

# **DARIEN PUBLIC SCHOOLS**

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## **CURRICULUM GUIDE**

### **8<sup>th</sup> Grade Science**

# **DARIEN PUBLIC SCHOOLS**

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**SECTION I - Course Information**

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## **STATEMENT OF PHILOSOPHY**

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### MMS Science Department Philosophy:

Our middle school science program is based on a framework of scientific inquiry, exploration, and application of learned content. Using state standards as a guide, students across all grades will be expected to conduct hands-on experiments, collect and analyze data, and use correct scientific language in formulating conclusions. Learning will be enhanced by readings, current events, writing, class discussions, proper note-taking, use of technology, and special projects.

## PROGRAM GOALS

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In alignment with the **Core Science Curriculum Framework**, students will “develop basic *explanations* for natural phenomena, and the ability to ask good questions and apply experimental procedures to collect and analyze data.” In addition, with the consideration of all learning needs, our students will continue to develop as scientifically literate individuals.

Scientific literacy “requires that a person have an essential understanding of key science ideas, along with a fluency in the language and terms used to describe them. Scientific literacy requires the ability to apply critical thinking skills when dealing with science-related issues. A scientifically literate person is able to transfer knowledge of the academic theories and principles of science to practical applications in the real world” (State of Connecticut Science Curriculum Framework).

## **OVERVIEW**

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This program is designed to meet all the needs of the students enrolled at MMS. The aim is to promote and integrate scientific inquiry, literacy, and numeracy throughout the middle school experience.

### 6<sup>th</sup> Grade:

- Introduction to Scientific Method
- Structure and Function of Organisms
- Heredity and Evolution
- Science & Technology: Technology Used to Improve Food Production and Preservation
- Properties of Matter

### 7<sup>th</sup> Grade:

- The Changing Earth: Earthquakes, Volcanoes, Glaciation, Weathering, and Erosion
- Abiotic Factors Influencing Long Island Sound: Temperature, Wind and Water
- Biotic Factors Influencing Long Island Sound: Food Webs and Photosynthesis
- Science & Technology: Human Impact on Long Island Sound

### 8<sup>th</sup> Grade:

- Motion, Forces and Energy
- Earth in the Solar System
- Electricity and Magnetism
- Science Exhibition Project
- Science & Technology: Space Exploration and Bridge Technology

## **ESSENTIAL QUESTIONS**

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- How do forces interact with each other and with matter?
- How does the position of Earth in the solar system affect the conditions on our planet?
- What is the role of energy in our world?
- How do science and technology affect the quality of our lives?
- How is scientific knowledge created and communicated?

## **PROCESS SKILLS**

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All of the following skills will help continue to develop a scientifically literate individual:

- Reading (Comprehending)
- Reading (Analyzing)
- Writing and Language Mechanics
- Speaking
- Listening
- Viewing
- Using Maps and Globes
- Studying
- Reasoning and Reflecting
- Using Learning Resources and Technology
- Working Independently and Collaboratively
- Inventing
- Designing
- Creating
- Debating
- Performing
- Quantifying
- Understanding Number Operations
- Using Formulas
- Problem Solving
- Graphing
- Data Analysis
- Applying Probability and Statistics
- Applying Scientific Method

## **STUDENT PERFORMANCE SUMMARY**

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- ◆ Narrative, Expository or Persuasive Essay/Short Answer, Letter or Article
- ◆ Research Report
- ◆ Lab Report
- ◆ Demonstration
- ◆ Oral Presentation with Visuals (story board, overhead transparencies, PowerPoint, whiteboard, LCD projector, Internet site, etc.)
- ◆ Notebook
- ◆ Model with Written Explanation
- ◆ Debate
- ◆ Exhibition
- ◆ Cooperative Learning
- ◆ Computer-Based Lab Work
- ◆ Foldable (graphic organizers)

## **GRADING GUIDELINES**

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Grades are determined based on the number of points earned divided by the possible points. The number of tests, quizzes or projects varies each quarter. Each grade has a numerical value, which is totaled at the end of the quarter. Listed below are typical point values for each type of assessment:

<b>Type of Assessment</b>	<b>Point Value</b>	<b>Assessment Definition</b>
Written Work	5-20 points	Class activities & homework
Notebook	5-30 points	Organizing and maintaining all written work
Labs	25–75 points	Based on Lab Report Format
Tests	100 points	Various formats
Quizzes	10-50 points	Various formats
Projects	10-200 points	Various formats
Final Assessment	100-200 points	Performance tasks, written responses and selected responses

### **Class Participation**

There is not a separate participation grade. Participation is reflected in the successful completion of tasks, labs and activities during class time. Students who do not finish labs or activities in class should promptly ask for an appointment outside of class time. The lab set-up will be disassembled within a few days. It is essential that students complete the labs, as these skills cannot be acquired through homework. The lab and activity grades can include participation, proper use of the facilities, equipment and clean-up.

