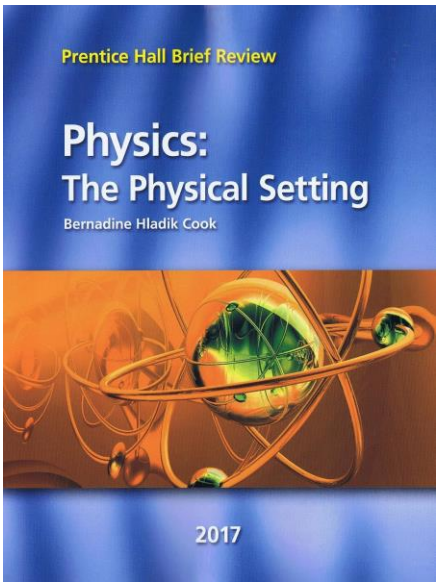
MOUNT VERNON CITY SCHOOL DISTRICT

Physics ®
Curriculum Guide



THIS HANDBOOK IS FOR THE IMPLEMENTATION OF THE PHYSICS ® CURRICULUM IN MOUNT VERNON CITY SCHOOL DISTRICT (MVCSD).

2019-20

Mount Vernon City School District

Board of Education

Arlene Torres
President

Darcy Miller
Vice President

Board Trustees
Serigne Gningue
Micah J.B. McOwen
Warren Mitchell
Melissa Muñoz Patterson
Adriane Saunders
Wanda White
Israel Williams

Superintendent of Schools
Dr. Kenneth R. Hamilton

Deputy Superintendent
Dr. Jeff Gorman

Assistant Superintendent of Business
Ken Silver

Assistant Superintendent of Human Resources
Denise Gagne-Kurpiewski

Assistant Superintendent of School Improvement
Dr. Waveline Bennett-Conroy

Associate Superintendent for Curriculum and Instruction
Dr. Claytisha Walden

Administrator of Mathematics and Science (K-12)
Dr. Satish Jagnandan

TABLE OF CONTENTS

IMPORTANT DATES 2019-20

REPORT CARD

MARKING PERIOD	MARKING PERIOD BEGINS	INTERIM PROGRESS REPORTS	MARKING PERIOD ENDS
MP 1	September 4, 2019	October 4, 2019	November 8, 2019
MP 2	November 12, 2019	December 13, 2019	January 31, 2020
MP 3	February 3, 2020	March 13, 2020	April 17, 2020
MP 4	April 27, 2020	May 21, 2020	June 26, 2020

The **Parent Notification Policy** states "Parent(s) / guardian(s) or adult students are to be notified, *in writing*, at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, *in writing*, at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory."

PREFACE

This curriculum for *The Physical Setting/Physics* is organized into instructional units based on the key ideas and major understandings of the New York State curriculum. These are further organized into specific objectives for lessons and laboratory activities to be completed throughout the year.

This *Physical Setting/Physics Core Curriculum* was written to assist teachers and supervisors as they prepare curriculum, instruction, and assessment for the Physics content and process skills of the New York State *Learning Standards for Mathematics, Science, and Technology.* The Core Curriculum is part of a continuum that elaborates the science content of Standard 4, which identifies Key Ideas and Performance Indicators. Key Ideas are broad, unifying, general statements of what students need to know. The Performance Indicators for each Key Idea are statements of what students should be able to do to provide evidence that they understand the Key Idea. As part of this continuum, this Core Curriculum presents Major Understandings that give more specific detail to the concepts underlying each Performance Indicator.

The topic content, skills, and major understandings address the content and process skills as applied to the rigor and relevancy to be assessed by the Regents examination in Physical Setting/Physics. Focus will also be on application skills related to real-world situations. Assessments will test students' ability to explain, analyze, and interpret Physics processes and phenomena, and generate science inquiry.*

*from *New York State Core Curriculum: Physical Setting/Physics*

REGENTS CURRICULUM

The Mount Vernon City School District recognizes that the understanding of science is necessary for students to compete in today's technological society. The study of science encourages students to examine the world around them. As individuals, they will use scientific processes and principles to make informed personal and public decisions. Students will become scientifically literate and apply scientific thinking, reasoning, and knowledge throughout their lives.

All Regents science courses culminate in a NY State Regent's examination. All students enrolled in science Regents courses **MUST** take the June Examination. According to the State Education Department regulations, all students must successfully complete the laboratory component of the course in order to be admitted to the Regent's examination.

In order to satisfy this requirement each student must:

1. Complete at least 30 full laboratory periods (**1200 minutes**)
2. Complete a satisfactory written report for each laboratory experience
3. Demonstrate proficiency in laboratory skills.

