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Pre-AP Chemistry

This course is intended to teach and reinforce crucial academic skills to help students strengthen their background in chemistry. *Career*Tech Pre-AP Chemistry is an introductory look at basic chemical principles and gives students hands-on lab experience. By performing experiments, analyzing data, manipulating numbers mathematically, and studying scientific information, students will acquire the skills and knowledge necessary to better understand the world. It will provide students with a solid foundation in the areas of structure and properties of matter as well as all aspects of chemical reactions. Mathematical computations are a strong part of chemistry and therefore math is integrated throughout the course. Upon completion of *Career*Tech Pre-AP Chemistry, a student will be prepared for AP Chemistry.

Course Description:

Pre-AP Chemistry is designed to prepare students for the complex thinking that will be expected in future science courses. This course will focus on the development of the student as a scientist through the study of chemistry. Being a scientist requires a broad set of tools, including theory, problem solving, written and oral communication, interpreting data and laboratory skills. Areas covered are: Matter, atoms & periodic table, molecules & compounds, chemical reactions & stoichiometry, Aqueous solutions & reactions, Gases, Energy & Chemical Reactions, Atomic & Molecular Structure. Prerequisites for this course are: Algebra I, Biology

Requirements for College Admission Status (Title 70 O.S. § 11-103.6)

These courses are to be taught by a highly qualified teacher with an Oklahoma Chemistry teaching certification. The students should be in the eleventh or twelfth grade or if a sophomore, they should be in a Focused Field of Career Study program. The prerequisites for this course are Biology I and Algebra I. The course should consist of 40% laboratory or fieldwork in order to be considered a lab science. The course will have at a minimum, but may exceed, a duration of 120 hours within a school year (72 hours theory/48 lab hours).

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Pre-AP Chemistry

Objective	National Science Education Standards 9-12 Content Standards	Oklahoma PASS Chemistry Content and Process Standards
I. Matter and Measurements		
A. Elements, atoms. and compounds	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
B. Chemical and Physical properties	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
C. Conversions	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
D. Scientific Method	A	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
E. Significant Figures	A	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
II. Atoms and Periodic Table		
A. Atomic Theory	A, B, G	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
B. Structure	A, B, G	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
C. Moles and Molar Mass	A, B, G	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
D. Periodicity	A, B, G	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
III. Molecules and Compounds		
A. Naming and writing	B	1.1, 1.2, 1.3, 1.4, 1.5,

formulas		2.3, 2.4
B. Percent Composition	B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
C. Empirical Formulas	B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
IV. Chemical Reactions and Stoichiometry		
A. Writing and Balancing Chemical Equations	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
B. Mass mole relationships	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
C. Types of chemical reactions	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
D. Limiting reactants	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
E. Percent yield	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
V. Aqueous Solutions and Reactions		
A. Types of aqueous reactions (Acid-Base, precipitation, gas-forming, oxidation-reduction)	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
B. Net ionic equations	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
C. Molarity	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
D. pH	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4
E. Titration	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.3, 2.4

VI. Gases		
A. Gas Laws (Boyles Law, Charles Law, Combined Gas Law, Ideal Gas Law, Dalton's Law)	A, B, G	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
B. Diffusion and effusion	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
VII. Energy and Chemical Reaction		
A. Temperature	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
B. Specific Heat	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
C. Enthalpy	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
VIII. Atomic Structure		
A. Quantum Mechanical Model	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
B. Energy Levels and orbitals	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
C. Bohr's Model	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
D. Electron Configuration	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
E. Periodic Trends	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
IX. Molecular Structure		
A. Lewis Structures	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
B. Ionic and Covalent Bonding	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
C. Electronegativity	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
D. Resonance Structures	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
E. VSEPR structures	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
Suggested Labs		
Laboratory Techniques	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2,

		4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Accuracy and Precision	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Separation of Mixtures	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Flame Tests	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Percent Composition of Hydrates	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Polymers	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Stoichiometry and Gravimetric Analysis	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Stoichiometry of	A, B	1.1, 1.2, 1.3, 1.4, 1.5,

Reactions		2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Calorimetry and Hess's Law	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Colorimetry and Molarity	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Boiling Point Elevation and Molar Mass	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Equilibrium Expressions	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Acid-Base Titration	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2,

		6.3, 6.4
Buffering	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Reaction Rate	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Redox Titration	A, B	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process Standards 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4

References and Resources

Referenced Standards

National Science Standards (5th ed). (1998). National Research Council, Washington, D.C., National Academy of Sciences

Oklahoma Priority Academic Student Skills (2003). Oklahoma State Department of Education-PASS-{ www.sde.state.ok.us}

Suggested Texts and Supplemental Materials

Zumdahl, Steven (2003). *Introductory Chemistry: A Foundation* (5th ed.). Boston: Houghton Mifflin.

Corwin, (2005). *Introductory Chemistry: Concepts and Connections*(4th ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.

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Singh, M.M., Pike, R.M., Szafran, Z. (1995). *Microscale and Selected Macroscale Experiments for General and Advanced General Chemistry: An Innovative Approach* (1st ed.). John Wiley & Sons, Inc.

Burns, Ralph A. (2003). *Fundamentals of Chemistry in the Laboratory*(4th ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.

Corwin, (2006). *Lab Manual Introductory Chemistry* (4th ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.

Gloffke, Wendy and Doris Kimbrough (2002). *Introductory Chemistry Laboratory Manual* (2nd ed.). San Francisco, CA: Benjamin Cummings.

Tyner, Kathy L. (1995). *Laboratory Exercises for Preparatory Chemistry* (1st ed.). New York, NY: McGraw-Hill.