### **Extra Credit**

Extra Credit is not available.

**SECTION II – Units of Study**

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## **SUMMARY OF UNITS**

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<b><u>Unit Title</u></b>	<b><u>Duration (Weeks)</u></b>
Unit 1: Motion, Forces and Energy	15 weeks
Unit 2: Earth in the Solar System	12 weeks
Unit 3: Electricity and Magnetism	12 weeks
Unit 4: Science Exhibition Project	(5 weeks woven into unit 3)
(Final Assessment)	(1 week)

## **UNIT 1 Motion, Forces and Energy**

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How do forces interact with each other and with matter?

- How can position, direction of motion and speed describe the motion of an object?
- How do unbalanced forces affect the motion of an object?
- How do forces affect objects moving in a circular path?
- How does the application of force affect the work on an object?
- How can energy be stored and transformed into the energy of motion?

How do science and technology affect the quality of our lives?

- How can bridges be designed to withstand certain loads and potentially destructive forces?

### **RELATED DARIEN AND CONNECTICUT STANDARDS**

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**8.1 An object's inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.**

- ◆ The motion of an object can be described by its position, direction of motion and its speed.
- ◆ An unbalanced force acting on an object changes its speed or direction of motion, or both.
- ◆ Objects moving in circles must experience force acting toward the center.
- ◆ Work is the process of making objects move through the application of force.
- ◆ Energy can be stored in many forms and can be transformed into the energy of motion.

**C 22.** Calculate average speed of a moving object and illustrate the motion of objects in graphs of distance over time.

**C 23.** Describe the qualitative relationships among force, mass and changes in motion.

**C 24.** Describe the forces acting on an object moving in a circular path.

**8.4 Science and technology affect the quality of our lives.**

- ◆ In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.
- ◆ Bridges can be designed in different ways to withstand certain loads and potentially destructive forces

**C 30.** Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.

### **CONTENT KNOWLEDGE OBJECTIVES**

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#### **Initial Understanding**

**Discuss** how motion can be described by position, direction, and speed.

**Recognize** whether an object is moving relative to a reference point.

#### **Developing an Interpretation**

**Explain** how the choice of a reference point can determine how the motion of an object is measured.

## Making Connections

**Calculate** average speed of a moving object and illustrate the motion of objects in graphs of distance over time.

**Describe** the qualitative relationships among force, mass and changes in motion.

**Describe** the forces acting on an object moving in a circular path.

**Explain** relationship between force, distance and work; use the relationship ( $W=F \times D$ ) to calculate work done in lifting heavy objects.

**Explain** how simple machines such as inclined planes, pulleys and levers are used to create mechanical advantage.

**Describe** how different types of stored (potential) energy are used to move objects.

**Explain** how beam, truss and suspension bridges are designed to withstand the forces that act on them.

## Taking a Critical Stance

**Take a position** on the following question, and support your position with evidence:  
Is this object moving?

**Research and defend** a choice of which type of bridge would be best suited for a particular purpose based on terrain, cost and usage. (Build a model)

## VOCABULARY

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Acceleration	Gravity
Actual/ideal mechanical advantage	Inclined plane
Air resistance	Inertia
Arch	Input force
Balanced force	Joule
Beam	Kinetic energy
Cable stayed	Law of conservation of energy
Centripetal force	Law of conservation of momentum
Compound machine	Lever
Compression force	Load
Efficiency	Machine
Elastic potential energy	Mass
Energy	Mechanical advantage
Energy conversion	Meter
Fluid friction	Metric system
Force	Momentum
Freefall	Motion
Friction	Net force
Fulcrum	Newton
Gears	Output force
Gravitational potential energy	Potential energy

Projectile  
Pulley  
Reaction force  
Reference point  
Rolling friction  
Satellite  
Screw  
Sliding friction  
Speed  
Suspension

Tension force  
Terminal velocity  
Truss  
Unbalanced force  
Velocity  
Wedge  
Weight  
Wheel and axle  
Work

## **ACTIVITIES**

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*Teachers will assure each of the following experience for students.*

Calculating Speed  
Designing a Rollercoaster  
Newton's 1<sup>st</sup> Law of Motion  
Newton's 2<sup>nd</sup> Law of Motion  
Newton's 3<sup>rd</sup> Law of Motion  
Momentum demonstrations and activities  
Centripetal Force demonstration  
Acceleration Lab  
Air Resistance demonstration  
Potential and Kinetic Energy demonstrations  
Simple machines lab  
Bridge Building Activity  
Final Unit Assessment: Motion, Forces and Energy Lab

*\*Activities will be revised and updated as needed.*

## **ASSESSMENT**

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Homework  
Quizzes  
Tests  
Lab reports  
Class activities  
Class discussions  
Special projects  
Group projects  
Performance assessments

## **CAREER AWARENESS**

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Mechanical/Civil Engineer  
Vehicle/rollercoaster designers  
Sports professionals  
Construction/Land Development  
Mechanics  
Artist/sculptor  
Movers  
Pilot  
Architect

## **CORE TEXT FOR STUDENTS**

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Science Explorer: Motion, Forces, and Energy. Prentice Hall, 2000.