The format of the Regents Examination in the **Physical Setting/Physics** will consist of three parts: Part A (multiple choice), Part B (multiple choice and constructed response), and Part C (extended-constructed response). The concepts, content, and process skills associated with laboratory experiences in Physical Setting/Physics that are aligned to the New York State *Learning Standards for Mathematics, Science, and Technology* and the Core Curriculum for Physical Setting/Physics will be assessed in Part B-1 (multiple choice), Part B-2 (multiple-choice and constructed response), and Part C (extended constructed response) of the Regents Examination in Physical Setting/Physics.

THE PHYSICAL SETTING / PHYSICS ® PACING GUIDE

This guide using *Discovery Education Science Techbook* and *Prentice Hall Brief Review in Physics: The Physical Setting* was created to provide teachers with a time frame to complete the New York State Physical Setting / Physics Curriculum.

INTRODUCTION – MEASUREMENT AND MATHEMATICS

Objectives

- Express answers with correct values with respect to significant figures.
- Use scientific notation to express physical values efficiently.
- Convert and estimate SI units.
- Differentiate between scalar and vector quantities.
- Use scaled diagrams to represent and manipulate vector quantities.
- Determine x- and y-components of two-dimensional vectors.
- Determine the angle of a vector given its components.

Vocabulary

Absolute error	Fundamental unit	Scientific notation
Accepted value	Independent variable	SI prefix
Accurate	Indirect square proportion	SI system
Constant proportion	Inversely proportional	Significant Figures
Dependent variable	Line of best fit	Slope
Derived unit	Mass	Standard Deviation
Direct square proportion	Mean	Unit
Directional proportional	Percent error	Variance
Experimental value	Precise	Vector
Extrapolation	Range	
Force	scalar	

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 1 - Measurement and Mathematics

- Units
- Tools for Measurement
- Uncertainty in Measurement
- Scientific Notation
- Evaluating Experimental Results
- Graphing Data
- Scalar and Vector Quantities
- Solving Equations Using Algebra

UNIT 1: INTRODUCTION TO FORCES AND MOTION

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS2-4, HS.PS2.B	1.1 Fundamental , Forces	How do electromagnetism and gravitation differ from the strong and weak nuclear forces?	• Modeling Electromagnetic Waves • Gravity • Atomic Spectroscopy • A Different Shape of Magnet • Fundamental Forces and Radioactivity	SEPTEMBER
HS-PS2-4, PS2.B	1.2 Gravity	What evidence is there that gravity affects Earth and the sun?	• Gravity A • Gravity B	
HS-PS1-8, HS-PS2-6, PS2.B PS1.C	1.3 Nuclear Forces	What forces hold an atom together, and how are those forces involved in nuclear reactions?	• Measuring Radiation in Food • Fundamental Forces and Radioactivity	
HS-PS2-6, HS.PS2.B	1.4 Electric Forces	What is Coulomb's Law?	• Charging by Induction • Electrostatic Forces at Work • Testing Methods for Charging Objects	
HS-PS2-1, HS.PS2.A	1.5 Centripetal Force and Circular Motion	How do centripetal force, acceleration, and velocity come together in circular motion?	• Uniform Circular Motion	
HS-PS3-2, PS3.A	1.6 Work and Power	How do you solve work and power problems?	• Work and Power • Mechanical Advantage	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 1 - Measurement and Mathematics	**Topic 2 - Mechanics**
• Scalar and Vector Quantities	• Kinematics • Statics • Dynamics • Two-Dimensional Motion and Trajectories • Uniform Circular Motion • Newton's Universal Law of Gravitation • Friction • Momentum • The Simple Pendulum

UNIT 2: MOTION

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS2-3, PS2.A	2.1 Using Vectors and Scalars to Describe Motion	Why is the total velocity of a roller coaster zero at the end of the ride? How does its speed vary with its location?	• Using Vectors and Scalars	OCT. – NOV.
HS-PS2.1, PS2.A, HS-PS2.4, PS2.B, HS-PS2.4, PS2.B	2.2 Understanding and Describing Motion	How can Newton's laws of motion and the law of gravitation predict the motion of an object, and how can frames of reference be used to describe that motion?	• Understanding and Describing Motion	
Reference HS-PS2-2, HS.PS2.A	2.3 Newton's First Law of Motion	How can the motion of objects be explained in terms of the balanced and unbalanced forces acting upon them?	• Newton's First Law of Motion • Newton's Laws of Motion	
HS-PS2-1, HS-PS2.A	2.4 Newton's Second Law of Motion	What is the relationship between force and motion?	• Exploring the Relationship Between Force and Motion	
Reference HS-PS2-2, HS.PS2.A	2.5 Newton's Third Law of Motion	When a baseball bat hits a baseball, the force of the bat causes the ball to change velocity, but what happens to the bat?	• Pulling on Strings	
HS-PS2-1, HS.PS2.A	2.6 Applying Newton's Laws of Motion	How do Newton's three laws of motion explain the movement of people and objects around you?	• Newton's Laws of Motion	
HS-PS2-2, HS.PS2.A	2.7 Free Body Diagrams	How do free body diagrams allow you to predict an object's change in motion?	• Diagramming Forces	
HS-PS2-2, HS.PS2.A	2.8 Solving Motion Problems	How do the displacement, velocity, and acceleration of a runner change as he races from the starting line toward the finish line?	• Falling Quarters • Measuring Friction • Two-Dimensional Motion • Walking About • Acceleration on an Incline • Flying off the Edge	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 2 - Mechanics	**Topic 3 - Energy**
• Kinematics • Statics • Dynamics • Two-Dimensional Motion and Trajectories • Uniform Circular Motion • Newton's Universal Law of Gravitation • Friction • Momentum • The Simple Pendulum	• Work and Energy • Forms of Energy • Potential Energy • Elastic Potential Energy • Kinetic Energy • Work-Energy Relationship

