THOMPSON RIVERS UNIVERSITY

Department of Physical Sciences (Chemistry)

CHEM 1520 – 3 Credits
Principles of Chemistry (3,0,3)(L)
Winter 2021

Instructor:	Dr. Nelaine Mora-Diez
Office:	S 254, Science Building
Phone/Voice Mail:	250 828-5442
E-mail:	nmora@tru.ca
Office Hours:	Tue 3:30 – 4:30 pm (via Zoom) Additional office hours are available by appointment (via Zoom)

Description

CHEM 1520 is the second half of first-year chemistry designed for students with a strong background in chemistry. The Department of Chemistry defines a strong background as at least a B in Chemistry 12 or CHEM 0600; however, the course is available to any student with CHEM 1500 and Chemistry 12 or CHEM 0600. This course, in combination with CHEM 1500, will serve as a prerequisite for second year Chemistry courses at TRU and other BC institutions.

The course topics include (1) gases, (2) thermochemistry, (3) kinetics, (4) acid-base equilibrium, (5) buffers, titrations and solubility equilibrium, and (6) entropy, free energy and electrochemistry. Students will become familiar with all these topics during the course. The laboratory stresses basic precision techniques in quantitative analytical chemistry as well as the use of analytical instrumentation and experiments in physical chemistry.

Prerequisites

Chemistry 12 or CHEM 0600 (a grade of B or better is recommended) and CHEM 1500 (C- minimum) or acceptance into the TRU Engineering program.

Course Schedule

Tue, Thu 5:30 – 6:45 pm
Recorded lectures and online delivery via Zoom on Tuesdays (unless otherwise specified in advance)

Course Materials

Text: R. Chang and J. Overby, *Chemistry*, 13th Edition, McGraw-Hill, 2019 (or previous editions). Available at the TRU Bookstore.

CHEM 1520 incomplete lecture notes and other useful course materials are available on Moodle.
Moodle course: "CHEM 1520 - Principles of Chemistry (Mora-Diez)"

To access Moodle, use the Moodle quick link from the TRU homepage (or visit https://moodle.tru.ca).
Login instructions are available on the Moodle site.

Assessment

This one-semester course is worth 3 credits. A letter grade will be awarded for CHEM 1520 using the Grading System (Policy ED-3-5) from the Policy website at: http://www.tru.ca/policy/allpolicy.html

The winter semester final exam period is April 16-28. Students **must** be available to write an exam at any time during this period. **No special arrangements will be made.**

Grades will be assigned on the following basis:

Moodle quizzes[≠]	10%	(12 Quizzes)
Test 1	20%	(Thu, Feb 25; exam cut-off: end of Feb 11 class)
Test 2	15%	(Thu, Apr 8; exam cut-off: end of Apr 1 class)
Laboratory	20%	(5 lab reports, 15%; 3 assignments 5%)
Final examination	35%	(Exam period: April 16-28)

[≠]**Moodle quizzes** can be done up to two times before the due date.
The mark of your best attempt will be kept as your quiz mark in each case.

An aggregate total of at least 50% (35/70) must be achieved on the **sum** of the term tests and the final exam in order to receive a passing grade.

A total of 50% (10/20) must be achieved in the laboratory to receive a passing grade for the course. Students must complete 4 of the 5 lab reports.

All examinations (except those related to the laboratory component of this course) will be done via the Moodle course "CHEM 1520 - Principles of Chemistry (Mora-Diez)"

Laboratory

Students must be enrolled in one of the following laboratory sections:

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:30 am – 12:20 pm			L-05		
2:30 – 5:20 pm	L-01, LE1	L-03	L-06		
6:30 – 9:20 pm	L-02, LE3	L-04	L-07	L-09	

Contact the department Chair, Dr. Mark Paetkau (mpaetkau@tru.ca), to request a change to a different lab section with space available if you are facing a timing conflict.