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS (optional)**

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### **Print Materials**

Exploring Motion and Forces: Speed, Acceleration, and Friction. Watertown, MA: Charlesbridge Publishing, 2000.

Eyewitness: Energy. New York: Doring Kindersley, 1993.

Eyewitness: Invention. New York: Alfred A. Knopf, 1991.

McCauley, David. How Things Work. Boston: Houghton Mifflin Co., 1988.

Simmons, Ron. Discover!: Work and Machines. St. Louis: Milliken Publishing Company, 2000.

### **Websites:**

Teacher resources

<http://www.brainpop.com/science/seeall/>

Physics tutorial online

<http://physicsclassroom.com>

Online sources for review and self quizzes

<http://www.bbc.co.uk/schools/gcsebitesize/physics/index.shtml>

Principles of aeronautics

[http://wings.avkids.com/Curriculums/Forces\\_Motion/](http://wings.avkids.com/Curriculums/Forces_Motion/)

Interactive simple machines

<http://www.edheads.org/activities/simple-machines/index.htm>

Work and energy animations

<http://www.physicsclassroom.com/mmedia/energy/energyTOC.html>

Interactive mobile-making

<http://www.vectorpark.com/Levers.html>

Lever classification

<http://www.enchantedlearning.com/physics/machines/Levers.shtml>

Lever classification (mnemonic devices)

<http://www.usoe.k12.ut.us/curr/science/sciber00/8th/machines/sciber/machine5.htm>

Work and energy

<http://hyperphysics.phy-astr.gsu.edu/hbase/work.html>

How roller coasters work

<http://science.howstuffworks.com/roller-coaster1.htm>

Video: “Medieval Siege: Trebuchet Catapults”. NOVA, 2000.

Video: “Super Bridge,” NOVA/WGBH (PBS), 2004.

Video: “Roller Coaster!” NOVA/WGBH (PBS), 1993.

## **MATERIALS AND SUPPLIES**

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Acceleration lab kit	Newton cars
Alka Seltzer tablets	Newton clackers
Balls and marbles of various weights and sizes	Newton poppers
Cardboard	Paper clips
Cardboard Levers	Paper cups
Coins	Pasta (or bridge building set, if possible)
Electrical tape	Plastic cups
Electronic balances	Plastic tracks
Fulcrums	Print material such as newspapers and magazines
Gears	Projectile motion apparatus
Glue	Pulleys
Graph paper	Ring stands
Hall’s carriages	Rollercoaster foam tubing
Hollow foam tubing	Rubber bands
Hot wheels cars	Sand paper (coarse and fine)
Inclined planes	Scissors
Internet access	Spring scales
Marbles	Stop watches
Markers	Straws
Masking tape	String
Mass sets	Washers
Meter sticks	Wax paper
Metric rulers	
Wheels and axles	
Wire hangers	
Wooden blocks	
Wooden dowels	

## **INTEGRATED TECHNOLOGY**

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Use of internet to research and for interactive demonstrations  
Word processing programs  
Graphing spreadsheet program  
Electronic balances  
Digital camera

## **UNIT 2: Earth and the Solar System (Full unit begins 2006-2007)**

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How does the position of Earth in the solar system affect the conditions on our planet?

- How does gravity affect the motion of objects in the solar system?
- Why does the motion of the Earth and moon relative to the sun cause daily, monthly and yearly cycles on Earth?

How do science and technology affect the quality of our lives?

- How can the field of space exploration affect our lives?

### **RELATED GOALS AND STANDARDS**

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#### **8.3 The solar system is composed of planets and other objects that orbit the sun.**

- ◆ Gravity is the force that governs the motions of objects in the solar system.
- ◆ The motion of the Earth and Moon relative to the sun causes daily, monthly and yearly cycles on Earth.

**C 28.** Explain the effect of gravity on the orbital movement of planets in the solar system.

**C 29.** Explain how the regular motion of the Sun, Earth and Moon explains the seasons, phases of the moon and eclipses.

#### **8.4 Science and technology affect the quality of our lives.**

- ◆ New technology and discovery are paramount in the field of Space Exploration.