UNIT 3: CONSERVATION OF ENERGY AND MOMENTUM

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	DEC. – JAN.
HS-PS3-2, HS-PS3-3	3.1 Types of Energy	What steps are involved in converting potential energy to kinetic energy, or kinetic energy to potential energy?	• Calorimetry and the Energy of Food • Engineering Solutions: The Egg Drop Challenge • Designing Solutions: Wind Energy	
HS-P3-1, HS.PS3.A, HS.PS3.B, HS-ETS1-1, HS-ETS1-2, HS.ETS1.B, HS.ETS1.C	3.2 Conservation of Energy	How is energy transferred between objects or systems?	• Pendulum • Roller Coaster • Evaluating Systems: Stearic Acid as a Heating Fluid • Conservation of Energy • Bouncing Balls • Water Wheel	
HS-PS2-2, HS_PS2-3, HS.PS2.A, HS-ETS1-2, HS.ETS1.A, HS.ETS1.C	3.3 Conservation of Momentum	How does the momentum of a soccer ball change as it travels from player to player?	• Marble Collisions • Engineering Solutions: The Egg Drop Challenge	
HS-PS3-2, HS.PS3.A	3.4 Temperature and Pressure	What is the relationship between temperature, pressure, and energy transfer when popping popcorn?	• Charles' Law • I Scream for Ice Cream	
HS-PS2-2, HS-PS3-5, HS.PS2.A, HS.PS3.C	3.5 Work, Power, and Impulse	As you push a heavy box up a ramp, what forces do work on the box?	• Getting from Point A to Point B • Work and Power • Newton's Cradle	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 2 - Mechanics	**Topic 3 - Energy**
• Kinematics • Statics • Dynamics • Two-Dimensional Motion and Trajectories • Uniform Circular Motion • Newton's Universal Law of Gravitation • Friction • Momentum • The Simple Pendulum	• Work and Energy • Forms of Energy • Potential Energy • Elastic Potential Energy • Kinetic Energy • Work-Energy Relationship

UNIT 4: ELECTROMAGNETISM

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	FEBRUARY
HS-PS2-5, HS-PS3-5, HS.PS2.B, HS.PS3.A, HS.PS3.C, HS-PS2-5, HS-PS3-5, HS.PS2.B, HS.PS3.A, HS.PS3.C	4.1 Electric and Magnetic Fields	What is the cause/effect relationship between electric and magnetic fields?	• Drawing Electric and Magnetic Fields • Modeling Electric and Magnetic Fields • Magnetic Induction	
HS-PS2-4, PS2.B, HS-PS4-5, PS3.D, PS4.A, PS4.B, PS4.C, HS-PS2-4, PS2.B	4.2 Electricity and Magnetism	How have electric and magnetic forces shaped the world in which we live?	• Bending Light • Electricity and Magnetism • Electromagnets • Investigating Coulomb's Law • Modeling Electromagnetic Waves • The Many Colors in Light	
HS-PS2-5, HS-PS3-1, HS-PS3-2, PS3.A, PS3.B	4.3 Electric Circuits	What happens when an electric charge moves through a circuit?	• Electric Circuits • How Bright Is It?	
HS-PS1-4, HS-PS1-5, HS-PS1-6, HS-PS1-7, HS.PS1.B, HS-LS2-3, HS-LS2-4, HS-LS2-5, HS.LS2.B, HS-ESS2-1, HS-ESS2-2, HS-ESS2-3, HS-ESS2-4, HS.ESS2.A	4.4 Conductors and Insulators	How does the structure of a material explain its behavior as a conductor or an insulator?	• Conductors and Insulators • Heat Flow in Solids and Fluids • Making or Breaking a Circuit	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 4 – Electricity and Magnetism

- Electrostatics
- Electric Fields
- Electric Current
- Electric Circuits
- Magnetism
- Electromagnetic Induction

