Milton Area School District
Physical Science Syllabus
Grade Level(s): 8

Physical Science Description:

The 8th Grade Physical Science course covers topics in the disciplines of chemistry and physics. Students participate in audio, visual, and tactile learning activities designed to increase their knowledge and interest in physical science. Additionally, students use the scientific method to collect and interpret data and report information. This course is an introduction to topics that students will see in high school biology, chemistry, and physics courses.

Physical Science Goals:

Matter Eligible Content

- S8.C.1.1.1 Explain the differences among elements, compounds, and mixtures.
- S8.C.1.1.2 Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
- S8.C.1.1.3 Identify and describe reactants and products of simple chemical reactions.

Energy Eligible Content

- S8.C.2.1.1 Distinguish among forms of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)
- S8.C.2.1.2 Explain how energy is transferred from one place to another through convection, conduction, or radiation.
- S8.C.2.1.3 Describe how one form of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) can be converted into a different form of energy.
- S8.C.2.2.1 Describe the Sun as the major source of energy that impacts the environment.
- S8.C.2.2.2 Compare the time span of renewability for fossil fuels and the time span of renewability for alternative fuels.
- S8.C.2.2.3 Describe the waste (i.e., kind and quantity) derived from the use of renewable and nonrenewable resources and their potential impact on the environment.

Force and Motion Content

- S8.C.3.1.1 Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).
- S8.C.3.1.2 Distinguish between kinetic and potential energy.

- S8.C.3.1.3 Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).

Nature of Science Eligible Content:

- S8.A.1.1.1 Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/information may change existing theories and practices.
- S8.A.1.1.2 Explain how certain questions can be answered through scientific inquiry and/or technological design.
- S8.A.1.1.3 Use evidence, such as observations or experimental results, to support inferences about a relationship.
- S8.A.1.1.4 Develop descriptions, explanations, predictions, and models using evidence.
- S8.A.1.2.1 Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants).
- S8.A.1.2.3 Describe fundamental scientific or technological concepts that could solve practical problems (e.g., Newton's laws of motion, Mendelian genetics).
- S8.A.1.3.1 Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter, mechanical advantage).
- S8.A.1.3.2 Use evidence, observations, or explanations to make inferences about change in systems over time (e.g., carrying capacity, succession, population dynamics, loss of mass in chemical reactions, indicator fossils in geologic time scale) and the variables affecting these changes.
- S8.A.1.3.3 Examine systems changing over time, identifying the possible variables causing this change, and drawing inferences about how these variables affect this change.
- S8.A.2.1.1 Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.
- S8.A.2.1.2 Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.
- S8.A.2.1.3 Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.
- S8.A.2.1.4 Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.
- S8.A.2.1.5 Use evidence from investigations to clearly communicate and support conclusions.
- S8.A.2.1.6 Identify a design flaw in a simple technological system and devise possible working solutions.
- S8.A.2.2.1 Describe the appropriate use of instruments and scales to accurately and safely measure time, mass, distance, volume, or temperature under a variety of conditions.
- S8.A.2.2.2 Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.
- S8.A.2.2.3 Describe ways technology (e.g., microscope, telescope, micrometer, hydraulics, barometer) extends and enhances human abilities for specific purposes.
- S8.A.3.2.2 Describe how engineers use models to develop new and improved technologies to solve problems.

Student Literacy Objectives for Physical Science:

- Effective readers use appropriate strategies to construct meaning.
- Critical thinkers actively and skillfully interpret, analyze, evaluate, and synthesize information.
- Active listeners make meaning from what they hear by questioning, reflecting, responding, and evaluating. • Effective speakers prepare and communicate messages to address the audience and purpose
- Effective research requires the use of varied resources to gain or expand knowledge.
- Audience and purpose influence a writer's choice of organizational pattern, language, concepts using appropriate literacy techniques.
- Language conventions support clarity of communications between writers/speakers and readers/listeners. • An expanded vocabulary enhances one's ability to express ideas and information

Physical Science Instructor Policies

Physical Science Resources:

