# SYLLABUS
# 11931/11932 SP17
# CHE*K122 General Chemistry II
# Three Rivers Community College
# Norwich, Connecticut 06360

***Welcome to General Chemistry II. I hope you had a nice break!***

Instructor: Dr. Shaneela Nosheen

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Office hours: Upon Request.

Disabilities Notice:

If you have a disability that may affect your progress in this course, please meet with a Disability Service Provider (DSP) as soon as possible. Please note that accommodations cannot be provided until you provide written authorization from a DSP.

TRCC Disabilities Service Provider: Matt Liscum (860) 215-9265
Counseling & Advising Office
Room A-119

- Physical Disabilities
- Sensory Disabilities
- Medical Disabilities
- Mental Health Disabilities
- Learning Disabilities
- ADD/ADHD
- Autism Spectrum

**BOARD OF REGENTS FOR HIGHTER EDUCATION AND CONNECTICUT STATE COLLEGES AND UNIVERSITIES POLICY REGARDING SEXUAL MISCONDUCT REPORTING, SUPPORT SERVICES AND PROCESSES POLICY**

"Title IX of the Education Amendments of 1972 (Title IX) prohibits discrimination based on sex in education programs and activities in federally funded schools at all levels. If any part of a school district or college receives any Federal funds for any purpose, all of the operations of the district or college are covered by Title IX.

Title IX protects students, employees, applicants for admission and employment, and other persons from all forms of sex discrimination, including discrimination based on gender identity or failure to conform to stereotypical notions of masculinity or femininity. All students (as well as

other persons) at recipient institutions are protected by Title IX – regardless of their sex, sexual orientation, gender identity, part-or full-time status, disability, race, or national origin-in all aspects of a recipient's educational programs and activities."

If any student experiences sexual misconduct or harassment, and/or racial or ethnic discrimination on Three Rivers Community College Campus, or fears for their safety from a threat while on campus, please contact Edward A. Derr, the Diversity Officer and Title IX Coordinator: Admissions Welcome Center * Office A116 PHONE # 860.215.9255
* EDerr@trcc.commnet.edu

## Course: General Chemistry II/CHE*K122

Credits: 4 credit hours (3hr lecture/3hr lab each week)

Course Description: Further study of the principles, theories and laws of chemistry. Topics include kinetics, equilibrium, thermodynamics, oxidation-reduction, electrochemistry, organic chemistry, nuclear chemistry and the chemistry of the elements and their compounds.

Prerequisites: CHE*K121 with a "C" grade or better, MAT* K186 with a "C" grade or better.

Text: *Chemistry The Central Science*, 13th ed., Brown, LeMay, Bursten, Murphy, Woodward, Stoltzfus; Pearson Publishing.

Lab Manual: *CHE 122 General Chemistry II Laboratory Exercises*, second edition, M. Carta, Academy.

Other Required Materials: Chemical safety goggles, scientific calculator.

General Course Objectives:
1. To provide students with a solid understanding of the fundamental concepts of chemistry.
2. To encourage students to apply problem-solving skills toward chemical calculations.
3. To educate students in the language and nomenclature of chemistry.
4. To help students relate chemical concepts to practical applications.

Class Attendance Policy:
Attendance of all class activities in lecture and laboratory is required. Absences are counted from the first meeting of class. More than four consecutive or more than six accumulative absences could result in a student receiving an "F" grade in this course. An explanation of the cause of all absences should be given to your instructor either by phone or email. Any missed handouts or other supplemental material may be obtained from BlackBoard.

Learning Portfolio: All students are required to maintain an online learning portfolio in Digication that uses the college template.

Academic and Classroom Misconduct:

The instructor has primary responsibility for control over classroom and/or laboratory behavior and maintenance of academic integrity, and can request the temporary removal or exclusion from the classroom or laboratory of any student engaged in conduct that violates the general rules and regulations of the institution. This includes any student engaged in conduct deemed hazardous in the laboratory. Extended or permanent exclusion from lecture or laboratory activities or further disciplinary action can only be effected through appropriate procedures of the institution. Plagiarism, cheating on quizzes or tests, or any form of academic dishonesty is strictly prohibited. Students guilty of academic dishonesty directly or indirectly will receive a zero for the exercise or quiz or test and may receive an "F" grade for the course in addition to other possible disciplinary sanctions which may be imposed through the regular institutional procedures. Any student that believes that he or she has been erroneously accused may appeal the case through the appropriate institutional procedures if their grade was affected.

