

Chemistry You Need to Know and Ohio Science Standards

Ohio Standards		Chpt 1-- Scientist s Tools	Chpt 2-- Antacids	Chpt 3-- Airbags	Chpt 4-- Light	Chpt 5-- Soap	Chpt 6-- Sports Drinks	Chpt 7-- Hot packs	Chpt 8-- Industry	Chpt 9-- Forensic s	Chpt 10-- Batteries	Chpt 11-- Polymer s	Chpt 12-- Nuclear radiation
9th grade													
	1. Recognize that all atoms of the same element contain the same number of protons, and elements with the same number of protons may or may not have the same mass. Those with different masses (different numbers of neutrons) are called isotopes.				Section 4-2								
	2. Illustrate that atoms with the same number of positively charged protons and negatively charged electrons are electrically neutral.				Section 4-2								
	3. Describe radioactive substances as unstable nuclei that undergo random spontaneous nuclear decay emitting particles and/or high energy wavelike radiation.												Section 12-1
	4. Show that when elements are listed in order according to the number of protons (called the atomic number), the repeating patterns of physical and chemical properties identify families of elements. Recognize that the periodic table was formed as a result of the repeating pattern of electron configurations.				Section 4-4, 4-5								
	5. Describe how ions are formed when an atom or a group of atoms acquire an unbalanced charge by gaining or losing one or more electrons.		Section 2-2, 2-3			Section 5-1, 5-2	Section 6-1						
	6. Explain that the electric force between the nucleus and the electrons hold an atom together. Relate that on a larger scale, electric forces hold solid and liquid materials together (e.g., salt crystals and water).				Section 4-1	Section 5-5, 5-6	Section 6-1						

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Nature of matter	7. Show how atoms may be bonded together by losing, gaining or sharing electrons and that in a chemical reaction, the number, type of atoms and total mass must be the same before and after the reaction (e.g., writing correct chemical formulas and writing balanced chemical equations).		Section 2-2, 2-3, 2-4, 2-6, 2-7									
	8. Demonstrate that the pH scale (0-14) is used to measure acidity and classify substances or solutions as acidic, basic, or neutral.		Section 2-5									
	9. Investigate the properties of pure substances and mixtures (e.g., density, conductivity, hardness, properties of alloys, superconductors and semiconductors).		Section 2-1	Section 3-1, 3-2, 3-3								
	10. Compare the conductivity of different materials and explain the role of electrons in the ability to conduct electricity.					Section 5-1						
	11. Explain how thermal energy exists in the random motion and vibrations of atoms and molecules. Recognize that the higher the temperature, the greater the average atomic or molecular motion, and during changes of state the temperature remains constant.			Section 3-1				Section 7-3				
	14. Summarize how nuclear reactions convert a small amount of matter into a large amount of energy. (Fission involves the splitting of a large nucleus into smaller nuclei; fusion is the joining of two small nuclei into a larger nucleus at extremely high energies.)											Section 12-1, 12-2

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Historical perspectives	27. Describe advances and issues in physical science that have important, long-lasting effects on science and society (e.g., atomic theory, quantum theory, Newtonian mechanics, nuclear energy, nanotechnology, plastics, ceramics and communication technology).				Section 4-1								
11th grade													
Nature of matter	Explain that elements with the same number of protons may or may not have the same mass and those with different masses (different numbers of neutrons) are called isotopes. Some of these are radioactive.				Section 4-2								
	2. Explain that humans have used unique bonding of carbon atoms to make a variety of molecules (e.g., plastics).										Section 11-1, 11-2, 11-3		
12th grade													
	1. Explain how atoms join with one another in various combinations in distinct molecules or in repeating crystal patterns.					Section 5-1, 5- 2, 5-3							
	2. Describe how a physical, chemical or ecological system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.								Section 8-1, 8-2, 8- 3, 8-4				

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Historical perspectives	14. Use historical examples to explain how new ideas are limited by the context in which they are conceived; are often initially rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., nuclear energy, quantum theory and theory of relativity).	Section 1-1 and throughout											
	15. Describe concepts/ideas in physical sciences that have important, long-lasting effects on science and society (e.g., quantum theory, theory of relativity, age of the universe).												
	Science & Technology, Scientific Inquiry & Science as a way of Knowing standards:	These standards are introduced in Section 1-1 and used throughout the text. Each chapter includes inquiry labs, discovery labs (students derive meaning from data before being formally introduced to concept) and a connection to technology through the chapter theme. Students are asked to communicate their findings, discuss discrepancies with their classmates, come to concensus based on evidence, etc., modeling the scientific community.											