



PLANNED COURSE OF STUDY

Course Title	Physical Science
Grade Level	8
Content Area / Dept.	Science
Length of Course	½ year
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Course Description:

In 8th grade students learn and use the habitats and techniques of scientists, including setting up experiments and making observations. Students will explore the foundation of chemistry through the study of basic forms of matter by conducting experiments on the properties of matter.

The Science Fair gives the students an opportunity to apply the scientific method and to conduct individual research. It is a unique way for students to come up with a question for which they must find an answer. Students are expected to complete an experiment, research, observations, problem demonstration, and demonstrate research effort.

Course Rationale:

In the physical sciences, performance expectations at the middle school focus on students developing an understanding of several scientific practices. These include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, constructing explanations; and finally, use these practices to demonstrate understanding of the core ideas.

The Science Fair is a motivating way to learn, utilize and understand the scientific method. Science Fair projects allow students to practice scientific thinking and problem solving. It encourages them to improvise when a procedure doesn't work out as predicted, present science findings to others and to communicate scientifically. The students strengthen math skills through analyzing and graphing data. They strengthen reading comprehension skills by doing complicated research, and creative problem solving. Science Fair projects allow for self-directed learning.



Curriculum Map

Month	Typical # of Weeks	Topics Covered this Month
September	4 weeks	Science Fair/Introduction to Chemistry
October	4 weeks	Science Fair/Introduction to Chemistry
November	3 weeks	Science Fair/Introduction to Chemistry
December	3 weeks	Introduction to Chemistry
January	4 weeks	Introduction to Chemistry
February	4 weeks	Introduction to Chemistry
March	4 weeks	Introduction to Chemistry
April	(Remember PSSAs this month)	Introduction to Chemistry
May	4 weeks	Introduction to Chemistry
June	2 weeks	Introduction to Chemistry



Unit Title	Introduction to Chemistry
Unit Description	This unit is designed to get students thinking about what matter is, what its properties are, and how it behaves and reacts.
Essential Questions & Enduring Understandings	Chapter 1 - How is matter described? Chapter 2 - Why does a substance change state? Chapter 3 - How is the periodic table organized? Chapter 4 - How can bonding determine the properties of a substance? Chapter 5 - How is matter conserved in a chemical reaction? Chapter 6 - What determines the properties of a solution?

PA Core Standards	Assessment Anchors
PE-MS-PS1-1	S8A.1.1
PE-MS-PS1-2	S8A.2.1
PE-MS-PS1-3	S8A.2.2
PE-MS-PS1-4	S8A.1.3
PE-MS-PS1-5	S8A.2.1
	S8A.2.2
	S8A.3.3
	S8C.1
	S8C.2.1
	S8C.2.2



Key Unit Vocabulary	<p>Chapter 1 - matter, chemistry, substance, physical property, chemical property, element, atom, chemical bond, molecule, compound, chemical formula, mixture, weight, mass, International System of Units, volume, density, physical change, chemical change, law of conservation of mass, temperature, thermal energy, endothermic reaction, exothermic reaction, chemical energy</p> <p>Chapter 2 - solid, crystalline solid, amorphous solid, liquid, fluid, surface tension, viscosity, gas, pressure, melting, melting point, freezing, vaporization, evaporation, boiling, boiling point, condensation, sublimation, Charles's Law, directly proportional, Boyle's Law, inversely proportional</p> <p>Chapter 3 - atom, electron, nucleus, proton, energy level, neutron, atomic number, isotope, mass number, atomic mass, periodic table, chemical symbol, period, group, metal, luster, malleable, ductile, thermal conductivity, electrical conductivity, reactivity, corrosion, alkali metal, transition metal, nonmetal, diatomic molecule, halogen, noble gas, metalloid, semiconductor, radioactive decay, nuclear reaction, radioactivity, alpha particle, beta particle, gamma ray, half-life, radioactive dating, tracer</p> <p>Chapter 4 - Valence electron, electron dot diagram, chemical bond, ion, polyatomic ion, ionic bond, ionic compound, chemical formula, subscript, crystal, covalent bond, molecule, double bond, triple bond, molecular compound, nonpolar bond, polar bond, metallic bond, alloy</p> <p>Chapter 5 - physical change, chemical change, reactant, product, precipitate, exothermic reaction, endothermic reaction, chemical equation, law of conservation of mass, open system, closed system, coefficient, synthesis, decomposition, replacement, activation energy, concentration, catalyst, enzyme, inhibitor.</p> <p>Chapter 6 - solution, solvent, solute, colloid, suspension, dilute solution, concentrated solution, solubility, saturated solution, acid, corrosive, indicator, base, hydrogen ion (H^+), hydroxide ion (OH^-), pH scale, neutralization, salt</p>
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Learning Objectives – <i>The student will...</i>	Assessment Opportunities
Chapter 1.1 <ul style="list-style-type: none">Apply scientific ideas to identify the properties used to describe matter.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 1.2 <ul style="list-style-type: none">Apply scientific ideas to describe the properties of a mixture.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 1.3 <ul style="list-style-type: none">Apply scientific ideas to describe the units used to measure mass and volume.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 1.3 <ul style="list-style-type: none">Construct an explanation for how to determine the density of a material.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 1.4 <ul style="list-style-type: none">Develop and use a model to explain what a physical change and chemical change is.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 1.4 <ul style="list-style-type: none">Develop and use a model to describe how energy changes when matter changes.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 2.1 <ul style="list-style-type: none">Describe the motion of particles in a solid, liquid and gas.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 2.2 <ul style="list-style-type: none">Explain what happens to a substance during changes between solid and liquid, between liquid and gas.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 2.3 <ul style="list-style-type: none">Explain how pressure and temperature are related.Explain how volume and temperature of a gas are related.Explain how pressure and volume of a gas are related.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments



