization design and process in engineering to chemical reaction systems. The crosscutting concept of *energy and matter* provides a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in *developing and using models, analyzing and interpreting data, designing solutions*, and *obtaining, evaluating, and communicating information*. Students are also expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Time Frame: 25-30 Days

Enduring Understandings:
New substances created in a chemical process have different properties from those of the reactants.
The total number of each type of atom in a chemical process is conserved, and thus the mass does not change (the law of conservation of matter).
Some chemical reactions release energy, while others store energy.

Essential Questions:
How do substances combine or change (react) to make new substances?
What happens to the atoms when I bake a cake?
How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?

Standards	Topics and Objectives	Activities	Resources	Assessments
<u>(MS-PS1-5)</u> **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.**	**Topics** Periodic Table Bonding Conservation of Mass Endo/Exothermic Reactions Solutions/Acids/Bases	Students will complete the text activities: 1. Discover Activity (p74, Chemical Building Blocks) What's in the Box 2. Lab (p21, Chemical Interactions) Comparing Atom Sizes 3. Discover Activity (p80, Chemical Building Blocks) Which is easier?	<u>**Text:**</u> • Prentice Hall Science Explorer: Chemical Building Blocks • Prentice Hall Science Explorer: Chemical Interactions <u>**Materials:**</u> For Discover Activity (p74,	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions • Students' learning needs will be assessed based on responses to Discover Activity discussion

(MS-ETS1-3) **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**	Reaction Rates Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Information and Media literacy **Objectives** Students will: Use physical models or drawings, including digital forms, to represent atoms in a chemical process. Use mathematical descriptions to show that the number of atoms before and after a chemical process is the same. Undertake a design project, engaging in the design cycle, to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	4. Write an Advertisement (p87, Chemical Building Blocks) selling the benefits of using the Periodic Table in the chemical profession 5. Discover Activity (p88, Chemical Building Blocks) Why Use Aluminum? 6. Discover Activity (p56, Chemical Interactions) Do You Lose Anything? 7. Discover Activity (p66, Chemical Interactions) Can You Speed Up or Slow Down a reaction? 8. Discover Activity (p22, Chemical Interactions) How Do Ions Form? 9. Discover Activity (p30, Chemical Interactions) Why Don't Water and Oil Mix? 10. Discover Activity (p84, Chemical Interactions) What Makes a Mixture a Solution? 11. Lab (p90, Chemical Interactions) Speedy Solutions 12. Discover Activity (p98, Chemical Interactions) What Colors does Litmus Paper turn? 13. Discover Activity (p104, Chemical Interactions) What Can Cabbage Juice Tell You? 14. Lab (p110, Chemical Interactions) The Antacid Test Students will explore positive	Chemical Building Blocks) What's in the Box • Tape • Show box • Objects such as pencils, empty soda can, marble, sponge, a sock For Lab (p21, Chemical Interactions) Comparing Atom Sizes • Drawing compass • Calculator • Periodic table of elements For Discover Activity (p80, Chemical Building Blocks) Which is easier? • Four colors of paper • Scissors • Pen or pencil • Stopwatch For Discover Activity (p88, Chemical Building Blocks) Why Use Aluminum? • Aluminum products: cans, disposable pie plate, heavy duty foil, foil-covered wrapping paper, and bare aluminum wire For Discover Activity (p56, Chemical Interactions) Do You Lose Anything? • Two dozen coins: pennies, nickels, dimes, and quarters • Pencil • Paper	questions. (Answer questions, Performances) **Summative Assessments:** Unit quizzes and test Students will receive a grade for answers to analysis questions for the following labs: *Lab (p21, Chemical Interactions) Comparing Atom Sizes*, *Lab (p90, Chemical Interactions) Speedy Solutions*, and *Lab (p110, Chemical Interactions) The Antacid Test.* Labs, Journal Responses, Rubric, Essays, Self-Assessments Students will demonstrate understanding of atomic structure Protons, Neutrons, and Electrons. Students will model conservation of mass in Controlling the Amount of Products in a Chemical Reaction. Model/Projects Students will design a device that releases thermal energy during the Chemical Reactions and Design Challenge. Rubric, Interviews, Polling, Peer Reviews, Checklists

