Elizabethtown Area School District

Chemistry II

Name of Course

Course Number: 325	Length of Course: 18 weeks
Grade Level: 10-12 Elective	Total Clock Hours: 120
Length of Period: 80 min	Date Written: June 11, 2007
Periods per Week/Cycle:5	Written By: Scott Baylor
Credits (if app.):1.0	Weighting: 1.05 (2007 – 2009) 1.10 (2010)

Prerequisite: Chemistry or Honors Chemistry

Course Description:

This weighted course is an advanced course for students interested in pursuing a career in any science related field and is taught at the collegiate level, including assessment and pacing. The course is a continuation of first-year chemistry and focuses on chemical bonding, a detailed study of the three phases of matter, thermodynamics, solution chemistry, reaction rates (kinetics), chemical equilibrium, a detailed study of acids and bases, oxidation and reduction and basic organic chemistry nomenclature. The course also reinforces the concepts from first-year chemistry and provides a solid background for any college-bound student.

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I. Overall Course/Grade Level Standards

Students will KNOW and be able TO DO the following as a result of taking this course.

A. Describe and apply the kinetic molecular and particle theories to all phases of matter and solutions.
B. Describe the behavior of gases under varying pressure and temperature conditions.
C. Perform calculations involving the collection of gases, reactions of gases and other various stoichiometric relationships.
D. Identify and classify basic crystalline structures.
E. Explain the intra- and intermolecular forces holding crystals together.
F. Explain the properties of solids, liquids, gases, and solutions using KMT, particle theory, intermolecular and intramolecular attractive forces.
G. Determine energy involved in chemical and physical reactions.
H. Use Le Chatelier's principle to explain chemical and physical equilibriums as it applies to chemical and physical systems.
I. Explain basic solution chemistry principles.
J. Explain basic acid / base chemistry principles.
K. Determine rates and reasons for chemical reactions.
L. Write and balance oxidation - reduction (REDOX) equations.
M. Use standard electrode potentials to predict the direction of a chemical reaction, maximum voltage produced, and the products of an electrolytic cell.
N. Solve the mathematical problems and work the quantitative relationships that pertain to all topics mentioned in the overall course objectives.
O. Qualitatively analyze an unknown using a self made flow chart.
P. Perform those laboratory skills that are necessary for college level laboratory work.
Q. Use writing and reporting skills required in a college laboratory.
R. Write scientific research papers on chemistry oriented topics.
S. Write net ionic equations.
T. Use appropriate charts and diagrams to explain chemical and physical phenomenon.
U. Name, classify and draw basic organic compounds.
V. Understand that scientific knowledge is a constantly changing and adapting body of scientific facts attempting to explain the world in which we live.
W. Understand that scientific knowledge is not exact, but as accurate as human technology allows.

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II. Content

Major Areas of Study

List all units of study below:

Unit	Estimated Time	Materials
1. Gas Stoichiometry	7 blocks	Text, lab supplies
2. Liquids and Solids	8 blocks	Text, lab supplies
3. Solutions	7 blocks	Text, lab supplies
4. Ions in Aqueous Solutions & Colligative Properties	7 blocks	Text, lab supplies
5. Qualitative Analysis	11 blocks	Text, lab supplies
6. Acids & Bases	7 blocks	Text, lab supplies
7. Acid – Base Titration and pH	6 blocks	Text, lab supplies
8. Reaction Energy & Reaction Kinetics	8 blocks	Text, lab supplies
9. Chemical Equilibrium	8 blocks	Text, lab supplies
10. Oxidation – Reduction	8 blocks	Text, lab supplies
11. Organic Chemistry Nomenclature	7 blocks	Text, lab supplies

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Name of Course: Chemistry II Name of Unit: Gas Stoichiometry
Essential Question for the Unit: How do we predict quantitites of gas products and reactants produced and needed?

Unit Objectives/Key Questions			
A. How does the collection of gases through water displacement impact the volume, temperature and pressure of that gas?	E	A, B, C	3.2.7.A
B. How do the temperature, pressure, volume and number of moles of a gas relate?	E	B, C	3.2.7.A
C. How can the properties of a gas be used to determine other properties of that gas?	I	A, B, C	3.2.7.A
D.			
E.			
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Curriculum Form

Name of Course: Chemistry II Name of Unit: Liquids and Solids

Essential Question for the Unit: How do the intermolecular attractive forces of liquids and solids affect their chemical and physical properties?