UNIT 5: WAVES

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS4-1, PS4.A, HS-PS4-2, PS4.A, HS-PS4.3, PS4.A, PS4.B, HS-PS4.4, PS4.B, HS-PS4-5, PS3.D, PS4.A, PS4.B, PS4.C, HS-ETS1-2, ETS1.C, HS-ES1-3, ETS1.B	5.1 Wave Characteristics	How do you know that the waves sent from the sun to Earth are not mechanical waves?	• Wave Characteristics • Investigating Light Reflection and Refraction • Speed of Sound • Investigating the Dual Nature of Light • Light Intensity and Distance • Modeling Light	MARCH
HS-PS4-1, HS-PS4-5, HS.PS4.A, HS.PS4.C, HS-ETS1-4, HS.ETS1.B	5.2 Reflection and Refraction	How does light from a headlamp use a lens and a mirror to produce a narrow beam?	• The Law of Reflection • The Law of Refraction	
Reference HS-PS2-2, Reference HS-PS2-1, HS.PS2.A	5.3 Simple Harmonic Motion	How do the position, velocity, and acceleration of a child on a swing change as she oscillates back and forth?	• Simple Harmonic Motion: Pendulums • Simple Harmonic Motion: Springs • The Speed of Sound	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 5 - Waves

- Introduction to Waves
- Periodic Wave Phenomena
- Light
- The Electromagnetic Spectrum

Topic 2 - Mechanics

- Momentum
- The Simple Pendulum

UNIT 6: HEAT AND THERMODYNAMICS

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS3-4, HS.PS3.B, HS.PS3.D, HS-ETS1-2, HS-ETS1-3, HS.ETS1.B, HS.ETS1.C	6.1 Heat	What is heat, how is it related to temperature and thermal energy, and how does the transfer of thermal energy affect matter?	• Designing Solutions: Slowing Down Heat Transfer • Newton's Law of Cooling • Specific Heat	APRIL
HS-PS3-1, HS-PS3-3, HS-PS3-4, HS.PS1.B, HS.PS3.B, HS.PS3.D, HS.ESS1.A, HS.ESS2.A, HS.ESS2.D	6.2 PV Diagrams	In terms of the particles involved, how do changes in temperature, pressure, and volume affect a gas?	• Boyle's Law • Specific Heat	
HS-PS3-4, HS.PS3.B, HS.PS3.D	6.3 Heat Engines	What factors affect the efficiency of a heat engine?	• Energy Efficiency • Latent Heats of Fusion	
HS-PS3-4, HS.PS3.B, HS.PS3.D	6.4 Laws of Thermodynamics	How do the laws of thermodynamics determine the function and efficiency of various technology systems?	• Determining the Specific Heat of a Metal • Entropy	
HS-PS3-4, HS.PS3.B, HS.PS3.D	6.5 Entropy	How does the second law of thermodynamics predict the increasing entropy of a system?	• Entropy	
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 3 - Energy

- Work and Energy
- Forms of Energy
- Potential Energy
- Elastic Potential Energy
- Kinetic Energy
- Work-Energy Relationship

UNIT 7: PROPERTIES OF MATTER

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS1-2, HS.PS1.A, HS-ETS1-1, HS.ETS1.A	7.1 Chemical Properties	How is the periodic table's arrangement related to the chemical properties of the elements?	• Structure of the Periodic Table • Chemical Properties	MAY
HS-PS1-1, HS-PS1-3, HS.PS1.A	7.2 The Building Blocks of Matter	Why are atoms considered the basic building blocks of all matter?	• The Building Blocks of Matter • Modeling Matter and Phase Changes • Comparing Melting Points	
HS-PS1-8, PS1.C	7.3 Nuclear Physics	How do the nuclei of radioactive elements break down, and how can we make use of the process?	• Penny Half-Lives	
Unit Assessment: Exam				

UNIT 8: CHEMICAL REACTIONS

Next Generation Standards	Lesson	Essential Question	Hands-On Activity	
HS-PS1-4, HS-PS1-6, HS.PS1.A, HS.PS1.B	8.1 Chemical Reactions	How does matter change during a chemical reaction, and how is energy involved in these changes?	• Getting Cold • Iodine Clock Reaction	JUN
Unit Assessment: Exam				

Prentice Hall Brief Review Chemistry: The Physical Setting

Topic 6 – Modern Physics

- Wave-Particle Duality of Energy and Matter
- Early Models of the Atom
- The Nucleus
- The Standard Model of Particle Physics
-