		and negative charges in the lesson Protons, Neutrons, and Electrons. (RST.6-8.1, RST.6-8.9, CRP8) Students will watch the videos They Might Be Giants - Meet the Elements, Tom Lehrer's "The Elements" animated, and Atoms Bonding Song. (8.2.8.C.4, 6.1.8.C.4.c) Students will play a periodic table game in the lesson The Periodic Table. (CRP4, 8.2.8.A.2) Students will explore the Chemicool Periodic Table and Periodic Videos websites Students will create Molecule Models of atoms, ionic compounds, and covalent bonds (also see Gumdrop Models). (MS-PS1-5, 8.2.8.C.5) Students will investigate conservation of mass in the lab activity Controlling the Amount of Products in a Chemical Reaction. (MS-ETS1-3) Students will engage in an engineering Chemical Reactions and Design Challenge with a small group. (9.2.8.B.3) **Enrichment Activity:** Students will complete	For Discover Activity (p66, Chemical Interactions) Can You Speed Up or Slow Down a reaction? • One and a half cups of vitamin C and water • Three beakers • Eye dropper • Iodine For Discover Activity (p22, Chemical Interactions) How Do Ions Form? • Checkers, twenty-four for each group For Discover Activity (p30, Chemical Interactions) Why Don't Water and Oil Mix? • Water • Jar with a tight-fitting lid • Vegetable oil • Liquid soap For Discover Activity (p84, Chemical Interactions) What Makes a Mixture a Solution? • Water • Plastic cups • Salt • Pepper For Lab (p90, Chemical Interactions) Speedy Solutions • Spoon • Thermometers • Balance • Ice • Test tube rack • Test tubes • Coarse rock salt	**Benchmark Assessment:** Exact Path **Alternative Assessments:** Students will design a project, engaging in the design cycle, to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. Rubrics, Checklists, Model/Projects Students will use mathematical descriptions to show that the number of atoms before and after a chemical process is the same. Computers, Essay, Discussions

		additional labs and activities listed in ***Middle School Chemistry***, Chapter 6: Chemical Change. (CRP8)	• Table salt • Graduated cylinders • Beakers • Solid stoppers #4 • Hot plate • Stirring rods • Stop watch For Discover Activity (p98, Chemical Interactions) What Colors does Litmus Paper turn? • Plastic droppers • Red litmus paper • Blue litmus paper • Lemon juice • Water • Orange juice • Ammonia • Vinegar • Baking soda • Table salt • Soap Discover Activity (p104, Chemical Interactions) What Can Cabbage Juice Tell You? • Plastic cups • Red cabbage juice • Lemon juice • Ammonia cleaner • Droppers For Lab (p110, Chemical Interactions) The Antacid Test • 3 plastic droppers • Small plastic cups • Dilute HCI 50 mL • Methyl orange solution 1mL	

- Liquid antacid 30 mL of each brand tested

<u>Protons, Neutrons, and Electrons</u>

Per group

- Plastic grocery bag
- Scissors
- Inflated balloon
- Small pieces of paper, confetti-size

Per demonstration

- Sink
- Balloon

For Molecule Models

- Appropriate materials to make models of atoms, ionic compounds, covalent bonds (also see <u>Gumdrop Models</u>)

For <u>Controlling the Amount of Products in a Chemical Reaction</u>

Per demonstration

- Vinegar
- Baking soda
- Water
- Alka-Seltzer
- Detergent solution
- Graduated cylinder (50 mL)
- Graduated cylinder (100 mL)
- Measuring spoon (½ teaspoon)
- 1 clear plastic cup
- Small cup
- Dropper
- Plastic waste container

Per group

- Vinegar in a cup
- Baking soda in a cup
- Detergent solution in a cup
- Dropper
- Graduated cylinder (50 mL)
- Measuring spoons (⅛, ¼, and ½ teaspoon)
- Plastic waste container

For Chemical Reactions and Design Challenge

- Goggles
- 2 small thermometers
- Calcium chloride
- Baking soda (used in the second part of the procedure)
- Water
- 2 small clear plastic cups
- 1 graduated cylinder, medicine cup, or Tablespoon
- Measuring spoons (⅛ tsp., ¼ tsp. and ½ tsp.)

