



## Physical Science

### **Contact Information**

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Please feel free to contact me if you get confused or have any other issues. I will reply within 24 hours on weekdays. I facilitate multiple courses so please include your name and the class name when you contact me.

### **Course Requirements**

- Be proficient with the basic functions of word-processing software.
- Have access to a computer with internet that has virus-protection software.
- Use an acceptable web browser to access the course: Chrome, Safari or Firefox.
- Have access to your own digital camera or cell phone camera.
- Be able to transfer your images from your camera to your computer.

### **Course Goals**

- Develop a clear understanding of physical and chemical properties of matter.
- Explore the structure of atoms and the periodic table, understanding their role in element behavior.

- Analyze the nature of chemical changes and reactions, applying the Law of Conservation of Matter.
- Investigate the different states of matter and how they transform based on temperature and pressure.
- Develop critical thinking skills by analyzing data, constructing models, and explaining scientific phenomena.
- Foster curiosity and a questioning mind about the natural world.

## **Semester A**

### **Block 1: What are Physical Properties?**

- **Goals:** Define physical properties, differentiate them from chemical properties, and explore methods for measuring density.

### **Block 2: Properties of Matter**

- **Goals:** Understand the different states of matter (solid, liquid, gas) and the factors influencing their properties.

### **Block 3: Chemical Changes**

- **Goals:** Introduce the concept of chemical changes, differentiate them from physical changes, and explore their role in everyday life (e.g., human body).

### **Block 4: Atomic Theory & the Structure of an Atom**

- **Goals:** Explore the historical development of atomic theory and the basic structure of an atom (protons, neutrons, electrons).

### **Block 5: Properties and Organization of Elements**

- **Goals:** Analyze the periodic table as a tool for organizing elements and understand periodic trends in properties.

### **Block 6: Periodic Table**

- **Goals:** Deepen understanding of the periodic table by creating models and exploring relationships between element groups and families.

### **Block 7: Ionic Bonds**

- **Goals:** Introduce the concept of ionic bonding and how it forms between elements.

### **Block 8: Covalent Bonds**

- **Goals:** Explore the concept of covalent bonding and how it forms between atoms.

### **Block 9: Chemical Reactions**

- **Goals:** Analyze the nature of chemical reactions, including reactants, products, and energy transfer.

### **Block 10: Reactions, Reactions, Reactions!**

- **Goals:** Reinforce understanding of chemical reactions through experimentation and observation.

### **Block 11: Law of Conservation of Matter**

- **Goals:** Understand and apply the Law of Conservation of Matter in chemical reactions.

### **Block 12: Mixtures and Solutions**

- **Goals:** Differentiate between mixtures and solutions, explore factors affecting solubility.

### **Block 13: Solutions and Solubility**

- **Goals:** Deepen understanding of solutions and factors influencing solubility.

### **Block 14: Acids and Bases**

- **Goals:** Explore the properties of acids and bases, including pH scale and their applications.

## **Semester B**

### **Block 1: Motion**

- **Goals:** Introduce concepts of motion, acceleration, and their connection to gravity. Analyze the motion of planets and orbiting objects.

### **Block 2: Newton's Law of Gravity**

- **Goals:** Understand Newton's Law of Gravity and its impact on objects and weight.

### **Block 3: Work**

- Goals: Introduce the concept of work and its relationship to force and distance. Explore the role of simple machines in work applications.

#### **Block 4: Energy**

- Goals: **Analyze the different forms of energy (kinetic, potential) and understand the Law of Conservation of Energy.**

#### **Block 5: Thermal Energy**

- Goals: Explore the concept of thermal energy, its transfer, and its role in everyday life (e.g., flooring materials).

#### **Block 6: Heat Transfer**

- Goals: Analyze the mechanisms of heat transfer (conduction, convection, radiation).

#### **Block 7: Waves**

- Goals: Introduce the concept of waves, their properties (wavelength, frequency), and their behavior.