Chapter 3.1 <ul style="list-style-type: none">Describe how atomic theory developed.Describe the modern model of the atom.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.2 <ul style="list-style-type: none">Explain how Mendeleev discovered the pattern that led to the periodic table.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.2 <ul style="list-style-type: none">Identify the data in the elements in the periodic table.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.2 <ul style="list-style-type: none">Explain how the periodic table is useful.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.3 <ul style="list-style-type: none">Summarize the properties of metals.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.3 <ul style="list-style-type: none">Describe how metals are classified in the periodic table.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.4 <ul style="list-style-type: none">Summarize the properties of nonmetals.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.4 <ul style="list-style-type: none">Describe the families that contain nonmetals.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.5 <ul style="list-style-type: none">Describe what happens to an atom during radioactive decay.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.5 <ul style="list-style-type: none">Identify the types of particles and energy produced by radioactive decay.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 3.5 <ul style="list-style-type: none">Describe how radioactive isotopes are useful.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments



Chapter 4.1 <ul style="list-style-type: none">Explain what determines an elements' chemistry.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.2 <ul style="list-style-type: none">Explain how ions form.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.2 <ul style="list-style-type: none">Explain how the formulas and names of ionic compounds are written.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.2 <ul style="list-style-type: none">Identify properties of ionic compounds.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.3 <ul style="list-style-type: none">Describe how atoms are held together in a covalent bond.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.3 <ul style="list-style-type: none">Identify properties of molecular compounds.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.3 <ul style="list-style-type: none">Explain how bonded atoms become partially charged.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.4 <ul style="list-style-type: none">Describe the structure of a metal crystal.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 4.4 <ul style="list-style-type: none">Identify properties of metals.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.1 <ul style="list-style-type: none">Explain how changes in matter can be described.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.1 <ul style="list-style-type: none">Identify ways to tell a chemical reaction has occurred.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.2 <ul style="list-style-type: none">Identify the information included in a chemical equation.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.2 <ul style="list-style-type: none">Explain how mass is conserved during a chemical reaction.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments



Chapter 5.2 ▪ Identify three categories of chemical reactions.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.3 ▪ Explain how activation energy is related to chemical reactions.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 5.3 ▪ Identify factors that affect the rate of a chemical reaction.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.1 ▪ Identify how mixtures are classified.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.1 ▪ Describe how a solution forms.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.2 ▪ Describe how to change concentration.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.2 ▪ Identify the factors that affect the solubility of a substance.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.3 ▪ Describe the properties of Acids and Bases.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.4 ▪ Identify the types of ions acids and bases form in water.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments
Chapter 6.4 ▪ Describe what happens in a neutralization reaction.	Performance Assessments, Formative and Summative Assessments, Quizzes, Lab Experiments

Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities Lab Activities: refer to Properties of Matter Textbook or Lab Zone activities in Pearson Resource Guide
2 Block	Chapter 1 Lesson 1	Lab Activities: 1. How do you describe matter? 2. Observing Physical Properties



2 Block	Chapter 1 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. What is a mixture?2. Modeling atoms and molecules3. Separating mixtures
2 Blocks	Chapter 1 Lesson 3	Lab Activities: <ol style="list-style-type: none">1. Which has more mass?2. Calculating Volume3. Making Sense of Density
3 Blocks	Chapter 1 Lesson 4	Lab Activities: <ol style="list-style-type: none">1. Is a New Substance Formed?2. What is a Physical Change?3. Demonstrating Tarnishing4. Where was the energy?
3 Blocks	Chapter 2 Lesson 1	Lab Activities: <ol style="list-style-type: none">1. What are solids, liquids and gasses?2. Observe crystals3. Modeling Particles4. As thick as honey - Viscosity5. How do particles in a gas move?
3 Blocks	Chapter 2 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. What happens when you breathe on a mirror?2. Measure Melting Ice3. Keeping Cool4. Observing Sublimation
3 Blocks	Chapter 2 Lesson 3	Lab Activities: <ol style="list-style-type: none">1. How can air keep chalk from breaking?2. How are pressure and temperature related?3. Hot and cold balloons4. It's a gas!
3 Blocks	Chapter 3 Lesson 1	Lab Activities: <ol style="list-style-type: none">1. What's in the box?2. Make an atomic model3. Visualizing an electron cloud4. How far away is the electron?
3 Blocks	Chapter 3 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. Periodic Table - Which is Easier?2. Classifying elements3. Distinguishing between mass number and atomic mass4. Using the periodic table