### **CONTENT KNOWLEDGE OBJECTIVES**

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#### **Initial Understanding**

**Understand** how the calendar was created based on repeated cycles.

**Understand** and diagram the phases of the moon.

**Diagram** the relative positions of the moon, Earth and Sun in each type of eclipse.

**Understand** the cause of changing tides.

**Understand** the effects of gravity in our solar system.

#### **Developing an Interpretation**

**Explain** the effect of gravity on the orbital movement of planets in the solar system.

**Explain** the effects of planetary tilt, rotation and revolution.

#### **Making Connections**

**Explore** the latest technology and discoveries made in the field of Space Exploration.

**Explain** how the regular motion of the Sun, Earth and Moon results in the seasons, phases of the moon, eclipses and tides.

**Demonstrate** how the relative positions of the moon, Earth and Sun create phases of the moon as observed from Earth.

#### **Taking a Critical Stance**

Based on fictional planetary data, **choose/defend** which planet would be best to support life.

## VOCABULARY

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Asteroid	Nuclear fusion
Asteroid belt	Orbit
Astronomy	Penumbra
Axis	Phase
Chromosphere	Photosphere
Comet	Prominence
Corona	Quarter
Crescent	Retrograde rotation
Eclipse	Revolution
Ellipse	Rotation
Equinox	Satellite
Extraterrestrial life	Solar eclipse
Full moon	Solar flares
Gas giant	Solar wind
Geocentric	Solstice
Geosynchronous orbit	Space Shuttle
Gibbous	Space Station
Gravity	Spacesuit
Heliocentric	Spring tide
Inertia	Sun
Latitude	Sunspot
Lunar eclipse	Telescope
Maria	Terrestrial planets
Meteor	Tide
Meteoroid	Umbra
Moon	Vernal/autumnal equinox
Neap tide	Waning
New moon	Waxing

## ACTIVITIES

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*Teachers will assure the following experiences for students.*

Phases of the moon

Seasons

Day/Night

Sun Observations

Constructing scale models

Planet project

Final Unit Assessment: Astronomy Lab

*\*Activities will be revised and updated as needed.*

## ASSESSMENT

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Homework

Quizzes

Tests

Lab reports

Class activities

Class discussions

Special or group projects

Performance assessments

## **CAREER AWARENESS**

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Astronomy  
Space technology/engineer (NASA)  
Astronaut  
Astrophysicist  
NOAA

## **CORE TEXT FOR STUDENTS**

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Science Explorer: Astronomy. Prentice Hall, 2000.

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS (optional)**

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Current space events  
<http://www.nasa.gov/>

Space vocabulary  
<http://www.geocities.com/pngplanetarium/spacevocabulary.htm>

Solar system viewer (simulator)  
<http://space.jpl.nasa.gov/>

Virtual solar system:  
<http://www.nationalgeographic.com/solarsystem/splash.html>

Circular motion and planetary motion:  
<http://www.physicsclassroom.com/Class/circles/circtoc.html>

Video: “The Greatest Show in Space”. Quebec: Madacy Entertainment Group, 1995.

Video: “Cosmos” with Carl Sagan. Cosmos Studios, 2000.

Video: “Space Explorers”. NOVA/WGBH, 1999.

Video: “Toys in Space”. NASA, 1994.

Video: “Welcome to Mars”. NOVA/WGBH, 2005.

Video: “Mars: Dead or Alive”. NOVA/WGBH, 2004.

## **MATERIALS AND SUPPLIES**

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Batteries	Lamp/light bulbs
Markers	Plaster
Flashlights	Protractors
Foam balls (different sizes)	Straws
Globes	Wooden dowels

## **INTEGRATED TECHNOLOGY**

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Use of internet for research and interactive demonstrations  
Word processing programs  
Graphing spreadsheet program  
Simulated demonstrations

## UNIT 3: Electricity and Magnetism

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What is the role of energy in our world?

- How do moving electrical charges produce magnetic forces?
- How do moving magnets produce electrical force?
- How do moving electrons produce light?

### RELATED GOALS AND STANDARDS

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#### 9.2 The electrical force is a universal force that exists between any two charged objects.

- ◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.
  - ◆ Electrical current can be transformed into light through the excitation of electrons.
- D 4.** Explain the relationship among voltage, current, and resistance in a simple series circuit.
- D 5.** Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.
- D 6.** Describe the relationship between current and magnetism.
- D 7.** Explain how heat is used to generate electricity.

### CONTENT KNOWLEDGE OBJECTIVES

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#### Initial Understanding

**Discuss** how electricity is made of electrons.

**Describe** how magnets interact with matter.

#### Developing an Interpretation

**Describe** how a compass reacts to magnetism and an electrical current running through a nearby wire.

**Illustrate** and explain how static electricity can be generated.

**Explain** how electrons flow in electrochemical cells.

#### Making Connections

**Explain** how heat is used to generate electricity.

**Describe** the relationship between current and magnetism.

**Explain** how electricity is used to produce heat and light in incandescent bulbs and heating elements.

**Explain** the relationship among voltage, current and resistance in a simple series circuit (Ohm's Law).

#### Taking a Critical Stance

**Compare and contrast** electrical charges and magnetic poles.

**Research** various means of generating electricity. **Develop an argument** for and against a chosen energy resource.

Project: Keep a log of all activities in a single day in a life **without** electricity. **Defend** the use of parallel circuitry in a house.