JUNE - NYS PHYSICS REGENTS

<table>
<tr><th colspan="5">Students with Disabilities (SWDs)</th></tr>
<tr><td colspan="3">Modifications
Pre-teach vocabulary
Use picture vocabulary
Picture examples of safety measures posted
Pictures for each category of science
Scaffold Depth of Knowledge questions
Provide copy of notes in ”cloze” form
Peer partner
Extended time for written tasks/verbal response
Break long tasks over multiple days
Allow for multiple ways to respond (verbal, written, response board, scribe)
Provide mock/model of performance task
Model use of graphic organizers (fade until mastery)
Modify informational text to shorter passages
Provide model of exemplar lab write-up
Provide interactive notebook
Present complex tasks in multiple ways
Model steps to read, interpret, and construct graphs
Multiple opportunities to perform to repeat labs
Provide advance organizer of class tasks</td><td>Assistive Technology:
Computer for lengthy writing tasks
Audio textbook
Videos to clarify concepts
Recording device to record class lecture/discussions
Other
Arrange seating for maximum engagement and minimum distraction
Accessible lab space (counter level)</td><td>Assessment
Scaffold written assignments
Individual criteria for success
Provide review packet
Modify the number of questions
Provide model of the task
Provide multiple options for projects
Practice calculations with sample problem before assessing student</td></tr>
<tr><th colspan="5">ENL</th></tr>
<tr><td>Listening
Build Background Knowledge
Audio</td><td>Speaking
Sentence Frames
Academic conversation Starters</td><td>Reading
Supplementary Texts
Visual Aids
Video
Standards-based questions</td><td>Writing
Sentence Frames
Graphic Organizers
Standards-based sentence stems</td><td>Accommodations
Extended time
Directions read 3x
Oral interpretation
Translated version of test (may have both English and other)
Responses in home language</td></tr>
</table>

SYSTEMATIC DESIGN OF A SCIENCE LESSON

What are the components of a Science Lesson?

Summary of the 5E Instructional Model

Phase	Summary
Engagement	The teacher or a curriculum task accesses the learners' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.
Exploration	Exploration experiences provide students with a common base of activities within which current concepts (i.e., misconceptions), processes, and skills are identified and conceptual change is facilitated. Learners may complete lab activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation.
Explanation	The explanation phase focuses students' attention on a particular aspect of their engagement and exploration experiences and provides opportunities to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to directly introduce a concept, process, or skill. Learners explain their understanding of the concept. An explanation from the teacher or the curriculum may guide them toward a deeper understanding, which is a critical part of this phase.
Elaboration	Teachers challenge and extend students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting additional activities.
Evaluation	The evaluation phase encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives.

IMPORTANT NOTICE

- Writing assignments at the end of the lesson (closure) bring great benefits. Not only do they enhance students' general writing ability, but they also increase both the understanding of content while learning the specific vocabulary of the disciplines.
- Demonstration (using manipulatives) must be incorporated in all lessons. With students actively involved in manipulating materials, interest in science will be aroused. Using manipulative materials in teaching science will help students learn:
  a. to relate real world situations to science symbolism.
  b. to work together cooperatively in solving problems.
  c. to discuss scientific ideas and concepts.
  d. to verbalize their scientific thinking.
  e. to make presentations in front of a large group.
  f. that there are many different ways to solve problems.
  g. that problems can be symbolized in many different ways.
  h. that they can solve problems without just following teachers' directions.

SCIENCE GRADING POLICY

This course of study includes different components, each of which are assigned the following percentages to comprise a final grade. I want you--the student--to ***understand that your grades are not something that I give you, but rather, a reflection of the work that you give to me.***

1.	**Exams**	→	**35%**
2.	**Quizzes**	→	**15%**
3.	**Homework**	→	**10%**
4.	**Labs, Projects, Literacy Tasks, Presentations, Portfolios**	→	**20%**
5.	**Classwork / Class Participation**	→	**20%**

Notes:

- *Class participation will play a significant part in the determination of your grade. Class participation will include the following: attendance, punctuality to class, contributions to the instructional process, effort, work in the laboratory, contributions during small group activities and attentiveness in class.*
- *Minimum grades for the first three (3) marking periods of 60, 55, & 55 are recommended to encourage student performance. The fourth (4th) marking period has no minimum and students' report card scores will reflect their actual grade earned.*

Important Notice

As per MVCSD Board Resolution 06-71, the **Parent Notification Policy** states "Parent(s) / guardian(s) or adult students are to be notified, *in writing*, at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, *in writing*, at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory.

SETUP OF THE SCIENCE CLASSROOM

I. Prerequisites for a Science Classroom

A Bulletin Board is meant to display necessary information related to the class itself. Displayed on the Bulletin Boards should be the following;

- Teacher Schedule
- Class List
- Seating Chart
- Code of Conduct / Discipline
- School Policies – dress code, attendance, important dates, etc.
- Grading Policy
- Safety and Laboratory Procedures
- Science Diagrams
- Extra Help Schedule

II. Updated Student Work

A section of the classroom must display *recent student work*. This can be of any type of assessment, graphic organizer, and writing activity. Teacher feedback must be included on student's work.

III. Board Set-Up

Every day, teachers must display the Objective, NYS Standard (Performance Indicator) and Engagement.

Student's Name:	**School:**
Teacher's Name:	**Date:**
Objective:	
NYS Standard:	
Engagement:	

IV. Spiraling Homework

Homework is used to reinforce daily learning objectives. The secondary purpose of homework is to reinforce objectives learned *earlier in the year*. The assessments are **cumulative,** spiraling homework requires students to review coursework throughout the year.