College Withdrawal Policy:

Any student who finds it necessary to discontinue this course MUST complete a withdrawal form in the Registrar's Office at the time of the withdrawal. Students may withdraw from the course any time during the 14 weeks of class to receive a "W" grade for the course (Deadline will be announced). Students who do not withdraw, but stop attending will be assigned an "F" grade in in this course. Verbal withdrawals CANNOT be accepted. If you are unable to withdraw in person, you may call the Registrar's Office and provide them with the appropriate information. *Once you withdraw from the course you are no longer eligible to attend class or take any remaining quizzes or tests.*

Revisions to the Syllabus:

Students are responsible for learning all of the objectives and all of the items in the course outline whether they are discussed in lecture and/or laboratory or not. The instructor reserves the right to revise the objectives, topical outline, or academic schedule contained in this syllabus without notice. However, if the revisions affect scheduled unit tests a 48-hour notice will be given for the new test date.

Grade Determination:

3 Unit Tests….....45%

Final exam Cumulative……25%

Online Homework/Daily lecture quizzes….10%

Lab ……..……20%

Grade Scale: There will be no grading on the normal distribution curve.

| | | |
|---|---|---|
| 100.00 - 93.50 = A | 79.49 - 77.50 = C+ | 59.49 - 00.00 = F |
| 93.49 - 90.00 = A- | 77.49 - 73.50 = C | |
| 89.99 - 87.50 = B+ | 73.49 - 69.50 = C- | |
| 87.49 - 84.50 = B | 69.49 - 63.50 = D+ | |
| 84.49 - 79.50 = B- | 63.49 - 59.50 = D | |

Exams: There will be 3 exams (1 hour each) given during the regular class period. Exams must be taken at the assigned time except under extreme circumstances. The tentative exam schedule is:

| | |
|---|---|
| Exam #1 | Th Feb 16 |
| Exam #2 | Th Mar 09 |
| Exam #3 | Tue Apr 25 |
| Finals | Th May 09 (tentative) |

Make-Ups: There are no make-up hour exams. If a student misses an exam due to an accepted documented reason their final exam grade will be substituted in for the missing exam grade for the purposes of grade calculations. There are also no make-up quizzes due to absences for any reason (see exceptions for athletes, etc.). The lowest quiz score will be dropped for those students who take all quizzes. A missed quiz for any reason will be entered as a zero and as a lowest quiz score will be dropped from the computation of the quiz average. No more than one quiz may be dropped from the quiz average. Extended absences for documented reasons will be handled on a case-by-case basis. Athletes or those who are participating in an organized University sponsored function must provide acceptable documentation for an absence on a test or quiz day and must contact their instructor in advance to schedule to take the exam or quiz before it is given to the remainder of the class. Any supplemental material can be obtained from the instructor. Lab work can only be made up during the week of the missed experiment with permission of the instructor in a scheduled lab period.

**Laboratory:** The laboratory portion of this course is required and a passing grade in lab must be obtained in order to pass K122. If a student misses four or more labs throughout the semester, that student cannot receive credit for having completed the K122 even if the absences are excused and legitimate. **A failing lab grade will automatically result in a failing grade for the entire course. Late arrivals in the lecture or lab are not allowed.**

**Late lab reports:**

All the lab reports are due at the start of the next scheduled meeting of the students regular lab section. Late lab report will be subject to a 25% (5point)grade deduction (5% (1 point off per day late. Reports turned in more than one week late will receive a grade of zero.

**Lab cleanup:**

Before you leave the lab, you will be required to clean your station. This includes all of your glassware, equipment, tray, bench top, and your entire work area. Your lab instructor will not sign you out of lab if your work area is not clean.

**Sign out:**

In order for you to be able to leave lab, your instructor must sign your lab data sheets in the lab manual. If you leave the lab without your instructor signature this will result in a zero for the lab.

Cell Phones and/or beepers:

Cellular phones and beepers are only allowed in class or lab if they are turned off or in silent mode. Under no circumstances are phones to be answered in class. When there are extenuating circumstances that require that a student be available by phone or beeper, that student must speak to the instructor prior to class, so that together they can arrive at an agreement. **A cell phone is not permitted as a substitute for a calculator.**