Websites:

- Chemicool Periodic Table
- Periodic Videos

Videos:

- They Might Be Giants - Meet the Elements
- Tom Lehrer's "The Elements" animated
- Atoms Bonding Song

Enrichment Lesson Plans:
See *Middle School Chemistry*, Chapter 6: Chemical Change

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity In planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
• Speak and display terminology • Teacher modeling • Peer modeling • Provide ELL students with multiple literacy strategies. • Word walls • Use peer readers • Give page numbers to help the students find answers • Provide a computer for written work • Provide two sets of textbooks, one for home	• Students can rate their understanding using hand signals • Utilize modifications & accommodations delineated in the student's IEP • Work with paraprofessional • Use multi-sensory teaching approaches. • Work with a partner • Provide concrete examples • Restructure lesson using UDL principals (http://www.cast.org/our	• Students can rate their understanding using hand signals • Using visual demonstrations, illustrations, and models • Give directions/instructions verbally and in simple written format. Oral prompts can be given. • Peer Support • Increase one on one time • Teachers may modify instructions by modeling what the student is expected to do • Instructions may be printed out in large print and hung	• Students can act as peer support • Curriculum compacting • Inquiry-based instruction • Independent study • Higher order thinking skills • Adjusting the pace of lessons • Interest based content • Real world scenarios • Student Driven Instruction • 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.

and one for school • Provide visual aides • Provide additional time to complete a task • Use graphic organizers	-work/about-udl.html#.VXmoXcfD_UA). • 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).	up for the student to see during the time of the lesson. • Review behavior expectations and make adjustments for personal space or other behaviors as needed. • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	• Structure the learning around explaining or solving a social or community-based issue. • Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-3)

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-PS1-5)

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-ETS1-3)

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) (MS-ETS1-3)

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.2.8.A.2: Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
8.2.8.C.4: Identify the steps in the design process that would be used to solve a designated problem.
8.2.8.C.5.: Create a technical sketch of a product with materials and measurements labeled.

Social Studies:
6.1.8.C.4.c: Analyze how technological innovations affected the status and social class of different groups of people, and explain the outcomes that resulted.

Integration of 21st Century Standards NJSLS 9:
9.2.8.B.3:
Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop a model to describe unobservable mechanisms. (MS-PS1-5) **Constructing Explanations and Designing Solutions** • Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6) **Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)	**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-PS1-5) • The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) • Some chemical reactions release energy, others store energy. (MS-PS1-6) **ETS1.B: Developing Possible Solutions** • A solution needs to be tested, and then modified on the basis of the test results, in	**Energy and Matter** • Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5) • The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) - **Connections to Nature of Science** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)

	order to improve it. (*secondary to MS-PS1-6*) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) **ETS1.C: Optimizing the Design Solution** • 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) • 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 those characteristics may be incorporated into the new design. (MS-ETS1-3)	

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Unit 4: Force and Motion

Overview: Students use *system and system models* and *stability and change* to understanding ideas related to why some objects will keep moving and why objects fall to the ground. Students apply Newton's third law of motion to related forces to explain the motion of objects. Students also apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of *system and system models* and *stability and change* provide a framework for understanding the disciplinary core ideas. Students demonstrate proficiency in *asking questions*, *planning and carrying out investigations*, *designing solutions*, *engaging in argument from evidence*, *developing and using models*, and *constructing explanations and designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 25 to 30 Days

Enduring Understandings:

The change in an object's motion depends on balanced (Newton's first law) and unbalanced forces in a system

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 includes qualitative comparisons of forces, mass, and changes in motion (Newton's second law); frame of reference; and specification of units

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).

Gravitational interactions are always attractive and depend on the masses of interacting objects.

Essential Questions:
How can we predict the motion of an object?
If I were able to eliminate air resistance and dropped a feather and a hammer at the same time, which would land first?

