

Physical Science: Introduction to Chemistry and Physics Syllabus

With Mrs. Shelley Wright

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I'm looking forward to learning together as we journey along the path toward understanding the foundations of chemistry and physics. This course will cover all the main topics of a high school physical science class and prepare students for other higher levels of science. Students will be prepared for higher levels of science for which a foundation in chemistry and physics would be helpful, such as Chemistry, Biology, Environmental Science, Physics or Anatomy and Physiology.

TOPICS AND OBJECTIVES

Semester 1: Introduction to Chemistry

- Scientific Inquiry
 - Understand and explain scientific method
 - Understand measurements and significant figures
 - Interpret tables and graphs and identify the manipulated and responding variable in experiments.
- Properties of Matter
 - Classify matter and its characteristics in different forms.
 - Identify and distinguish between chemical and physical properties and changes.
- States of Matter
 - Describe the characteristics of the five states of matter.
 - Learn and apply the gas laws to changes of pressure temperature and volume.
 - Describe the energy changes and properties associated with changes in the phases of matter.
- Atomic Structure
 - Learn the history of the discovery of the parts of an atom.
 - Apply an atomic model to representing a model.
 - Identify the parts of atoms and their interaction.
 - Distinguish the ground state of atoms and the differences when atoms are in an excited state.
- The Periodic Table
 - Learn the origins and arrangement of the periodic table of elements.
 - Interpret the position of elements in the periodic table and predict their properties based on their position.
 - Predict reactivity based on number of valence electrons
- Chemical Bonds
 - Understand and predict compound formulas in ionic compounds
 - Understand and predict compound formulas in covalent compounds

- Name compounds and molecules and determine formulas from the names of compounds and formulas
- Describe the structure and strength of metals and alloys and how it impacts its properties
- **Chemical Reactions**
 - Interpret chemical equations and balance them in terms of atoms and moles.
 - Calculate the amounts of reactants or products using molar mass, mole ratios and balanced chemical equations.
 - Classify types of chemical reactions.
 - Describe and identify energy changes in chemical reactions.
 - Describe the factors affecting chemical reaction rates and chemical equilibrium.
- **Solutions, Acids and Bases**
 - Describe dissolution from dissociation, dispersion or ionization and the energy changes associated with dissolving.
 - Describe solutions as unsaturated, saturated, or supersaturated and concentrated or dilute using measures of concentration.
 - Define acids and bases and describe how they interact in neutralization reactions.
 - Define pH and how it relates to the strength of acids or bases.
- **Carbon Chemistry**
 - Relate the structures of carbon and carbon compounds and their properties.
 - Classify hydrocarbons as saturated, unsaturated or substituted and identify their properties.
 - Describe the formation, composition and uses of three types of fossil fuels.
 - Describe the four types of polymers.
 - Compare photosynthesis and cellular respiration.
- **Nuclear Chemistry**
 - Describe nuclear decay and classify the three types of nuclear radiation.
 - Identify sources of nuclear radiation and how it affects matter.
 - Describe methods of detecting nuclear radiation.

Semester 2: Introduction to Physics

- **Motion**
 - Describe and calculate instantaneous and average velocity and acceleration.
 - Identify appropriate SI units for measuring distance, speed, velocity, and acceleration.
 - Distinguish between scalar and vector quantities in motion.
 - Interpret distance-time and speed-time graphs and classify acceleration as positive, negative, or constant.

- **Forces and Motion**
 - Describe and classify the types of forces and how they affect motion, including types of friction, gravity, and air resistance.
 - Describe and relate how Newton's first, second, and third laws of motion affect acceleration, force and mass values.
 - Identify and calculate momentum, force and inertia using appropriate SI units.
 - Identify the universal forces acting within a nucleus, between bodies in space and circular motion.
- **Forces in Fluids**
 - Describe and calculate pressure using appropriate SI units.
 - Describe how pressure is affected by altitude and depth.
 - Explain and calculate pressures in a hydraulic system using Pascal's principle.
 - Explain and calculate apparent weight in a fluid, density and buoyancy using Archimedes' principle.
 - Explain the effect of speed on pressure using Bernoulli's principle.
- **Work, Power and Machines**
 - Describe and calculate work and power using appropriate units.
 - Describe the six types of simple machines and calculate work input and work output of the machine using ideal and actual mechanical advantage.
 - Explain how efficiency of a machine works and calculate it.
- **Energy**
 - Describe and calculate gravitational potential energy and kinetic energy and relate them using the law of conservation of energy.
 - Describe and give examples of various forms of energy and energy sources and classify energy sources as renewable and nonrenewable.
- **Thermal Energy and Heat**
 - Describe how temperature, work, motion and thermal energy are related.
 - Calculate thermal energy, temperature change and specific heat using equations.
 - Describe the three means of thermal energy transfer and calculate thermal energy changes in a calorimeter.
 - Apply the laws of conservation of energy and the three laws of thermodynamics.
 - Describe heat engines and various types of heating and cooling systems and how they operate.
- **Mechanical Waves and Sound**
 - Describe the types of mechanical waves, how they are produced and how reflection, refraction, diffraction and interference affect them.
 - Define and determine the properties of waves and solve equations relating wave speed to wavelength, frequency or period of a wave.
 - Distinguish between constructive and destructive interference and explain how standing waves form.
 - Describe the properties of sound waves and applications of sound waves in technology.
 - Explain the effect of motion on sound waves.