Unit Objectives/Key Questions			
A. Describe a solid and liquid using the kinetic molecular theory.	E	A, F	3.2.7.A
B. Classify solids according to the seven basic types of crystalline shapes.	E	D	3.2.12.A
C. Classify crystals depending on composition using the four types of crystals.	E	E	3.2.12.A, 3.2.10.A
D. Use phase diagrams to determine boiling points, melting points, critical temperature and pressure, and triple points.	E	T	3.2.10.A, 3.2.12.A
E. Use Le Chatelier's principle to evaluate and describe dynamic equilibrium.	I	H	3.7.12.A
F. Calculate energy involved in raising the temperature of a substance from below freezing to above boiling.	E	G, N, T, W	3.2.12.B
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Name of Course: Chemistry II Name of Unit: Solutions
Essential Question for the Unit: Why are solutions so important in chemistry?

Unit Objectives/Key Questions			
A. Distinguish between heterogeneous and homogeneous mixtures.	E	I	3.2.12.A, 3.2.12.B
B. Distinguish between electrolytes and nonelectrolytes.	E	I	3.2.12.A, 3.2.12.B
C. Compare and contrast suspensions, colloids, and solutions.	I	I	3.2.12.A, 3.2.12.B
D. Explain the mechanisms of the dissolving process for ionic and molecular substances including the energy involved.	E	I, T	3.2.12.A, 3.2.12.B
E. List and explain the factors that influence the rate of dissolving of a solid in a liquid.	E	I	3.2.12.A, 3.2.12.B
F. Explain solution equilibrium.	E	I	3.2.12.A, 3.2.12.B
G. Explain and use general solubility rules.	I	I	3.2.12.A, 3.2.12.B
H. Explain and calculate heats of solutions.	E	I, G	3.2.12.A, 3.2.12.B
I. Compare the affect of temperature and pressure on solubility.	E	I	3.2.12.A, 3.2.12.B
J. Determine various concentrations of solutions using molarity, molality, normality, mole fraction, % mass, and % volume.	E	I, N	3.2.12.A, 3.2.12.B
K. Prepare various solutions of varying concentrations.	I	P, I	3.2.12.A, 3.2.12.B
L. Write net ionic equations for soluble, slightly soluble and insoluble compounds.	E	I, S, T	3.2.12.A, 3.2.12.B

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Aligned to PA Standard

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Name of Course: Chemistry II Name of Unit: Physical, Chemical and Colligative Properties of Solutions

Essential Question for the Unit: How do environmental conditions affect the physical, chemical and colligative properties of solutions?

Unit Objectives/Key Questions			
A. Compare and contrast physical, chemical and colligative properties.	E	I, P	3.2.12.A, 3.2.12.B
B. Using the colligative properties of a solution determine the boiling point and melting point of solutions with varying concentrations.	E	I, P	3.2.12.A, 3.2.12.B
C. Using the colligative properties of a solution determine the molar mass of rock salt.	I	I, P, R, Q	3.2.12.A, 3.2.12.B
D. Using the colligative properties of a solution determine the temperature of Tomis in 8 A.D.	C	I, P, R, V, W	3.2.12.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Acids and Bases
Essential Question for the Unit: What makes an acid an acid and a base a base?

Unit Objectives/Key Questions			
A. Describe, name, compare and contrast acids and bases using the Arrhenius, Bronsted-Lowery, and Lewis definitions of acids and bases.	E	J	3.2.12.A, 3.2.12.B
B. Determine the strength of acids and bases.	E	J, N	3.2.12.A, 3.2.12.B
C. Use the K_w to determine $[H_3O^+]$, $[OH^{-1}]$ in solutions of various concentrations.	E	J, N	3.2.12.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Acid / Base Titration and pH
Essential Question for the Unit: How do bases neutralize acids and how much base is needed to do so?

Unit Objectives/Key Questions			
A. Use acid/base reactions to determine concentrations, pH, and % ionization of substances.	E	J, N, P	3.2.12.A, 3.2.12.B
B. Calculate various equilibrium constants and use them to describe the properties of acids and bases.	E	J, I, N	3.2.12.A, 3.2.12.B
C. Explain how indicators work.	C	J	3.2.12.A, 3.2.12.B
D. Calculate pH and solution concentration using $[H_3O^+]$.	E	J, N	3.2.12.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Qualitative Analysis
Essential Question for the Unit: How can the properties of various solutions be used to identify an unknown solution?

Unit Objectives/Key Questions			
A. Construct a flow chart showing the reactions of solutions made in previous chapter.	E	T, P, O, V, W	3.7.12.A
B. Identify an unknown solution from the known solution prepared previously using the flow chart.	E	T, P, O, V, W	3.7.12.A
C.			
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Name of Course: Chemistry II Name of Unit: Reaction Energy and Kinetics
Essential Question for the Unit: How are reactions affected by changes in temperature?