WORD WALLS ARE DESIGNED …

- to promote group learning.
- to support the teaching of important general principles about words and how they work.
- to foster reading and writing in content area.
- to provide reference support for children during their reading and writing.
- to promote independence on the part of young students as they work with words.
- to provide a visual map to help children remember connections between words and the characteristics that will help them form categories.
- to develop a growing core of words that become part of their vocabulary.

IMPORTANT NOTICE

- A science word wall must be present in every science classroom.

Sample Science Word Wall

Process Skills	Plants	Soils	Animals
classify	root	soil	inherit
measure	stem	humus	trait
predict	leaf	topsoil	mammal
observe	seed	clay	bird
record	germinate	loam	amphibian
infer	seedling	resource	gills
variable	photosynthesis	conservation	fish
compare	chlorophyll	strip cropping	scales
	cotyledon	contour plowing	reptile
			metamorphosis
			cycle

Habitats	Food Chains	Rocks and Minerals	
environment	interact	mineral	valley
ecosystem	producer	rock	canyon
population	consumer	crust	plain
community	decomposer	mantle	plateau
habitat	food chain	core	barrier island
forest	energy pyramid	igneous rock	weathering
deciduous forest	food web	sedimentary rock	erosion
tropical rain forest	predator	metamorphic rock	glacier
coastal forest	prey	rock cycle	earthquake
coniferous forest		fossil	volcano
desert		geologist	flood
salt water		landform	natural disaster
fresh water		mountain	

SCIENCE CLASSROOM AESTHETICS

"PRINT–RICH" ENVIRONMENT CONDUCIVE TO LEARNING

TEACHER NAME: _____

PERIOD: _____

ROOM: _____

CHECKLIST

	YES	NO
• **Teacher Schedule**	☐	☐
• **Class List**	☐	☐
• **Seating Chart**	☐	☐
• **Code of Conduct / Discipline**	☐	☐
• **Grading Policy**	☐	☐
• **List of Core Laboratories**	☐	☐
• **Safety and Laboratory Procedures**	☐	☐
• **Science Diagrams, Posters, Displays**	☐	☐
• **Updated Student Work (Projects, Assessments, Writing, etc.)**	☐	☐
• **Updated Student Portfolios**	☐	☐
• **Updated Word-Wall**	☐	☐
• **Updated Lab Folder**	☐	☐
• **Organization of Materials**	☐	☐
• **Cleanliness**	☐	☐

Principal Signature: _____ **Date:** _____

Administrator Signature: _____ **Date:** _____

Mount Vernon City School District
Science Department
Formal Lab Report Format

Laboratory reports are the vehicle in which scientific information is passed on from the experimenter to others who have an interest in the scientific study. It is therefore very important that each student enrolled in a science class at University High School learn the proper format and procedure for writing a scientific report.

The following is a brief summary of what information is to be included in an acceptable laboratory report. **Not all experiments will include all of the sections shown below**. If your experiment (or your teacher) does not call for certain parts of the report format simply leave that section out.

Formal lab reports should always be word-processed or at least written neatly in ink. Never write any section in pencil. Graphs should be hand drawn or done by a computer-graphing program. The report does not necessarily have to be lengthy or elaborate. Scientific writing should be clear, concise and accurate. Correct spelling and grammar is always important and will have an impact on the evaluation of your report. Unless your teacher informs you that this will be a group report, each student in the lab group will be responsible for completing his/her own report. The report may include:

Title Page	This section includes your name, title of the lab and the names of all lab partners. The page should also include the course title, instructor, period and the date the lab was conducted
Title	The title of the report must clearly reflect what the experiment was all about. This is not an appropriate place for creative or ambiguous titles.
Purpose	This section of the report clearly states in one or two sentences what is to be studied in this experiment. What are you trying to find out in this experiment?
Hypothesis	Write a brief statement outlining your specific expected outcomes of the experiment. The hypothesis is what you think will happen during the experiment. It differs from a guess in that it is based upon prior knowledge or evidence.
Materials	List what equipment was used in your experimental setup. In many experiments, it may be helpful to include a detailed and labeled diagram of