- *Holt Science and Technology: Physical Science*
- Primary Source Documents
- PowerPoint Presentations
- Office 365: Microsoft Class Notebook
- Online formative assessment tools
- Educational Videos and Video Clips

Physical Science Requirements:

- Labs
- Quizzes
- Unit Tests
- Projects
- Graded class work

Physical Science Attendance Policy:

- Section 1327 of the Public School Code establishes a compulsory attendance law. Under this section, all students of compulsory school age are required to attend a day school in which subjects and activities prescribed by the standards of the School Board of Education are taught in the English language. Also, recent publication of the Student Rights and Responsibilities states that students' responsibilities include regular school attendance, conscientious effort in classroom work, and conformance to school rules and regulations. Period by period attendance is also taken on school attendance software and may have academic ramifications as determined by the teacher. Any excessive attendance issues may affect a student's eligibility and will be reviewed by administration. Excessive unexcused tardiness is subject to the same ramifications as unexcused absences; minutes will be converted into school days.

Physical Science Grading Policy:

GRADING SYSTEM

A 90-100
B 80-89
C 70-79
D 65-69
F 64 & Below

HOMEWORK/MAKE-UP WORK

The homework and make-up work philosophy for this course is in accordance with the Milton Middle School Parent and Student Handbook.

Course Content Schedule

Week	Unit Title	Focus/Concept(s)	Unit Essential Question(s)	Related Academic Standards	Assignment/Artifact	Method(s) of Evaluation
1 - 6	Nature of Science	Scientific Method • • Lab Safety • • Science Skills • Measurement Graphing	How is science inquiry used to gather information and solve problems?	S8.A.1.1.1 S8.A.1.1.2 S8.A.1.1.3 S8.A.1.1.4 S8.A.1.2.1 S8.A.1.3.1 S8.A.1.3.3 S8.A.2.1.1 S8.A.2.1.2 S8.A.2.1.3 S8.A.2.1.4 S8.A.2.1.5 S8.A.2.1.6 S8.A.2.2.1 S8.A.2.2.2	• Density Dessert Lab • Melt Away Mint Lab • Toilet Paper Lab • Science Skills Lab • Graphing Station Lab	Scientific Method and Lab Safety Quiz Measurement and Graphing Quiz
7 - 8	Properties of Matter	• • Properties of matter Physical and chemical changes	How do we identify matter and how can it change?	S8.C.1.1.2	• Burning Bargain Investigation • Carrot Density Lab • Physical vs. Chemical Changes Lab	Properties of Matter Test

9 - 11	Classifying Matter	• Elements, Compounds, and Mixtures • Mixtures and solutions	How do you identify the classes of matter according to their properties?	S8.C.1.1.1	• Identifying Elements, Compounds, and Mixtures Lab • Investigating Solubility Virtual Lab • Picking Out the Plastic Lab • Types of Mixtures Lab	Classifying Matter Test

12 - 13	States of Matter	• Solids, liquids, gases • Phase change diagrams • Gas laws and pressure • Properties of Water	What are the states (phases) of matter and how does heat change these phases?	S8.C.1.1.2	• Matter Traveling Tasks Review	States of Matter Test
14 - 16	Atomic Structure	• Atomic structure Periodic • table	What is the structure of the atom and how does this affect its reactivity?	S8.C.1.1.1	• Editable Atom Lab Element Advertisement • Project Atomic Structure • Escape Room Periodic Table • Battleship Proton, Neutron, Electron Bingo	Atomic Structure and Periodic Table Test