## **VOCABULARY**

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Ammeter	Magnetic pole
Atom	Magnetism
Conductor	Mechanical energy
Electric charge	Nonrenewable resource
Electric circuit	Nucleus
Electric current	Ohm's Law
Electric generator	Parallel circuit
Electric motor	Power
Electrical energy	Proton
Electromagnet	Renewable resource
Electron	Resistance
Element	Resistor
Energy	Series circuit
Galvanometer	Solenoid
Insulator	Turbine
Magnetic field	Voltage
Magnetic field lines	Voltmeter

## **ACTIVITIES**

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*Teachers will assure the following experiences for all students.*

Common characteristics of magnets

Making magnets/breaking magnets

Building an electromagnet

Building a series circuit

Building a parallel circuit

Building an electromagnetic motor (dissecting an electric motor)

Exploring and debating energy sources

A day without electricity

Final Unit Assessment: Electricity and Magnetism Lab

*\*Activities will be revised and updated as needed.*

## **ASSESSMENT**

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Homework

Quiz

Tests

Class discussions

Special projects

Group projects

Performance assessments:

## **CAREER AWARENESS**

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Electrician

Electrical engineer

## **CORE TEXT FOR STUDENTS**

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Science Explorer: Electricity and Magnetism. Prentice Hall, 2002.

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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Currently under development (December 2005)

## **MATERIALS AND SUPPLIES**

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Alligator clips  
Ammeters  
Balloons  
Bar magnets  
Batteries  
Battery holders  
Bulb holders  
Disc magnets  
Feathers  
Flashlight bulbs  
Fur  
Galvanometers  
Hand-crank generator  
Masking tape  
Neodymium magnets  
Plastic rods  
Silk  
Small compasses  
Styrofoam pellets  
Switches  
Voltmeters  
Wire (insulated, non-insulated, various gauges/resistances)

## **INTEGRATED TECHNOLOGY**

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Use of internet for research and interactive demonstrations  
Word processing programs  
Graphing spreadsheet program

## UNIT 4: Science Exhibition Project

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How is scientific knowledge created and communicated?

- ◆ Students will implement the scientific method to conduct an individual (unique) scientific inquiry.

### RELATED GOALS AND STANDARDS

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#### SCIENTIFIC INQUIRY

- ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- ◆ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.
- ◆ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.

#### SCIENTIFIC LITERACY

- ◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.
- ◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.

#### SCIENTIFIC NUMERACY

- ◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.

### CONTENT KNOWLEDGE/PERFORMANCE OBJECTIVES (as suggested by the CT State Framework)

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#### Initial Understanding

C INQ 1. **Identify** questions that can be answered through scientific investigation.

#### Developing an Interpretation

C INQ 2. **Read, interpret** and **examine** the credibility of scientific claims in different sources of information.

#### Making Connections

C INQ 3. **Design** and conduct appropriate types of scientific investigations to answer different questions.

C INQ 4. **Identify** independent and dependent variables, and those variables that are kept constant, when designing an experiment.

C INQ 5. Use appropriate tools and techniques to **make observations** and **gather data**.

C INQ 6. Use mathematical operations to **analyze** and **interpret** data.

C INQ 7. **Identify** and **present** relationships between variables in appropriate graphs.

## Taking a Critical Stance

C INQ 8. **Draw conclusions** and **identify** sources of error.

C INQ 9. **Provide explanations** to investigated problems or questions.

C INQ 10. **Communicate** about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.

**Defend** the findings of an individual scientific inquiry.

**Extend** application of knowledge to other content areas or new situations.

## VOCABULARY

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Analysis	Independent variable
Application to real world	Interpolate
Chart	Introduction
Conclusion	Materials
Data Collection	Measurement
Data Table	Problem
Dependent variable	Procedure
Discussion	Qualitative
Experimental Plan	Quantitative
Extrapolate	References
Further Investigations	Scientific Error
Graph	Trial
Hypothesis	Units

## ACTIVITIES

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All labs throughout the year will be conducted using this format.

Culminating Science Exhibition project

## ASSESSMENT

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Homework

Quizzes

Tests

Labs

Class activities

Class discussions

Special projects

Group projects

Performance assessments

Final Exhibition Project

## **CAREER AWARENESS**

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Laboratory Scientist

Many different fields of interest will be addressed by individual projects

## **CORE TEXT FOR STUDENTS**

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Middlesex Middle School Science Lab Format Sheet (no textbook provided)

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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These resources vary depending on a student's individual topic of study but can include internet resources, print materials such as *Scientific American*, *Popular Science*, and different encyclopedias. The MMS library sets aside all books relevant to students' topics of study, books about experiments and provides access to several online databases for other print sources.