#### **Block 8: Sound Waves**

- Goals: Explore the properties of sound waves, their interaction with the environment, and how they are perceived by humans.

#### **Block 9: EM Spectrum**

- Goals: Investigate the electromagnetic spectrum, its components, and their applications.

#### **Block 10: Light Waves**

- Goals: Analyze the properties of light waves, differentiate between light and radio waves, and understand their interactions with matter.

#### **Block 11: Color**

- Goals: Explore the science of color, how we perceive it, and the role of light in color formation.

#### **Block 12: Electric Circuits**

- Goals: Introduce the concept of electric circuits, their components (conductors, insulators), and how they generate electricity.

#### **Block 13: Electromagnetism**

- Goals: Explore the relationship between electricity and magnetism, investigate magnetic fields and their interactions.

#### **Block 14: Conductors and Usage**

- Goals: Analyze the role of conductors and insulators in circuits, and investigate household energy consumption.

#### **Block 15 & 16: Culminating Project**

- Students will choose a project option to demonstrate their understanding of physics concepts and their applications in the real world.

#### **Course Description**

Students explore the fundamental principles of chemistry which characterize the properties of matter and how it reacts. Computer-based and traditional laboratory techniques are used to obtain, organize and analyze data. Conclusions are developed using both qualitative and quantitative procedures. Topics include, but are not limited to: measurement, atomic structure, electron configuration, the periodic table, bonding, gas laws, properties of liquids and solids, solutions, motion, forces, gravity, energy, and many more.

#### **Course Outline**

##### **Semester A**

- Block 1. What are Physical properties?
  - DISCUSS: Physical Properties
  - SUBMIT: Density Lab
- Block 2. Properties of Matter
  - DISCUSS: Changes in the States of Matter
  - SUBMIT: Phases of Water Assignment
- Block 3. Chemical Changes
  - DISCUSS: Chemistry & the Human Body
  - SUBMIT: Chemical Changes Activity
- Block 4. Atomic Theory & the Structure of an Atom
  - DISCUSS: Piece O'History and Today
  - SUBMIT: Atomic Theory -Past to Present
- Block 5. Properties and Organization of Elements
  - DISCUSS: Hunting the Elements
  - SUBMIT: Elements Assignment
- Block 6. Periodic Table
  - DISCUSS: Design Your Own Table
  - SUBMIT: Periodic Table Models

- Block 7. Ionic Bonds
  - DISCUSS: Chemical Bonds
  - SUBMIT: Ionic Bonds
- Block 8. Covalent Bonds
  - DISCUSS: Bonds
  - SUBMIT: Covalent Bonds
- Block 9. Chemical Reactions
  - DISCUSS: Energy Reactions
  - SUBMIT: Chemical reactions
- Block 10. Reactions, Reactions, Reactions!
  - DISCUSS: Washable Markers
  - SUBMIT: Reactions Lab
- Block 11. Law of Conservation of Matter
  - DISCUSS: Law of Conservation of Matter
  - SUBMIT: Law of Conservation of Matter Lab
- Block 12. Mixtures and Solutions
  - DISCUSS: Mixtures and Solutions
  - SUBMIT: Solutions Assignment
- Block 13. Solutions and Solubility
  - DISCUSS: Solutions and Solubility
  - SUBMIT: Solutions and Solubility Assignment
- Block 14. Acids and Bases
  - DISCUSS: Alkaline Water
  - SUBMIT: Acids and Bases Assignment
- Block 15. Culminating project
  - Select one of the below
    - Chemistry A-Z Project
    - Experimental Design Polymer Lab\*\* By request \*\*
    - Build/Design a Rocket Car using everyday materials, use a common chemical reaction (Baking Soda & Vinegar) to make it propel forward, record a video of your car running. Submit a presentation describing and analyzing the design process. How can we use new innovations in Chemistry to address issues involving Global Warming and transportation?
    - Reflection Project: Sit outside for 15 minutes, take a few deep breaths, and make as many observations as you can. What do you see, hear, smell, or feel? Choose 5 of those observations, create a driving question, and research the chemistry involved. Example: grass is green, then researched pigments and light in relation to Chemistry.
- Block 16. Culminating project
  - SUBMIT: Cumulative project