17 - 19	Chemical Reactions	• Chemical Reactions • Chemical Equations • Acid/bases	How do elements and compounds interact (react)?	S8.A.1.3.2 S8.C.1.1.3	• Acid and Bases Lab White Before your • Eyes Lab Energy Experiments (Exothermic vs. • Endothermic) Balanced Act (Balanced vs Unbalanced)	Chemical Reactions Test
20 - 22	Energy	• Nonrenewable/renewable • Kinetic/Potential • Energy Transformation • Heat	What are the major forms (types) of energy?	S8.A.1.2.1 S8.C.2.1.1 S8.C.2.1.2 S8.C.2.1.3 S8.C.2.2.1 S8.C.2.2.2 S8.C.2.2.3	• Popcorn Lab (Heat Transfer) • Rollin' KE and PE lab • Energy Transformation Lab	Energy Test
23 - 25	Forces and Motion	• Forces • Special forces • Motion	What is the relationship between force and motion?	S8.A.1.2.3 S8.C.3.1.1 S8.C.3.1.2 S8.C.3.1.3	• Forces and Motion Traveling Task Review	Forces and Motion Test
		• Newton's Laws of Motion			• Mathematical Motion Lab • Net Force Escape Room	
26 - 27	Work and Simple Machines	• Simple Machines • Work/power	How do simple machines make work easier?	S8.A.1.3.1 S8.A.2.1.6 S8.A.2.2.3 S8.A.3.2.2 S8.C.3.1.3	• Identifying Simple Machines Lab • Pulley Lab	Simple Machines Test

28 - 29	Sound and Light	• Properties of Waves • Sound as Waves • Light as Waves	How do you describe and measure the motion of sound waves?	S8.C.2.1.1	• Sound and Light PowerPoint Presentations	Sound and Light Test

Appendix A

Student and Teacher Roles with a Defined Focus on Literacy Students

will:

1. **Work independently in their learning to:**

• Comprehend and evaluate complex situations, be a critical consumer of ***Physical Science*** text, produce; research and gather evidence, communicate effectively, listen actively to engage in a range of conversations, to analyze and synthesize idea and positions, and to evaluate accuracy in order to learn, reflect, and respond.

2. **Construct content-meaning for self-efficacy and the efficacy all learners:**

• Build personal engagement in ***Physical Science*** literacy (RWSL), take and share power for learning, self-assess, monitor and reflect on. Set goals for extending math skills, use text-based evidence to establish clear relationships among claims, explore ***Physical Science*** concepts beyond the classroom and search to discover global perspectives

3. **Develop a Classroom Learning Community of respectful collaborative, collective dynamics:**

- Contribute and collaborate in a community of ***Physical Science*** learners, provide multiple perspectives to solve problems toward shared understanding, value, represent, and respect diverse opinions and perspectives.
- Tasks or assignments are completed on time in support of a shared responsibility
- Self-monitoring for preparation and understanding is encouraged to promote contribution and respect for equity of time

4. **Participate in the assessment process:**

- Set goals and self-monitoring their progress with an expectation for fulfilling assessment requirements
- Produce and complete tasks and assignments according to the parameters and expectations of the learning process and the instructor's timeline.
- Seek help in understanding and clarifying confusions is an expectation to foster student independence and confidence as a life-long learner.

5. **Use of technology to support their learning:**

- Explore creative and innovative uses of technology to enhance and express their learning.
- Participate as a 21st Century student to make connections to the global learning environment
- Use and evaluate research available resources for validity and reliability

Instructor will:

1. **Conduct the learning environment that promotes a student-centered community of learners.**

- Conceptualizes instruction to include students as part of the learning community; students formally collaborate on important learning tasks
- Share learning experience to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming
- Set up the learning environment and experiences for valuing diversity, multiple perspectives, and strengths of the student.
- Foster and encourage development of new ideas and understanding in conversations and work with others
- Arrange groups to support collaboration and inquiry; students work independently, in pairs, in small groups and as a class dependent on the task.

2. **Represent themselves as a facilitator, a guide for learning, a co-learner, or as an investigator.**

- Engage in negotiation, stimulates and monitors discussion and project work but does not control
- Help students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options
- Considers themselves as self- learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals

3. **Design the instructional model and learning context driven by standards and researched-based best practices.**

- Identify the specific PACCS standards addressed in all lessons and units**.**
- Provide students with an understanding of PACCS standard guiding the instruction and the relationship to the student learning goals.

4. **Develop authentic tasks to engage all learners with relevance to transfer knowledge to outside world situations**.