- Analyze and explain the parts of a human ear and their functions.
- The Electromagnetic Spectrum and Light
 - Describe the characteristics of electromagnetic waves and calculate wavelength, frequency given the speed of a wave.
 - Describe the particle-wave duality nature, evidence for it and the effect of distance on the intensity of light.
 - Classify electromagnetic waves based on the electromagnetic spectrum and applications in technology for the various types of waves.
 - Describe materials as transparent, translucent or opaque and whether they cause light to be reflected, refracted, polarized or scattered.
 - Analyze how color is perceived, the effect of a prism and distinguish among primary, secondary and complementary colors of light and pigments.
 - Describe how light is produced from various light sources and the characteristics of lasers.
- Optics
 - Describe the law of reflections and the characteristics of plane, concave, and convex mirrors, the images they form and the relationship to real and virtual images.
 - Describe the index of refraction and the characteristics of concave and convex lenses, the images they form and the relationship to real and virtual images.
 - Describe total internal reflection, its relationship to the critical angle and why it is important.
 - Describe and explain the uses of the parts of telescopes, cameras, and microscopes.
 - Describe the functions of the main parts of the eye and identify common vision problems and how they are corrected.
- Electricity
 - Describe the interaction between electric fields, electric forces and electric charges.
 - Describe the two types of electric current, electrical insulators and conductors and factors that affect resistance.
 - Calculate voltage, current and resistance using Ohm's law and appropriate units.
 - Analyze circuit diagrams for series and parallel circuits and describe devices and procedures for electrical safety.
 - Solve equations relating electrical power, current, voltage and electrical energy.
 - Describe analog and digital signals and how electronic devices control electron flow.
 - Describe three types of solid-state components and how they are used in electronic devices.

- Magnetism

- Describe magnetic forces, fields and poles in bar magnets, ferromagnetic materials and compasses.
- Describe how a moving electrical charge creates and the relationship between the charge, the field and the direction of motion.
- Describe and explain the function of electromagnetic devices such as electromagnets, solenoids, AC and DC generators, and transformers.
- Describe how electrical energy is produced, transmitted, and converted for use in the home.

A successful student will need:

1. ***An enthusiastic and curious nature!***
2. Discipline to complete all assigned work!
3. Habits to ALWAYS check Canvas
4. Communication Skills.... NEVER hesitate to reach out to me with questions or cool stuff you want to share! I believe that communication is key to success and lifelong learning!
5. A GROWTH MINDSET..... we are all learning everyday! Be open minded to ideas and perspectives!
6. Use all available resources.... I will post many related videos and websites that can help.
7. Of course... your school supplies: * These are your basic supplies that I would expect you to have accessible.
 - a. 3 ring notebook with unit dividers with a few page protectors for use throughout the year.
 - b. Calculator
 - c. School Supplies (Pencils, highlighter, other writing utensil)
8. **LAB MATERIALS:** a list of supplies needed will be sent no later than 4-6 weeks before the start of the course. MOST SUPPLIES WILL BE HOUSEHOLD TYPE PRODUCTS.
9. **Textbook:** Prentice Hall High School Physical Science Concepts in Action with Earth and Space Science. Edition 2006C by Wyssession, Frank, Yancopoulos
 - a. Online Link for text: Thriftbooks.com

GRADING:

- Grades will always be available in Canvas for students and parents. I recommend checking often to keep up to date on your progress. Averages will be given at the end of each semester.
- Grades will be given on a point system and put into categories with varying weight percentages:
Homework: 30%
Exams: 30%
Labs and Projects: 30%

Participation 10%

LATE POLICY:

All assignments are designed in a scaffolded way to help students perform well on the unit tests. Therefore, the expectation is to complete and submit assignments in the order they are assigned.

- To reward students for assignments submitted **ON the DUE DATE**, a $\frac{1}{4}$ **extra credit point** will be given for **each** assignment submitted on the **DUE DATE**. **Excluding UNIT TESTS/PROJECTS.**
- Assignments will be accepted past the due date (without the extra credit) until the close of a unit which will be on the **UNIT TEST DAY**.
- After the unit test day, **NO** credit will be given for an assignment. Extenuating circumstances will be considered with parental communication.

CHEATING:

Cheating will not be tolerated. If a student is suspected of cheating, the assignment will result in a zero and disciplinary action will result. This applies to copying another students' work or plagiarism.

OFFICE HOURS:

- While I am always an email away...sometimes it may take me a little while to respond. It is my priority to respond quickly and within 24 hrs.
- I will provide one hour outside of weekly live classes to be immediately available for your questions. I will let you know and remind you often of this hour before the beginning of the school year. If ever this office hour changes, I will give you plenty of notice.

TECHNOLOGY REQUIRED:

1. High speed, broadband Internet
2. Sound card and microphone (for live sessions)
3. Streaming video capabilities to watch video lectures and other videos as assigned
4. Computer Access
5. Microsoft Word, Excel and PowerPoint or Google Docs, Sheets and Slides Access. PDF reader
6. Printer
7. Scanner/Ability to scan with phone or tablet.