## Standards:

- **HS-PS1.A:** Structure and Properties of Matter (covered in Blocks 1, 2, 5, 6)
  - HS-PS1-2 (Connects partially) Analyze data on the atomic weights of elements and the mass of substances before and after a chemical reaction to propose and defend a scientific explanation of the conservation of mass law. (Covered potentially in Block 11)
  - HS-PS1-3 (Connects partially) Develop models to describe the atomic composition of molecules and polyatomic ions, and their structures. (Covered potentially in Block 8)
  - HS-PS1-5 (Connects partially) Classify a substance as a solid, liquid, or gas in terms of its molecular arrangements. (Covered potentially in Block 2)

## High School Chemistry (HS-PS):

- **HS-PS1.B:** Chemical Reactions (covered throughout Blocks 3-11, 14)
  - HS-PS1-2 (Connects partially) Analyze data on the atomic weights of elements and the mass of substances before and after a chemical reaction to propose and defend a scientific explanation of the conservation of mass law. (Covered potentially in Block 11)
  - HS-PS1-4 Develop models to illustrate the change in the atomic arrangement of atoms when a substance undergoes a chemical reaction. (Covered potentially in Blocks 3, 9, 10)
  - HS-PS1-5 (Connects partially) Classify a substance as a solid, liquid, or gas in terms of its molecular arrangements. (Covered potentially in Block 2)
  - HS-PS1-6 Use the periodic table as a model to predict the relative properties of elements based on trends across periodic groups and families. (Block 5)
  - HS-PS1-7 (Connects partially) Use the periodic table to explain trends in atomic radii, ionization energies, and electron affinities. (Block 5)
- **HS-PS1.C:** States of Matter (covered in Block 2)
  - HS-PS1-8 Develop models to predict and explain the change in state as a function of temperature and pressure. (Covered potentially in Block 2)

## High School Engineering Design (HS-ETS):

- **HS-ETS1.A:** Defining and Delimiting Engineering Problems (potentially in Culminating Projects)
  - HS-ETS1-1 Define the criteria and constraints of a design problem related to the function of a specific system. (Culminating Project options)
- **HS-ETS1.B:** Developing Possible Solutions (potentially in Culminating Projects)
  - HS-ETS1-2 Evaluate a solution to a specific problem by considering a range of criteria, including practicality, affordability, and social and environmental impact. (Culminating Project options)

## **Semester B**

- Block 1. Motion
  - DISCUSS: Accelerating Planets
  - SUBMIT: Fan cart Physics
- Block 2. Newton's Law of Gravity
  - DISCUSS: Our Weight
  - SUBMIT: Crumple Zone Gizmo
- Block 3. Work
  - DISCUSS: Simple Machines
  - SUBMIT: Levers Lab
- Block 4. Energy
  - DISCUSS: Law of Conservation of Energy
  - SUBMIT: Potential Energy on Shelves
- Block 5. Thermal Energy
  - DISCUSS: Flooring
  - SUBMIT: Thermal Energy Lab
- Block 6. Heat Transfer
  - DISCUSS: Heat Transfer
  - SUBMIT: Radiation Lab
- Block 7. Waves
  - DISCUSS: How Waves behave
  - SUBMIT: Waves Lab
- Block 8. Sound Waves
  - DISCUSS: Sound in Space
  - SUBMIT: Sound and Hearing Lab
- Block 9. EM Spectrum
  - DISCUSS: EM Encounters
  - SUBMIT: EM Spectrum
- Block 10. Light Waves
  - DISCUSS: Light Vs. Radio Waves
  - SUBMIT: Light Lab
- Block 11. Color
  - DISCUSS: How we see Color
  - SUBMIT: Light and Color Lab
- Block 12. Electric Circuits
  - DISCUSS: Trash and Electricity
  - SUBMIT: Circuit Builder
- Block 13. Electromagnetism
  - DISCUSS: Magnetic Fields
  - SUBMIT: Magnetism lab
- Block 14. Conductors and Usage