- Pertains to real world, meaningful intellectual work; may be addressed to personal interest
- Challenge and engage students with tasks with different levels of difficulty, enough to be interesting but not totally frustrating, and sustainable.

• Involves integrating disciplines to solve problems and address issues in context
• Engage students with rigorous course content to prepare them for College and Career readiness.
• Construct processes that engage students through cognitive application as an intentional principle of instruction.

5. Motivate and intentionally organize classroom instructional structure.

• Direct students to set goals, self-assess their progress to produce quality products and determine next steps
• Integrate the Literacy skills of Reading, Writing, Speaking and Listening that is discipline specific
• Activate and develop students' repertoire of thinking/learning strategies for changeable and complex knowledge building**.**
• Promote intrinsic learning with a passion for exploring and solving problems.
• Use data-driven instruction to plan for individual and group learning situations.

6. Assess students with a multitude and variety of formative, performance-based, generative, and summative assessments to address the needs and levels of all learners.

• Create assessments with meaning for the learner to produce product, performance, or service
• Make assessments transparent and integral to instruction; students learn during/through challenging meaningful activities • Evaluate students fairly and equitably based upon student individual needs and achievement level.
• Use the most appropriate and effective technology available to enhance tasks and the evidence on learning

7. Utilized discipline-specific digital literacy and processes to engage and connect students in furthering 21st century teaching and learning.

• Use the most appropriate and effective technology available to allow for interaction by communicating and collaborating in diverse ways • Use the most appropriate and effective technology available to access simulations, goals-based learning and real-world productivity tools.
• Use the most appropriate and effective technology available to complete and access task, locate data, and learning opportunities that stimulate thought and inquiry.
• Build awareness of and where possible, access media technologies to keep pace with the ever-changing technological devices to further educational possibilities.

Appendix B
Engaged Learning Framework for Course Content Reflection and Review

Indicators of Engaged Learning		Indicator Definition
Evaluation		
Tasks	• Authentic • Challenging • Multidisciplinary	• Pertains to real world, meaningful intellectual work; may be addressed to personal interest • Difficult enough to be interesting but not totally frustrating, usually sustained • Involves integrating disciplines to solve problems and address issues in context
Assessment	• Performance-based • Generative • Seamless and ongoing • Equitable	• Involving a performance or demonstration, usually for a 'real' audience and addressing a useful purpose • Assessments having meaning for learner; may produce information, product, service • Assessment is transparent and integral; students learn during/through challenging and meaningful activities • Assessment is culture fair
Process		
Instructional Model	• Interactive • Generative	• Instruction actively engages learners through meaningful context and construction of knowledge; encourages, supports and responds to student contributions, needs, requests for clarification, etc. • Instruction oriented to constructing meaning; providing meaningful activities/experiences
Learning Context	• Collaborative • Knowledge-building • Empathetic	• Instruction conceptualizes students as part of learning community; students formally collaborate on important learning tasks • Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming • Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths
Grouping	• Heterogeneous • Equitable • Flexible/agile	• Small groups with persons with different skill sets, backgrounds, interests • Groups sized and organized so that over time all students have challenging learning tasks/experiences • Different groups organized for different instructional purposes; supports collaboration across multiple contributors
Roles		
Instructor Role	• Facilitator • Guide	• Engages in negotiation, stimulates and monitors discussion and project work but does not control • Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options • Instructor considers self as learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals

	• Co-learner/coinvestigator	
Student Role	• Explorer • Cognitive Apprentice • Teacher • Producer	• Students have opportunities to explore new ideas/tools; push the envelope in ideas and research • Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research) • Students encouraged to teach others in formal and informal contexts • Students develop products of real use to themselves and others; demonstrated learning
Resources		
Technology	• Interconnectivity • Access to challenging tasks • Enables learning by doing • Media Use	• Technology allows interaction by communicating and collaborating in diverse ways • Technology offers or allows access to tasks, data, and learning opportunities that stimulate thought and inquiry • Technology offers access to simulations, goals-based learning, and real-world problems and productivity tools • Technology provides opportunities to use media technologies