## **MATERIALS AND SUPPLIES**

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Examples of prior student work

Students purchase many of the materials needed for individual projects on their own.

All classroom lab equipment and teacher resources

## **INTEGRATED TECHNOLOGY**

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Use of internet for research and interactive demonstrations

Word processing programs

Organization of data tables and graphing using spreadsheet program (Excel)

**SECTION III - Goals and Standards**

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# **Core Science Curriculum Framework**

An Invitation for Students and Teachers  
to Explore Science and Its Role in Society

# Content Standards and Expected Performances

## Core Science for Grades 6-8



**THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.**

**Grades 6-8 Core Scientific Inquiry, Literacy and Numeracy**

*How is scientific knowledge created and communicated?*

Content Standards	Expected Performances
<p><b>SCIENTIFIC INQUIRY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>◆ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>◆ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>SCIENTIFIC LITERACY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.</li> <li>◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>SCIENTIFIC NUMERACY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	<p><b>C INQ.1</b> Identify questions that can be answered through scientific investigation.</p> <p><b>C INQ.2</b> Read, interpret and examine the credibility of scientific claims in different sources of information.</p> <p><b>C INQ.3</b> Design and conduct appropriate types of scientific investigations to answer different questions.</p> <p><b>C INQ.4</b> Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment.</p> <p><b>C INQ.5</b> Use appropriate tools and techniques to make observations and gather data.</p> <p><b>C INQ.6</b> Use mathematical operations to analyze and interpret data.</p> <p><b>C INQ.7</b> Identify and present relationships between variables in appropriate graphs.</p> <p><b>C INQ.8</b> Draw conclusions and identify sources of error.</p> <p><b>C INQ.9</b> Provide explanations to investigated problems or questions.</p> <p><b>C INQ.10</b> Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>

## Grade 6

Content Standards	Expected Performances
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p><b>7.2 Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.</b></p> <ul style="list-style-type: none"> <li>◆ All organisms are made up of one or more cells; each functions more or less independently.</li> <li>◆ Multicellular organisms need specialized structures and systems to perform basic life functions.</li> </ul>	<p><b>MMS: ***Introduction to Scientific Method***</b></p> <p><b>C 15.</b> Describe the basic structures of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.</p> <p><b>C 16.</b> Describe the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.</p> <p><b>C 17.</b> Explain how the human muscular/skeletal system supports the body and allows movement.</p>
<p><i>Heredity and Evolution – What are the processes responsible for life’s unity and diversity?</i></p> <p><b>8.2 Reproduction is a characteristic of living systems and it is essential for the continuation of every species.</b></p> <ul style="list-style-type: none"> <li>◆ Heredity is the passage of instructions specifying traits from one generation to another.</li> <li>◆ Some characteristics of an organism are inherited and some result from interactions w/ environment.</li> </ul>	<p><b>C 25.</b> Explain the similarities and differences in cell division in somatic and germ cells.</p> <p><b>C 26.</b> Describe the structure and function of the male and female human reproduction system, including the process of egg and sperm production.</p> <p><b>C 27.</b> Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>7.4 Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.</b></p> <ul style="list-style-type: none"> <li>◆ Methods have been developed to prevent food spoilage caused by bacteria.</li> </ul>	<p><b>C 21.</b> Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by bacteria.</p>
<p><i>Properties of Matter - How does the structure of matter affect the properties and uses of materials?</i></p> <p><b>6.1 Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.</b></p> <ul style="list-style-type: none"> <li>◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated using a variety of physical means.</li> <li>◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means.</li> </ul>	<p><b>C 1.</b> Describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.</p> <p><b>C 2.</b> Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.</p> <p><b>C 3.</b> Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.</p>