Unit Objectives/Key Questions			
A. Explain and calculate heat of reaction, heat of formation and enthalpy.	E	K, G, N	3.2.10.A, 3.2.12.B
B. Describe the relationships between enthalpy, entropy, and reaction tendencies.	C	K	3.2.10.A, 3.2.12.B
C. Calculate and interpret free energy.	E	K, N	3.2.10.A, 3.2.12.B
D. Describe how a reaction occurs using the collision theory.	E	K	3.2.10.A, 3.2.12.B
E. Discuss reaction rates and factors that affect these reaction rates using chemical kinetics.	E	K	3.2.10.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Chemical Equilibrium
Essential Question for the Unit: How can chemical equilibrium be used to predict solubilities?

Unit Objectives/Key Questions			
A. Define discuss and explain chemical equilibrium.	E	K	3.2.10.A, 3.2.12.B
B. Write equilibrium expressions and use them in calculations.	E	K, N	3.2.10.A, 3.2.12.B
C. Apply Le Chatelier's principle to chemical equilibrium.	C	K, N	3.2.10.A, 3.2.12.B
D. Explain and calculate solubility product constants.	E	K	3.2.10.A, 3.2.12.B
E. Using solubility product constants detemine if precipitation occurs when two solutions are mixed.	E	K, N, P	3.2.10.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Oxidation – Reduction
Essential Question for the Unit: How do REDOX reactions affect our society?

Unit Objectives/Key Questions			
A. Assign oxidation numbers to reactants and products.	E	K	3.2.10.A, 3.2.12.B
B. Balance REDOX reactions.	E	K, L, N	3.2.10.A, 3.2.12.B
C. Relate chemical actvity to oxidizing and reducing strength.	I	K	3.2.10.A, 3.2.12.B
D. Compare and contrast electrochemical, voltaic and electrolytic cells.	C	K, M, V, W	3.2.10.A, 3.2.12.B
E. Explain, use and solve problems involving standard, electrode potentials.	C	K, M, V, W	3.2.10.A, 3.2.12.B
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Name of Course: Chemistry II Name of Unit: Organic Chemistry Nomenclature
Essential Question for the Unit: How are organic substances classified, drawn and named?

Unit Objectives/Key Questions			
A. Classify, name and draw basic organic substances.	C	U	3.2.12.A
B.			
C.			
D.			
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III. Course Assessments

Check types of assessments to be used in the teaching of the course.
(Provide examples of each type.)

__X Objective Tests/Quizzes
____ Constructed Responses
____ Essays
____Reports
_X__ Projects
____ Portfolios
____ Presentations
____ Performance tasks
____ _____

____ Response Journals
____ Logs
____ Computer Simulations
_X__ Research Papers
____ Class Participation
____ Notetaking
____ Daily Assignments
____ Writing Samples
____ _____

Provide copies of common assessments that will be utilized for all students taking this course. Overall course/grade level standards will be measured by a common course assessment. Unit objectives will be measured on an ongoing basis as needed by the classroom teacher to assess learning and plan for instruction. List common assessements below and recommended date/time frame for administration (at least quarterly).

Name of Common Assessment	When given?
1. Formal Lab report – college level	Freezing point depression lab
2. Research Paper	Assigned at beginning of semester – due at the end of semester
3. Final	End of Semester
4.	
5.	
6.	

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IV. Expected levels of achievement

Current grading scale:

A^+	98 – 100
A	95 – 97
A^-	92 – 94
B^+	89 – 91
B	86 – 88
B^-	83 – 85
C^+	80 – 82
C	77 – 79
C^-	74 – 76
D^+	71 – 73
D	68 – 70
D^-	65 – 67
F	64 – 0

PA Proficiency Levels
Advanced Proficient
Basic Below Basic

Attach rubrics, checklists, or other documentation noting how levels of proficiency will be determined for common assessments. The following scoring documents have been developed for this course:

FREEZING POINT DEPRESSION LAB POINTS

NAME _____

CATEGORY	POSSIBLE POINTS	POINTS EARNED
INTRODUCTION / PURPOSE	10 POINTS	
MATERIALS & APPARATUS	5 POINTS	
PROCEDURE	15 POINTS	
OBSERVATION	10 POINTS	
DATA TABLE	15 POINTS	
CALCULATIONS	15 POINTS	
RESULTS	15 POINTS	
CONCLUSION	15 POINTS	
TOTAL	100 POINTS	