Course Objectives: CHE*K122- General Chemistry II

1. The student will learn about the factors which affect the rate of chemical reaction.
2. The student will be able to write a rate law.
3. The student will understand the meaning of reaction order.
4. The student will learn how to calculate the half-life for a reactant.
5. The student will be able to understand the meaning of activation energy.
6. The student will learn about different types of catalysts and how they function.
7. The student will be able to calculate the instantaneous and the average reaction rate.
8. The student will be able to understand the concept of reaction mechanism.
9. The student will be able to define enzymes and understand basic enzyme catalysis.
10. The student will be able to define chemical equilibrium.
11. The student will learn how to write an equilibrium expression.
12. The student will learn how to interpret the equilibrium constant.
13. The student will be able to understand the relationship between kinetics and equilibrium.
14. The student will learn how to calculate equilibrium concentrations of reactants and products.
15. The student will understand LeChatelier's principle and factors which affect equilibrium.
16. The student will learn the definitions of acids and bases.
17. The student will learn how to determine the strength of acids and bases.
18. The student will be able to define pH and calculate the pH of acid or base solutions.
19. The student will be able to understand weak acids and the acid ionization constant.
20. The student will learn how to calculate the pH of a weak acid or base solution.
21. The student will be able to understand the concept of Lewis acids and bases.
22. The student will learn how to determine the acid-base properties of salts.
23. The student will be able to understand how titrations are used to quantitate acids and bases.
24. The student will learn how acid-base indicators are used.
25. The student will be able to define a buffer and learn how buffers work.
26. The student will learn how to use the Henderson-Hasselbalch equation.
27. The student will be able to understand the concept of solubility equilibria.
28. The student will learn the definition of the solubility product, $K_{sp}$.
29. The student will be able to understand the common ion effect.
30. The student will be able to understand the laws of thermodynamics.
31. The student will be able to differentiate spontaneous from nonspontaneous processes.
32. The student will be able to define entropy.
33. The student will be able to understand the concept of free energy.
34. The student will learn how to predict spontaneity based on the free energy change, $\Delta G$.
35. The student will learn about the relationship between the equilibrium constant and free energy.
36. The student will be able to understand the relationship between enthalpy, entropy and free energy.
37. The student will be able to understand how equilibrium and free energy are central to living systems.
38. The student will learn how to balance redox equations.
39. The student will be able to understand the basics of galvanic cells.

40. The student will learn the significance of standard reduction potentials.
41. The student will be able to write half-cell reactions.
42. The student will be able to understand the thermodynamics of redox reactions.
43. The student will be able to define the Faraday constant.
44. The student will learn how to use the Nernst equation.
45. The student will learn the definition of a coordination compound.
46. The student will be able to define coordination number, ligand, and chelating agent.
47. The student will learn the basic nomenclature of coordination compounds.
48. The student will be able to understand the bonding in coordination complexes.
49. The student will learn how coordination chemistry applies to biological systems.
50. The student will learn the basic nomenclature of organic compounds.
51. The student will be able to distinguish between types of organic compounds.
52. The student will be able to define and differentiate between geometric, optical and constitutional isomers.
53. The student will be able to predict the physical and chemical properties of various organic compounds.
54. The student will be able to differentiate between the different types of nuclear particles.
55. The student will be able to understand the fundamentals of nuclear reactions.
56. The student will be able to understand the basis of nuclear stability.
57. The student will be able to write and balance nuclear equations.
58. The student will learn the definition of nuclear binding energy.
59. The student will be able to understand natural radioactivity and half-life of radioactive decay.
60. The student will be able to understand the concept of nuclear transmutation.
61. The student will be able to understand the concept of nuclear fission.
62. The student will learn how radioactive isotopes are used in biology and medicine.

Course Outline: CHE*K122- General Chemistry II

UNIT 1

I. Chemical Kinetics
   A. Reaction Rate
      1. factors affecting reaction rate
      2. measuring reaction rates
         a. instantaneous rate
         b. average rate
         c. rate constants
      3. rate law
      4. reaction order
      5. half-life
   B. Activation Energy and Collision Theory
      1. transition state
      2. Arrhenius equation for determining $E_{act}$
   C. Reaction Mechanism
      1. elementary steps
      2. rate-determining step

3. reaction intermediates
4. molecularity
    a. unimolecular, bimolecular and termolecular reactions

D. Catalysts

II. Chemical Equilibrium

A. Law of Mass Action
1. Equilibrium Constant

C. Equilibrium Expressions
1. homogeneous equilibria
2. heterogeneous equilibria
3. $K_c$ vs. $K_p$
4. multiple equilibria

D. Relationship between Kinetics and Equilibrium

E. Reaction Quotient, $Q_c$

F. LeChatelier's Principle
1. factors affecting equilibrium

UNIT 2

I. Acids and Bases

A. Definitions/Theories
1. Arrhenius
    a. hydronium ion
2. Bronsted-Lowry
    a. conjugate acid-base pairs
3. Lewis

B. Properties of Acids and Bases

C. Ion Product of Water
1. $K_w$
2. pH, pOH

D. Strengths of Acids and Bases
1. acid ionization constant $K_a$; percent ionization
2. monoprotic, diprotic, polyprotic acids
3. molecular structure and acid strength