Standards	Topics and Objectives	Activities	Resources	Assessments
(MS-PS2-1) **Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.**	**Topics** Motion Acceleration	Students will complete the text activities: 1. Discover Activity (p6) How Fast and How Far? 2. Lab (p16) Inclined to Roll 3. Discover Activity (p22)	**Text:** Prentice Hall Science Explorer: Motion, Forces, and Energy **Materials:**	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions

(MS-PS2-2) **Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** **(MS-PS2-4)** **Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.** **(MS-ETS1-1)** **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** **(MS-ETS1-2)** **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**	Force Friction Gravity Newton's Laws Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Information and Media literacy **Objectives** Students will: Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. Plan an investigation individually and collaboratively 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.	Will You Hurry Up? 4. Lab (p28) Stopping on a Dime 5. Discover Activity (p36) Is the Force with you? 6. Lab (p40) Sticky Sneakers 7. Discover Activity (p42) Which Lands First? 8. Lab Activity (p44) Spinning Plates 9. Discover Activity (p51) What Changes Motion? 10. Lab Activity (pg52) Around and Around 11. Discover Activity (p55) How Pushy is a Straw? 12. Lab Activity (p59) Colliding Cars 13. Lab (p62) Forced to Accelerate (WHST.6-8.9, RST.6-8.1) Students will complete the *PBL MATH SLOPE*. (MS-ETS1-2, CRP4) Students will observe the reactions of *Newton's Car*. Students will interact with unbalanced forces in the online Force and Motion Simulations. (MS-PS2-4) After watching the video Newton's Three Laws With a Bicycle, students will discuss how Newton's Laws are demonstrated in the videos Tablecloth Trick and Motorcycle Carousel. (MS-PS2-1, 8.2.8.C.5,	For Discover Activity (p6) How Fast and How Far? • Masking tape • Meter stick • Stopwatch For Lab (p16) Inclined to Roll • Skateboard • Meter stick • Protractor • Masking tape • Flat board, 1.5 m long • Small piece of sturdy cardboard • Supports (book or boxes) • Two stop watches For Discover Activity (p22) Will You Hurry Up? • Masking tape • Meter stick • Stopwatch For Lab (p28) Stopping on a Dime • Wooden meter stick • Tape measure • 2 stopwatches For Discover Activity (p36) Is the Force with you? • Skateboard • two spring scales For Lab (p40) Sticky Sneakers • Skateboard • Spring scales • Sneakers • Tape • Paper clips • Balance	• Students will explain the relationship between mass and gravity in the Gravity Exploration activity. **Summative Assessments:** Unit quizzes and test Students' learning needs will be assessed based on responses to Discover Activity and Force and Motion Simulations discussion questions. Self-Assessments, Checklists Students will receive a grade for answers to analysis questions for the following labs: *Lab (p16) Inclined to Roll*, *Lab (p28) Stopping on a Dime*, *Lab (p40) Sticky Sneakers*, and *Lab (p62) Forced to Accelerate*. Labs, Observations, Rubrics Students will represent motion graphically during the *PBL MATH SLOPE* Students will model and describe Newton's laws during the *Newton's Car activity*. Model/Projects, Peer Review Students will design a solution for colliding objects in the Bumper Boats Activity. Drawings, Self-Assessments

(MS-ETS1-3) **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** **(MS-ETS1-4)** **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved**.		6.1.8.C.4.c, 9.2.8.B.3) Students will complete the Gravity Exploration activity and explore the website Your Weight on Other Worlds Calculator to determine how mass and gravity are related. (MS-PS2-2, CRP8) Students will design solutions for colliding objects in the Bumper Boats Activity. (MS-ETS1-1,WHST.6-8.7, 8.2.8.A.2) **Enrichment Activity:** Student will experiment with different parachute designs in the lab Playing with Parachutes. (MS-ETS1-4, 8.2.8.C.4. CRP6, RST.6-8.3)	• Mass sets • Textbook For Discover Activity (p42) Which Lands First? • Rulers • 4 quarters • Tape For Lab Activity (p44) Spinning Plates • 2 Pie plates • Marbles For Discover Activity (p51) What Changes Motion? • Metal washers • Toy cars • Heavy books For Lab Activity (pg52) Around and Around • Thread • Tape • Table tennis ball For Discover Activity (p55) How Pushy is a Straw? • Rubber bands • Medium size book • Four marbles • Straw For Lab Activity (p59) Colliding Cars • Two identical toy cars • Masking tape For Lab (p62) Forced to Accelerate • Skateboard	**Benchmark Assessment:** See Unit 3 for quarterly assessment **Alternative Assessments:** Students will design an investigation and identify independent and dependent variables and controls. Graphic Organizers, Discussions, Practice Presentations Students will examine the changes over time and forces at different scales to explain the stability and change in designed systems. Troubleshoot model/design, Checklist, Peer Evaluation Students will evaluate competing design solutions involving the motion of two colliding objects based on jointly developed and agreed-upon design criteria. Partner/Team work, Practice Presentations, Checklists Students will analyze and interpret data to determine similarities and differences in findings. Graphic Organizers, Charts, Checklists, Response Logs