	how the equipment is set up. Experiments involving measurements of electrical circuits must include a circuit diagram.
Procedure	If you are reporting on an experiment with a written procedure, summarize briefly how the experiment was performed. Include only the basic elements the will give the reader an understanding of how the data was collected. Please do not include small details such as size of beakers, specific times, computer commands, or how specific equipment is to be connected together, etc. Do NOT just recopy the procedure from the lab book or hand out. Write the procedure as if you were describing the experiment to an interested friend. If you are writing a report on an experiment of your own design, list the numbered steps of the procedure you followed. This should look a lot like the procedure section of your lab book
Safety	Write a short statement outlining whatever safety precautions might apply to the experiment. Consider the potential dangers of flammables, corrosives, toxins, sharps, heat or cold, among others. Eye protection is required for experiments involving the use of chemicals, boiling water, dissections or the possibility of flying projectiles
Experimental Data	This section of the report will contain the raw data collected during the experiment. Experimental data may take the form of **qualitative observations** made during the experiment. Observations may include color changes, new products formed, phase changes, sounds, lights, positions or other non-measurement observations. This type of information is often best given in paragraph form where you describe your observations during a particular step. Include in your description what you did and what happened when you did it. Do not attempt to include interpretations of what happened at this time. This section is for raw data only. Data may also take the form of numerical measurements collected during the experiment. **Quantitative Data** should be included in a data table with clearly labeled headings that include the units used. Do not ignore suspected faulty data but include it you report. Later, in your CONCLUSIONS, you will have the opportunity to explain why you have decided not to include the suspected errors in your analysis.
Charts and Graphs	To look for relationships in the data it is often of benefit to graph the data collected. Make sure all graphs and charts are fully titled and labeled. See handout on how to construct a scientific graph for format instructions.
Sample Calculations	Every time that you perform a new calculation for data analysis, show a sample calculation of how it was done in this section of your report. Show a sample for each type of calculation done in the experiment, no matter how trivial it seems. Use data from your experiment in your sample calculation, not made up numbers. Fully label each calculation so that the reader understands what you are calculating. Show the equation used for each calculation. Make sure that each measurement has the proper units and that each calculated result is given the correct number of significant digits. If a calculation is repeated in the experiment, there is no need to show it more that

	once. %Error: calculation which determines how close your experimental value is to the accepted value (as always, show your work) $$\% \text{ Error} = \frac{|\text{accepted value - your value}|}{\text{accepted value}}$$ If one of the analysis questions below asks for a calculation, show the work in the Questions section not Sample Calculations.
Questions	All analysis questions found at the end of the experiment are to be answered in **complete sentences** (except calculations, where you need to show your work). One or two word answers are never acceptable. Do not rewrite the original question; instead, word your answer such that the question is obvious from the wording of your answer.
Conclusions	This is the most important part of your lab report. It is here that you answer the questions asked in the purpose. Your conclusion should always be stated in terms of what you said your purpose was. Did the experiment verify your hypothesis? How do you know? Begin your conclusion by restating your purpose and/or hypothesis. In a sentence or two, indicate how the experiment was conducted. State whether the results verified or refuted your hypothesis. List the evidence or logic from your experimental results that lead you to that conclusion. Be specific. If your results did not agree with the expected results, how far off were you from the accepted value? A percent error might be appropriate here. Is this error significant? Looking back on how the experiment was conducted, identify several sources of error. "Experimental error", "measurement error", "human error" and "calculation error" are not acceptable statements of error. Be much more specific! Your discussion of error should include the effects of each source with regard to both magnitude and direction. If you were to do this experiment again, how could you modify this experiment to improve your results? Many of the points made above may have been previously discussed elsewhere in the report. **Do not leave them out of your conclusion!** Your conclusion should be able to stand alone without the rest of the report.

All reports should be signed and dated by the author at the bottom of the report. The date should reflect the date that the report is submitted.

Mount Vernon City School District

STEM Project Guide
(Student Packet)

What do I do?
Choose your topic. Get ideas from your teacher, parents, friends, science books, newspaper articles, television, Internet, etc. You are not to experiment on any human or animal without the prior permission of your teacher. Collect and put together your ideas and materials you will need. Follow the Scientific Method as much as possible.

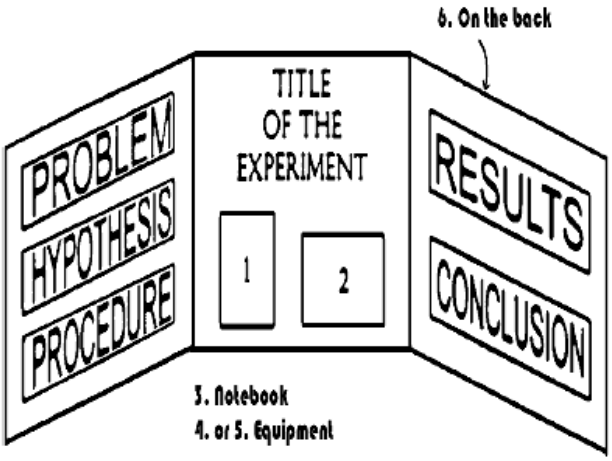
What is the Scientific Method?
Scientific Method refers to the process that scientists go through when solving a problem.
It involves the following steps:

1. State the Problem: Write the problem clearly, perhaps in the form of a question.
2. Present a Hypothesis: Describe your educated guess of the possible solution (your prediction of the outcome of your experiment) and justify your reasoning.
3. Present a Procedure: Describe how you will go about solving the problem. Include a list of all the materials needed. Do the experiment.
4. Present the Results: Tell what happened in words. Show what you have discovered using tools like charts, tables, graphs, diagrams and pictures.
5. State your conclusions: Write a paragraph that tells whether the experiment solved your problem. Did it prove or disprove your hypothesis? If your hypothesis was incorrect, what might be some of the reasons?