- DISCUSS: Household Energy
- SUBMIT: Energy Use Assessment
- Block 15. Culminating project
  - Select one of the below
    - Physics A-Z Project
    - Reflection Project: Sit down for 15 minutes, take a few deep breaths, and think about the Physics in your everyday life. In what ways has physics made your life simpler? What tasks require less effort due to Physics? Share 5-10 things for full credit.
    - How Can We Use Physics to Help the Environment?
- Block 16. Culminating project
  - SUBMIT: Cumulative project

Standards:

**HS-PS1: Motion and Stability:** (Possibly covered in Blocks 1 & 2)

- **HS-PS1-2:** Analyze data to identify the relationship between the distance an object travels, the speed at which it travels, and the time it takes to travel that distance (Block 1 - Accelerating Planets)
- **HS-PS1-3:** Plan an investigation to determine the effect of a specific variable on the motion of an object (Block 1 - Fan Cart Physics)
- **HS-PS2-1:** Analyze data to identify the relationship between the mass of an object and its gravitational force on another object (Block 2 - Our Weight)

**HS-PS3: Energy:** (Covered throughout Blocks 4-6)

- **HS-PS3-1:** Create or revise a computational model to illustrate the energy transfer during a chemical reaction (Block 4 - Law of Conservation of Energy)
- **HS-PS3-2:** Design an experiment to determine the amount of energy transferred between objects colliding at different speeds (Block 5 - Thermal Energy Lab)
- **HS-PS3-3:** Design, build, and test a device that demonstrates a specific thermal energy transfer process (Block 6 - Heat Transfer)

**HS-PS4: Waves and Their Applications:** (Covered in Blocks 7-11)

- **HS-PS4-1:** Use mathematical representations to describe a relationship between the frequency of a wave and its wavelength (Block 7 - How Waves Behave)
- **HS-PS4-2:** Evaluate the design of a device that uses sound waves to solve a specific problem (Block 8 - Sound and Hearing Lab)
- **HS-PS4-3:** Investigate and describe the electromagnetic spectrum (Block 9 - EM Spectrum)
- **HS-PS4-5:** Communicate knowledge about the cause and effect relationships between the distance between an object and its brightness, color, and the type of electromagnetic radiation it emits (Block 10 - Light Vs. Radio Waves, Block 11 - How We See Color)

## **HS-PS5: Electricity and Magnetism:** (Covered in Blocks 12 & 13)

- **HS-PS5-1:** Use a model to describe how electromagnetic fields can be produced by electrically charged objects (Block 12 - Trash and Electricity)
- **HS-PS5-2:** Construct, test, and modify a device that transfers energy from electrical energy to mechanical energy (Block 12 - Circuit Builder)
- **HS-PS5-3:** Investigate and explain the relationship between the magnetic field and the current in a wire (Block 13 - Magnetism Lab)

## **HS-ETS1: Engineering Design:** (Possibly connected to Culminating Projects)

- **HS-ETS1-1:** Define the criteria and constraints of a design problem related to the function of a specific system (Culminating Project options)
- **HS-ETS1-2:** Evaluate a solution to a specific problem by considering a range of criteria, including practicality, affordability, and social and environmental impact. (Culminating Project options)

### **Method of Instruction**

This is an online course, and while there is flexibility in how and when you do assignments, it is best to log in and complete work each day according to the posted pacing schedule. Due dates will be clearly stated for each assignment in the course calendar and the weekly schedule. It is highly recommended that learners follow the pacing schedule posted, but work may be submitted late.