## Grade 7

Content Standards	Expected Performances
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p><b>7.3 Landforms are the result of the interaction of constructive and destructive forces over time.</b></p> <ul style="list-style-type: none"> <li>◆ Volcanic activity and the folding and faulting of rock layers during the shifting of Earth's crust affect the formation of mountains, ridges and valleys.</li> <li>◆ Glaciation, weathering and erosion change the Earth's surface by moving materials from place to place.</li> </ul>	<p><b>C 18.</b> Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.</p> <p><b>C 19.</b> Explain how glaciation, weathering and erosion create and shape valleys and floodplains.</p> <p><b>C 20.</b> Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.</p>
<p><i>Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?</i></p> <p><b>6.2 An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.</b></p> <ul style="list-style-type: none"> <li>◆ Populations in ecosystems are affected by biotic factors such as other populations and abiotic factors such as soil and water supply.</li> <li>◆ Populations in ecosystems can be categorized as producers/consumers/decomposers of organic material.</li> </ul>	<p><b>C 4.</b> Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis.</p> <p><b>C 5.</b> Explain how populations are affected by predator-prey relationships.</p> <p><b>C 6.</b> Describe common food webs in different Connecticut ecosystems.</p>
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p><b>6.3 Variation in the amount of the sun's energy hitting the Earth's surface affects daily and seasonal weather patterns.</b></p> <ul style="list-style-type: none"> <li>◆ Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water.</li> </ul>	<p><b>C 7.</b> Describe the effect of heating on the movement of molecules in solids, liquids and gases.</p> <p><b>C 8.</b> Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.</p> <p><b>C 9.</b> Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>6.4 Water moving across and through earth materials carries with it the products of human activities.</b></p> <ul style="list-style-type: none"> <li>◆ Most precipitation that falls on Connecticut eventually reaches Long Island Sound.</li> </ul>	<p><b>C 10.</b> Explain the role of septic and sewage systems on the quality of surface and ground water sources.</p> <p><b>C 11.</b> Explain how human activity may impact water resources in Connecticut such as local ponds, rivers and the Long Island Sound ecosystem.</p>
<p>Added from standards for Grades 9:</p> <p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.8 The use of resources by human populations may affect the quality of the environment. Some materials can be recycled, but others accumulate in environments and may affect the balance of the Earth systems.</b></p> <ul style="list-style-type: none"> <li>◆ Accumulations of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution.</li> <li>◆ New technologies and changes in lifestyles can have positive and/or negative effects on the environment.</li> </ul>	<p><b>D 25.</b> Explain how land development, transportation options, and consumption of resources may affect the environment.</p> <p><b>D 26.</b> Describe human efforts to reduce the consumption of raw materials and improve air and water quality. Explain the short and long term impacts of landfill and incineration of waste materials on the quality of the environment.</p>

## Grade 8

Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p><b>8.1 An object’s inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.</b></p> <ul style="list-style-type: none"> <li>◆ The motion of an object can be described by its position, direction of motion and its speed.</li> <li>◆ An unbalanced force acting on an object changes its speed or direction of motion, or both.</li> <li>◆ Objects moving in circles must experience force acting toward the center.</li> </ul>	<p><b>C 22.</b> Calculate average speed of a moving object and illustrate the motion of objects in graphs of distance over time.</p> <p><b>C 23.</b> Describe the qualitative relationships among force, mass and changes in motion.</p> <p><b>C 24.</b> Describe the forces acting on an object moving in a circular path.</p>
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p><b>7.1 Energy provides the ability to do work and it can exist in many forms.</b></p> <ul style="list-style-type: none"> <li>◆ Work is the process of making objects move through the application of force.</li> <li>◆ Energy can be stored in many forms and can be transformed into the energy of motion.</li> </ul>	<p><b>C 12.</b> Explain relationship between force, distance and work; use the relationship (<math>W=F \times D</math>) to calculate work done in lifting heavy objects.</p> <p><b>C 13.</b> Explain how simple machines such as inclined planes, pulleys and levers are used to create mechanical advantage.</p> <p><b>C 14.</b> Describe how different types of stored (potential) energy are used to move objects.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>8.4 In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.</b></p> <ul style="list-style-type: none"> <li>◆ Bridges can be designed in different ways to withstand certain loads and potentially destructive forces.</li> </ul>	<p><b>C 30.</b> Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.</p>
<p><i>Earth in the Solar System – How does the position of Earth in the solar system affect the conditions on our planet?</i></p> <p><b>8.3 The solar system is composed of planets and other objects that orbit the sun.</b></p> <ul style="list-style-type: none"> <li>◆ Gravity is the force that governs the motions of objects in the solar system.</li> <li>◆ The motion of the Earth and Moon relative to the sun causes daily, monthly and yearly cycles on Earth.</li> </ul>	<p><b>C 28.</b> Explain the effect of gravity on the orbital movement of planets in the solar system.</p> <p><b>C 29.</b> Explain how the regular motion of the Sun, Earth and Moon explains the seasons, phases of the moon and eclipses.</p> <p><b>MMS:</b> Explain the latest technology and discoveries made in the field of Space Exploration.</p>
<p>Added from standards for Grades 9:</p> <p><i>Energy transfer and transformations – What is the role of energy in our world?</i></p> <p><b>9.2 The electrical force is a universal force that exists between any two charged objects.</b></p> <ul style="list-style-type: none"> <li>◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.</li> <li>◆ Electrical current can be transformed into light through the excitation of electrons.</li> </ul>	<p><b>D 4.</b> Explain the relationship among voltage, current, and resistance in a simple series circuit.</p> <p><b>D 5.</b> Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.</p> <p><b>D 6.</b> Describe the relationship between current and magnetism.</p> <p><b>D 7.</b> Explain how heat is used to generate electricity.</p>

**SECTION IV – Learning Resources**

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## **SUPPLEMENTAL RESOURCES**

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Print materials, Internet sites, MMS lab format sheet and a sample lab rubric are included in addition to those listed above for individual units. This information is subject to change as units are more fully developed.