How do I display my experiment?
Your experiment should be placed on a display board that stands by itself, such as on a threesided display, as shown below. It should not be over 48 inches wide when open.

Example of display layout:

1. Graphs and Charts
2. Photographs or drawings and diagrams of your work.
3. Notebooks may be placed in front of the project.
4. K-3 only: Equipment may be placed on table in front of display. Do not include liquids or smelly items.
5. Grades 4-6: No equipment or apparatus.
6. Student's and teacher's names should be written **only** ON THE BACK of the display.



SOME SUGGESTIONS FOR STEM INVESTIGATIONS:

Use these if you need ideas, but it's best to think of your own!

1. How can you stop cut apples from going brown?
2. How does the color of light affect plant growth?
3. How does temperature influence yeast cell reproduction?
4. Which surfaces provide the least amount of friction?
5. Which materials insulate best against the cold?
6. How high do you have to raise a smooth board to get a block to slide down it? How does covering the block with felt or sandpaper or other materials affect that height? How does changing the weight of the block affect height?
7. What affects how fast an ice cube melts in air? How can you get it to melt faster than in air?
8. What is the biggest shadow you can make with a piece of paper 8 ½ inches by 11 inches? What is the smallest shadow you can make with the same piece of paper?
9. How can you get seeds to germinate fastest?
10. Which seeds germinate fastest? Do little seeds germinate faster than big seeds?
11. What is the fastest way to cool a cup of hot water?
12. Do people who play sports regularly have the same heart rate as people who don't? Do sports people recover from exercise more quickly than less active people?
13. How can you make suds last longest? Compare shampoos to dishwashing detergents. Compare different brands of shampoo or different brands of dishwashing detergent to each other.
14. Does toilet paper stop bacteria getting through? Try touching agar with a naked finger and then with a finger wrapped in one layer of toilet paper.
15. Which materials conduct electricity? Try different kinds of liquids too.
16. Which design of paper plane will fly the furthest?
17. Who can react faster to a bell - children or adults?
18. Can people identify different kinds of Kool-Aid by taste alone?
19. What age group is best at estimating the passage of time?
20. Does the type of liquid affect how fast an ice cube melts?
21. Does changing the temperature of water affect the buoyancy of an egg?
22. Does the type of wood affect how long it burns?
23. Does the flavor of ice cream affect how fast the ice cream melts?
24. Does changing the wingtip direction affect an airplane's flight? What design flies the farthest?
25. Does changing the height of a ramp affect how far a car will travel?
26. Does the type of shoe worn during a 20-yard dash affect the speed in which you can run?
27. How does changing the amount of baking soda and vinegar affect the height of an explosion? (Careful to change only one: baking soda or vinegar)
28. How does the type of light affect how quickly a plant will grow?
29. Do artificial sugars attract ants?
30. Does the type of insulation on the wire affect the strength of an electromagnet?
31. What effect does temperature have on the strength of different types of magnets?
32. On which surface can a snail move the fastest-dirt, cement, or grass?
33. How can you make a parachute fall more slowly?

34. Does the direction seeds are planted affect plant growth?
35. Is there an effect on evaporation rates when forming crystals from sugar and sugar substitutes?
36. Does the length of the wire affect the power of the circuit?
37. What materials provide the best insulation?
38. Will more air inside a basketball make it bounce higher?
39. Do heavier toy cars roll faster than lighter toy cars?
40. Does surrounding color affect an insect's eating habits?
41. What is the effect of different amounts of chlorine on plant growth- a lot, a little, or none?
42. What is the effect of different amounts of air movement on plant growth?
43. Do ants prefer artificial sweeteners, natural sugar, or hard candy?
44. Can mealworms or other invertebrates be taught to go through a maze?
45. Which increases your heart rate more: walking up and down real stairs or using a stair-master?
46. How does the temperature of water affect the time it takes to freeze into ice cubes?
47. Given the same amount of water, how does pot size affect the amount of time it takes to boil?
48. How does a light bulb's wattage affect the amount of heat detected above a light?
49. Does the color of a shirt affect the amount of heat it absorbs?
50. Can people use their sense of hearing alone to tell apart a penny, nickel, dime, and quarter?
51. How does increasing the height of a ramp affect how far a ball rolls down the ramp?
52. How does caffeine affect people's heart rate?
53. How does talking on a cell phone or listening to music affect reaction time?
54. How does temperature affect a magnet?
55. What type of travel mug keeps hot drinks hot for the longest time?
56. Does the direction of a multiplication problem affect how fast you solve it?
57. How does temperature affect the stretchiness of a gummy worm?
58. Does positive encouragement or negative trash-talking affect free throw accuracy?
59. Which eggs can support the most weight?
60. Does mint-flavored gum affect the temperature of your mouth?