This course uses project based learning to encourage an authentic, developed appreciation of the topics covered. That means that while it may include some traditional assessments, the bulk of the coursework focuses on projects that require learners to display their learning in a thorough and creative manner.

If you are struggling to complete your work or you need some assistance with an alternate schedule or workload, please contact me as soon as possible. I am more than happy to help support your success in the class!

### **Learner Expectations**

- Check the course pages for directions and announcements every weekday.
- Check your email every weekday to see if your instructor has emailed you.
- Read the assigned readings on the weekdays you're directed to.
- Use available resources including teacher support.
- Create original work and submit it on time.

### **Discussion Board Posts**

- Discussions are credit/no credit so just participating in them will earn you credit. If you are unable to answer the discussion questions just mention that and then share what you think of the video or ask a question about it. Your opinion matters so feel free to share it. :)

- Note: If you feel uncomfortable interacting with the other learners then please message me directly so I may accommodate you.

### **Netiquette**

Netiquette is a set of rules for behaving properly online. The following bullet points cover some basics to communicating online:

- Use good taste when composing your responses in Discussion Forums. Swearing and profanity is also part of being sensitive to your classmates and should be avoided. Also consider that slang can be misunderstood or misinterpreted.
- Be sensitive to the fact that there will be cultural and linguistic backgrounds, as well as different political and religious beliefs, plus just differences in general.
- Don't use all capital letters when composing your responses as this is considered "shouting" on the internet and is regarded as impolite or aggressive. It can also be stressful on the eye when trying to read your message.
- Be respectful of your others' views and opinions. Avoid "flaming" (publicly attacking or insulting) them as this can cause hurt feelings and decrease the chances of getting all different types of points of view.
- Be careful when using acronyms. If you use an acronym it is best to spell out its meaning first, then put the acronym in parentheses afterward, for example: Frequently Asked Questions (FAQs). After that you can use the acronym freely throughout your message.
- Use good grammar and spelling, and avoid using text messaging shortcuts.
- I expect students to treat fellow students, their instructors, other faculty, and staff with respect. Any student or employee will tolerate no form of "hostile environment" or "harassment."

### **Grading:**

Each assignment is given a specific number of points. The number of points earned by the student is determined and a percentage is calculated. The raw score is recorded in the grade book.

An overall grade in the course will be determined according to your school's grading scale.

### **Scoring Rubric**

90-100	Mastered process and technique Strong composition Appropriate subject-matter Strong creative expression
80-89	Good-Very good process and technique Good-Very composition Shows some creative strength

	Appropriate subject-matter
70-79	Technique/composition needs improvement Fair quality composition Shows a little creativity or originality
60-69	Poor evidence of technique/composition Lacks creativity or originality Did not follow some directions
0-59	Incomplete Did not follow most or all directions Please redo and resubmit

### **Discussion Rubric**

9-10	Response is long On-topic / relevant / varied structure No grammar / spelling errors
7-8	Response is ok length On-topic / relevant Minor grammar / spelling errors
5-6	Response is short Somewhat on-topic / relevant Many grammar / spelling errors
0-5	Response is too short Off-topic / not relevant Please redo

### **Honesty and Plagiarism**

Plagiarism of any sort is prohibited. According to the Merriam-Webster online dictionary, to "plagiarize" means:

- to steal and pass off (the ideas or words of another) as one's own
- to use (another's production) without crediting the source
- to commit literary theft
- to present as new and original an idea or product derived from an existing source

Please review [THIS RESOURCE](#) for more information on plagiarism. Any plagiarized work will be given a zero and referred to your EF/COACH/GUIDE for review.

### **Privacy Policy**

All work submitted is the property of the author and is not available to anyone not in the class. If work is to be submitted or viewed outside of this website, I will obtain permission from the author. [FERPA Info](#)

