



# HUDSONVILLE HIGH SCHOOL COURSE FRAMEWORK



**COURSE/SUBJECT**

**Chemistry Concepts**

<b>KEY COURSE OBJECTIVES/ ENDURING UNDERSTANDINGS</b> Important ideas and core processes	<b>UNIT PACING</b> Names of units and approximate pacing	<b>UNIT LEARNING TARGETS</b> By the end of the unit, students will be able to...	<b>STANDARD</b> Which standards (i.e. common core, MMC, etc.) does this address?
<p>Investigative practices that drive the course and therefore are used throughout it.</p>		<p>Students will be able to write a formal lab writeup. Students will be able to present and defend their claims in front of class. The sequence of learning targets are reflected in the standards in the next column.</p>	<p>C1.1A Generate new questions that can be investigated in the laboratory or field. C1.1B Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions. C1.1C Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity -- length, volume, weight, time interval, temperature -- with the appropriate level of precision). C1.1D Identify patterns in data and relate them to theoretical models. C1.1E Describe a reason for a given conclusion using evidence from an investigation. C1.2 Scientific Reflection and Social Implications C1.2A Critique whether or not specific questions can be answered through scientific investigations. C1.2B Identify and critique arguments about personal or societal issues based on scientific evidence. C1.2C Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information. C1.2D Evaluate scientific explanations in a peer review process or discussion format. C1.2E Evaluate the future career and occupational prospects of science fields.</p>

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	Matter and its Changes - 2 weeks		P4.p2A Distinguish between an element, compound, or mixture based on drawings or formulas. (prerequisite) P4.p2B Identify a pure substance (element of compound) based on unique chemical and physical properties. (prerequisite) P4.p2C Separate mixtures based on the difference in physical properties of the individual components. (prerequisite) P4.p2D Recognize that the properties of a compound differ from those of its individual elements. (prerequisite) C5.2B Distinguish between chemical and physical changes in term of the properties of the reactants and products. C5.2C Draw pictures to distinguish the relationships between atoms in physical changes.
	Atom and Periodic Table - 2 weeks		C4.8A Identify the location, relative mass, and charge for electrons, protons, and neutrons. C4.8B Describe the atom as mostly empty space with an extremely small, dense nucleus consisting of the protons and neutrons and an electron cloud surrounding the nucleus. C4.8C Recognize that protons repel each other and that a strong force needs to be present to keep the nucleus intact. C4.8D Give the number of electrons and protons present if the fluoride ion has a -1 charge. C4.10 Neutral Atoms, Ions, and Isotopes C4.10A List the number of protons, neutrons, and electrons for any given ion or isotope. C4.10B Recognize that an element always contains the same number of protons.

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	Bonding - 1.5 weeks		C5.5A Predict if the bonding between two atoms of different elements will be primarily ionic or covalent. C5.5B Predict the formula for binary compounds of main group elements. C4.2A Name simple binary compounds using their formulas. C4.2B Given the name, write the formula of simple binary compounds.
	Chemical Reactions - 1 week		C5.2A Balance simple chemical equations applying the conservation of matter. C3.4A Use the terms endothermic and exothermic correctly to describe chemical reactions in the laboratory. C3.4B Explain why chemical reactions will either release or absorb energy.
	Energy Transfer through Heat and Phase Changes - 1.5 week		P5.p1A Draw a picture of the particles of an element or compound as a solid, liquid, and gas. (prerequisite) P2.p1A Describe energy changes associated with changes of state in terms of the arrangement and order of the atoms (molecules) in each state. (prerequisite) P2.p1B Use the positions and arrangements of atoms and molecules in solid, liquid, and gas state to explain the need for an input of energy for melting and boiling and a release of energy in condensation and freezing. (prerequisite) P4.p1A For a substance that can exist in all three phases, describe the relative motion of the particles in each of the phases. (prerequisite) P4.p1B For a substance that can exist in all three phases, make a drawing that shows the arrangement and relative spacing of the particles in each of the phases. (prerequisite)

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			<p>P4.p1C For a simple compound, present a drawing that shows the number of particles in the system does not change as a result of a phase change. (prerequisite)</p> <p>P3.p1A Explain that the amount of energy necessary to heat a substance will be the same as the amount of energy released when the substance is cooled to the original temperature. (prerequisite)</p> <p>C4.3A Recognize that substances that are solid at room temperature have stronger attractive forces than liquids at room temperature, which have stronger attractive forces than gases at room temperature.</p> <p>C4.3B Recognize that solids have a more ordered, regular arrangement of their particles than a liquid and that liquids are more ordered than gases.</p> <p>C2.2A Describe conduction in terms of molecules bumping into each other to transfer energy. Explain why there is better conduction in solids and liquids than gases.</p> <p>C2.2B Describe the various states of matter in terms of the motion and arrangement of the molecules (atoms) making up the substance.</p> <p>P3.p2A Trace (or diagram) energy transfers involving various types of energy including nuclear, chemical, electrical, sound, and light. (prerequisite)</p>
	Acid / Base Chemistry 1.5 weeks		<p>C5.7A Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from families I and II.</p> <p>C5.7B Predict products of an acid-base neutralization.</p> <p>C5.7C Describe tests that can be used to distinguish an acid from a base.</p> <p>C5.7D Classify various solutions as acidic of basic, given their pH.</p> <p>C5.7E Explain why lakes with limestone or calcium carbonate experience less adverse effects from acid rain than lakes with granite beds.</p>

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	Carbon Chemistry - 1.5 weeks		C5.8A Draw structural formulas for up to ten carbon chains of simple hydrocarbons. C5.8B Draw isomers for simple hydrocarbons. C5.8C Recognize that proteins, starches, and other large biological molecules are polymers.