E. Acid-Base Properties of Salts

F. Acid-Base Properties of Oxides and Hydroxides
1. acidic and basic oxides
2. basic and amphoteric hydroxides

II. Acid-Base Equilibria

A. Common Ion Effect

1. Henderson-Hasselbalch equation
2. pKa

B. Buffers
1. importance in biological systems

C. Acid-Base Titrations
1. strong acid-strong base
2. strong acid-weak base
3. weak acid-strong base
4. indicators

III. Solubility Equilibria

A. Solubility Product
1. $K_{sp}$
2. ion product, Q
3. solubility
4. molar solubility

B. Precipitation Reactions

C. Factors Affecting Solubility
1. common ion effect
2. pH effect

D. Complex Ions

UNIT 3

I. Second Law of Thermodynamics

A. Entropy
1. spontaneous processes
2. microstates
3. standard entropy
4. relationship between $\Delta S$ and $\Delta H$

II. Third Law of Thermodynamics

A. Absolute Entropy

B. Gibbs Free Energy (G)
1. standard free energy change, $\Delta G^{\circ}$
2. relationship between $\Delta G$, $\Delta S$ and $\Delta H$
a. predicting the sign of $\Delta G$

III. Free Energy and Equilibrium

A. $\Delta G = -RT\ln K$

IV. Electrochemistry

A. Oxidation-Reduction Reactions
1. balancing redox equations

B. Galvanic Cells
1. anode, cathode
2. half-cell reactions
3. cell potential or emf

4. Daniel cell
5. standard reduction potentials

C. Thermodynamics of Redox Reactions
1. relationship between $E_{cell}$, $\Delta G$ and K

D. Effect of Concentration on $E_{cell}$
1. Nernst equation

E. Electrolysis

UNIT 4

I. Chemistry of Metals
A. Sources/Production
1. minerals
2. ores
3. alloys

B. Band Theory
1. conductors and semiconductors

II. Transition Metal Chemistry
B. Electron Configurations

III. Coordination Chemistry
1. coordination number
2. donor atom
3. ligand
4. chelating agent
2. nomenclature
3. structure
4. isomerism
a. geometric isomers, optical isomers, chirality
5. bonding
a. crystal field theory
6. reactivity
7. applications of coordination chemistry
a. industrial
b. biological

III. Organic Chemistry
A. Classes of Compounds/Nomenclature
1. aliphatic hydrocarbons
a. alkanes, alkenes, alkynes, alicyclic hydrocarbons
2. aromatic hydrocarbons
a. benzene and related compounds

B. Functional Groups
1. alcohols
2. carboxylic acids
3. amines
4. amides
5. aldehydes

6. ketones
7. esters
8. ethers

C. Physical and Chemical Properties
1. mp, bp, solubility
2. reactivity

D. Isomers
1. cis/trans isomers
2. constitutional isomers
3. optical isomers and chirality

UNIT 5

IV. Nuclear Chemistry

A. Subatomic Particles
1. protons, neutrons, electrons
2. beta particles, alpha particles, positrons

B. Fundamentals of Nuclear Reactions
1. radioactive decay
2. nuclear transmutation
3. conservation of atomic number
4. conservation of mass number

C. Nuclear Stability
1. belt of stability
2. nuclear binding energy

D. Kinetics of Radioactive Decay
1. half-life
2. radiocarbon dating

E. Nuclear Fission
1. critical mass
2. nuclear chain reaction
3. nuclear reactors

F. Uses of Radioisotopes
1. mechanistic studies
2. biology and medicine

# CHE*K122 General Chemistry II Tentative Academic Schedule Spring 2017
## 11931 Lecture: Tu 6:30p.m.-9:15 p.m. E223
## 11932 Lab: Th 6:30 p.m.-9:15 p.m. B222

Lab report should be typed and submitted on the next week of that lab. Lab report will be graded on writing and formatting, calculations, accuracy of results and tables, graphs and summary of the lab (WCAT). Lab report format would be provided to you as a handout on the first day of lab.

**WEEK**
THURSDAY

**1**
1/19 Safety/Review

**2**
1/26 Clock Reaction

**3**
2/02 Sucrose Hydrolysis

**4**
2/09 Equilibrium

**5**
2/16 EXAM -1

**6**
2/23 Vitamin C

**7**
3/02 pH and Buffers

**8**
3/09 Exam-2

**9**
SPRING BREAK

**10**
3/23 Aspirin Synthesis

**11**
3/30 Ksp of Calcium Hydroxide

**12**

4/06 Redox Titration

**13**

4/13 Spectroscopy/Melting Point

**14**

4/20 Thin-Layer Chromatography
**4/25 Exam 03**

**15**

4/27 Models

**16**

5/04 Analysis of Sugars by Optical Rotation

**17**

5/09 Finals