### **Print Materials**

Exploring Motion and Forces: Speed, Acceleration, and Friction. Watertown, MA: Charlesbridge Publishing, 2000.

Exploring the Moon and Stars: Cycles, Phases, and Patterns. Watertown, MA: Charlesbridge Publishing, 2000.

Simmons, Ron. Discover!: Work and Machines. St. Louis, MO: Milliken Publishing Company, 2000.

### **Websites**

Current space events

<http://www.nasa.gov/>

Mars information

<http://www.pbs.org/wgbh/nova/mars/> (\*\*this is a current link as of 8/2005)

The New York Times science section

<http://www.nytimes.com> (online or print)

Interactive simple machines

<http://www.edheads.org/activities/simple-machines/index.htm>

Work and energy animations

<http://www.physicsclassroom.com/mmedia/energy/energyTOC.html>

Potential energy

<http://www.physicsclassroom.com/>

Interactive mobile-making

<http://www.vectorpark.com/Levers.html>

Lever classification

<http://www.enchantedlearning.com/physics/machines/Levers.shtml>

Lever classification (mnemonic devices)

<http://www.usoe.k12.ut.us/curr/science/sciber00/8th/machines/sciber/machine5.htm>

Work and energy

<http://hyperphysics.phy-astr.gsu.edu/hbase/work.html>

How roller coasters work

<http://science.howstuffworks.com/roller-coaster1.htm>

Space vocabulary

<http://www.geocities.com/pngplanetarium/spacevocabulary.htm>

Solar system viewer (simulator)

<http://space.jpl.nasa.gov/>

Virtual solar system

<http://www.nationalgeographic.com/solarsystem/splash.html>

Circular Motion and Planetary Motion

<http://www.physicsclassroom.com/Class/circles/circtoc.html>

Teacher resources

<http://www.brainpop.com/science/seeall/>

Physics tutorial and potential energy

<http://physicsclassroom.com>

Online sources for review and self quizzes

<http://www.bbc.co.uk/schools/gcsebitesize/physics/index.shtml>

Principles of aeronautics

[http://wings.avkids.com/Curriculum/Forces\\_Motion/](http://wings.avkids.com/Curriculum/Forces_Motion/)

## **Special Education Resources**

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Lessons are differentiated for all students based on individual student needs. Specifically for special education students, materials are adapted based on needs as indicated by the Individual Education Plan (IEP).

# Lab Format Sheet

(Keep this sheet in your binder all year!)

Name: \_\_\_\_\_

Period: \_\_\_\_\_ Date: \_\_\_\_\_

Independent Variable (IV)	What you are changing/testing in the experiment (only 1 thing changes!!)
Dependent Variable (DV)	What is being measured – this changes based on the independent variable.

## Problem

- The question your experiment will answer

## Hypothesis

- What do you expect to happen in the experiment
- If Independent Variable then Dependent Variable, because...
- Written in a Statement Form

## Introduction

- Background information you have obtained from literature research (Paragraph Form)

## Experimental Plan

- List of Materials
- List Procedure in numbered steps – Do not use I, we – write in 3<sup>rd</sup> person

## Discussion = Table, Charts & Results

**Title:** The effect of the IV on the DV. (All tables & charts need a title!)

### Table:

Table with one Trial

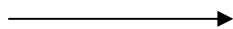
IV (units)	DV (units)

Table with repeated Trials

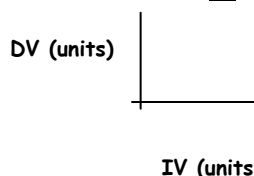
IV (units)	DV (units)			Average DV (units)
	1	2	3	

### Chart:

- Title Chart & Axis
- IV on x-Axis
- DV on y-Axis



The effect of the IV on the DV.



**Results:** A paragraph discussing the results - state information on Table(s) and Chart(s) & discuss trends/patterns of the data

## Conclusion

- Write in complete sentences & in paragraph form
- Do Not use I, me, we – write in the 3<sup>rd</sup> person
- Rephrase the problem as a statement that answers the question
- Explain Hypothesis – data supported or data did not support
- Analyze Results – using scientific concepts from class/research, explain how and why?
- Explain any unavoidable/experimental error - effects of it, and ways to reduce it
- Explain any real-life applications – who would care about the results & why
- Explain how this experiment relates to the topic you are studying in science class

## Further Investigations

- Based on this experiment what questions do you now have about this topic.
- List at least 2 questions/problems that you would like to run an experiment on now!