- Meter stick
- String
- Stopwatch
- Masking tape
- Spring scale, 5-N
- Several bricks

For Newton's Car

- Wooden block about 1Ox2Ox2.5 cm
- 1 Wooden block about 7.5x5x2.5 cm
- 3 3-inch No. 10 wood screws (round head)
- 12 Round pencils or short lengths of similar dowel rods
- 3 Rubber bands
- Cotton string
- Matches
- 6 Lead fishing sinkers (about 1/2 ounce each)
- Drill and bit (bit size determined by the diameter of the fishing sinkers)
- Vice
- Screwdriver
- Meter stick

For Bumper Boats Activity

- 2-3 meter sticks
- 8 table shuffle board pucks
- 1 plastic tub
- Tape

Websites:

- Force and Motion Simulations
- Your Weight on Other

		Worlds Calculator **Videos:** • Newton's Three Laws With a Bicycle • Tablecloth Trick • Motorcycle Carousel **Enrichment Lesson Plans:** See lab Playing with Parachutes

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
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Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity In planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
• Break tasks into smaller parts (especially reading) • Speak and display terminology • Teacher modeling	• Provide a checklist for activities • Utilize modifications & accommodations delineated in the student's IEP	• Give directions/instructions verbally and in simple written format. Oral prompts can be given. • Using visual demonstrations, illustrations, and models.	• Curriculum compacting • Inquiry-based instruction • Independent study • Higher order thinking skills • Adjusting the pace of lessons • Interest based content

• Peer modeling • Provide ELL students with multiple literacy strategies. • Word walls • Use peer readers • Give page numbers to help the students find answers • Provide a computer for written work • Provide two sets of textbooks, one for home and one for school • Provide visual aides • Provide additional time to complete a task • Use graphic organizers	• Work with paraprofessional • Use multi-sensory teaching approaches. • Work with a partner • Provide concrete examples • Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). • 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).	• Peer Support • Increase one on one time • Teachers may modify instructions by modeling what the student is expected to do • Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. • Review behavior expectations and make adjustments for personal space or other behaviors as needed. • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	• Real world scenarios • Student Driven Instruction • 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. • Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:

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),(MS-ETS1-1),(MS-ETS1-2)

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)

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-ETS1-1)

WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)

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-ETS1-2),(MS-ETS1-3)
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-ETS1-2)

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.2.8.A.2: Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
8.2.8.C.4: Identify the steps in the design process that would be used to solve a designated problem.
8.2.8.C.5.: Create a technical sketch of a product with materials and measurements labeled.

Social Studies:
6.1.8.C.4.c: Analyze how technological innovations affected the status and social class of different groups of people, and explain the outcomes that resulted.

Integration of 21st Century Standards NJSLS 9:
9.2.8.B.3
Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Plan an investigation individually and	**PS2.A: Forces and Motion** • For any pair of interacting objects, the force	**Systems and System Models** • Models can be used to represent

collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2) **Constructing Explanations and Designing Solutions** • Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) **Asking Questions and Defining Problems** • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) **Engaging in Argument from Evidence** • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)	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) **ETS1.A: Defining and Delimiting Engineering Problems** • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) **ETS1.B: Developing Possible Solutions** • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2) • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet	systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1) **Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1) • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) • The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such

	the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) **ETS1.C: Optimizing the Design Solution** • 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 those characteristics may be incorporated into the new design. (MS-ETS1-3) • 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. (MS-ETS1-4)	factors as climate, natural resources, and economic conditions. (MS-ETS1-1)