		5. Expanding the periodic table
3 Blocks	Chapter 3 lesson 3	Lab Activities: <ol style="list-style-type: none">1. Why use Aluminum? Copper? Carbon? That is the question2. Differentiating Alkali metals3. Classifying metals4. Finding metals
3 Blocks	Chapter 3 Lesson 4	Lab Activities: <ol style="list-style-type: none">1. What are the properties of charcoal?2. Carbon - a nonmetal3. Reading fertilizer labels4. Generating oxygen5. Finding non-metals
3 Blocks	Chapter 3 Lesson 5	Lab Activities: <ol style="list-style-type: none">1. How much goes away?2. What happens when an atom decays?3. Modeling Beta Decay4. Designing experiments using radioactive tracers
2 Block	Chapter 4 Lesson 1	Lab Activities: <ol style="list-style-type: none">1. What are the trends in the periodic table?2. Observing reactivity of Alkali earth metals3. Element Chemistry
3 Blocks	Chapter 4 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. How do ions form?2. Ion formation3. How do you write ionic names and formulas?4. High melting point of an ionic compound5. Shedding light on ions
3 Blocks	Chapter 4 Lesson 3	Lab Activities: <ol style="list-style-type: none">1. Covalent Bonds2. Sharing Electrons3. Properties of Molecular Compounds4. Attraction Between Polar Molecules
2 Block	Chapter 4 Lesson 4	Lab Activities: <ol style="list-style-type: none">1. Are they "steel" the same?2. Metal crystals3. What do metals do?
3 Blocks	Chapter 5 Lesson 1	Lab Activities: <ol style="list-style-type: none">1. What happens when chemicals react?



		<ol style="list-style-type: none">2. A toaster reaction3. Observing Change4. Where's the evidence
4 Blocks	Chapter 5 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. Did you lose anything?2. Model an equation3. Information in a chemical equation4. Still there5. A Balancing Act6. Is Matter Conserved?7. The disappearing penny8. Categories of chemical reactions
3 Blocks	Chapter 5 Lesson 3	Lab Activities: <ol style="list-style-type: none">1. Can you speed up or slow down a chemical reaction?2. Modeling activation energy3. Comparing reaction rates4. Effect of temperature on chemical reactions
3 Blocks	Chapter 6 Lesson 1	Lab Activities: <ol style="list-style-type: none">1. What makes a mixture a solution?2. Scattered Light3. Boiling point of a solution4. Speedy Solutions
3 Blocks	Chapter 6 Lesson 2	Lab Activities: <ol style="list-style-type: none">1. Compare solutions2. Does it dissolve?3. Measuring Concentration4. Predicting Rates of Solubility
2 Blocks	Chapter 6 Lesson 3	Lab Activities: <ol style="list-style-type: none">1. What color does litmus paper turn?2. Properties of Acids3. Properties of Bases
3 Blocks	Chapter 6 Lesson 4	Lab Activities: <ol style="list-style-type: none">1. What can cabbage juice tell you?2. Phone Home3. Testing a salt solution4. The Antacid test



Unit Title	Science Fair
Unit Description	This unit is designed to have students develop an understanding of the scientific method and conduct individual research.
Essential Questions & Enduring Understandings	How do Scientists organize and carry out investigations?

PA Core Standards	Assessment Anchors
	S8A.1.1 S8A.2.1 S8A.2.2

Key Unit Vocabulary	<i>scientific theory, scientific method, problem, hypothesis, variable, independent variable, dependent variable, controlled variables, materials, procedures, repeated trials, constants, experiment, research, observations, qualitative observations, quantitative observations, inferences, data table, graphs - line, bar, circle, results, conclusion, abstract</i>
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Learning Objectives – <i>The student will...</i>	Assessment Opportunities
<ul style="list-style-type: none"> ▪ Apply the scientific method to a self-selected question/problem and conduct independent research. ▪ Design an experiment to solve a problem and create a video of the experiment for use during presentation. 	Formative and Summative Assessments, Science Fair Presentation for peers, Video presentation

Sequence of Teaching and Learning		
Number of Lessons / Blocks	Lesson Topic	Lesson Activities
1	Introduce the Scientific Method	Lab Experiments - The scientific method is reviewed during every science lab students conduct
1	Explore possible questions or problems	Go to the library where different reference sources are introduced to students.



1	Choose a question/problem of interest and begin to brain storm possible research topics	Teacher/student conference - Meet with teacher to discuss
1	Begin research process	Go to library - discuss research integrity
1	Design an experiment	Teacher/student conference - Meet with teacher to review possible experiment ideas
3	Research	Self-directed
1	Organize research for writing of research paper/teach students in text citations	mini lesson - research paper writing mini lesson - in text citation
1	Data Collection/excel graphing	mini lesson - excel graphing
1	Writing an abstract, conclusion	mini lesson - writing an abstract, conclusion
1	Create video using We Video for presentation of experiment	mini lessons - WeVideo