Laboratory Schedule

Week	Assessment
Jan 11 - 15	**No Labs**
Jan 18 - 22	**No Labs ***
Jan 25 - 29	**Assignment 1: Lab Safety** (Teams session)
Feb 1 - 5	**Experiment 1: Gas Constant** (Teams session)
Feb 8 - 12	**Experiment 2: Heat of formation** (Teams session)
Feb 15-19	**No Labs (Mid-Semester Break)**
Feb 22-26	**Assignment 2:** (Teams session)
Mar 1- 5	**Experiment 3: Kinetics** (Teams session)
Mar 8 - 12	**Assignment 3:** (Teams session)
Mar 15 - 19	**Experiment 4: Titration Curves & Buffer Systems** (Teams session)
Mar 22 - 26	**Experiment 5: Electrochemistry** (Teams session)
Mar 29- Apr 2	**No Labs (Good Friday)**
Apr 6 - 9	**No Labs (Easter Monday)**

* Students should ensure they can access the lab Moodle course and Teams and must sign a mandatory course contract – required to access and submit lab content.

CHEM 1520 Laboratory Resources (including laboratory report guidelines, report templates and supplementary information) are available in the "CHEM 1510-1520 Laboratory" Moodle course (separate from the Moodle course for the class). All assessment items related to the lab (lab reports and assignments) will be submitted via this Moodle course. You should be automatically enrolled in the laboratory Moodle course.

There will be synchronous 3-hour laboratory sessions offered during your scheduled laboratory time via **Microsoft Teams (Teams)**. Refer to the "CHEM 1510-1520 Laboratory" Moodle course for the deadlines for submission of laboratory reports. Your laboratory instructor will be available during the scheduled lab section time on **Teams**. A unique dataset, required to complete each week's assessment item, will be provided exclusively at this time. Lab reports completed using an incorrect dataset will not be marked and will receive a zero.

Attending the live session provides a structured and supported environment for students to successfully complete the weekly lab report or assignment with instructor supervision and real time assistance. Lab instructors will be asked to record their introduction as well as any relevant question period or discussion that could benefit other students not present. The recordings will be available on the Teams page for later review by all students in that section.

Attendance to LIVE Teams sessions is restricted to only those students registered in that section.

If you cannot attend your synchronous lab session, it is your responsibility to refer to your section specific **Teams** group to obtain your dataset and find additional instruction on how to complete that week's lab report or assignment. CHEM 1510 and CHEM 1520 Labs are equivalent.

For general lab enquiries, please contact the Lab Coordinator, Dr. Lindsay Blackstock, lblackstock@tru.ca.

To join **Microsoft Teams**, you MUST set up a Microsoft Office 365 account. TRU provides you with many free Office tools but it is up to you to request access by following these steps:

- Go to https://tru.ca/its/students/software/office-365.html and click the "Download Office 365" link
- Agree to the terms and conditions and use your myTRU email
- Check your myTRU email after agreeing and follow additional sign-up prompts to complete registration with Microsoft

For help with Moodle and Teams access contact IT Services: ITServiceDesk@tru.ca, and go to the IT website for further information http://www.tru.ca/its/students.html

Supplemental Learning

Supplemental Learning (SL) is academic support provided to challenging introductory courses. In courses supported by SL, students are invited to attend weekly sessions (on a regular basis, or occasionally). SL sessions provide opportunities to study with peers informally but with a planned and strategic approach. Sessions are led by a student who has previously mastered the course and knows what it takes to succeed. Sessions integrate how-to-learn (study skills) with what-to-learn (course content) in a collaborative setting. For more information, visit:
https://www.tru.ca/current/academic-supports/sl.html.

CHEM 1520 will have SL support. The schedule for the SL sessions will be announced once classes start and posted on Moodle.

Legal Information

It is the responsibility of all students to be aware of TRU Student Academic Policies, Regulations and Procedures. These include: Academic Honesty Policy ED-5-0; Appeals Policy ED-4-0; Attendance ED-3-1; and Exams Policy ED-3-9. Forms of Academic Dishonesty are summarized and described in the TRU Policy website at: http://www.tru.ca/policy/allpolicy.html and include cheating, misconduct, fabrication and plagiarism.

Uploading any type of course examination onto the internet or using online platforms such as Chegg, Course Hero, Slader, among others, during exams, are violations of the TRU Academic Honesty Policy.

Students must write all examinations (quizzes, term tests, final exam and lab reports/assignments) independently.

Course Content (This outline may change as the course progresses)

Section 1. Gases

1.1. Gas properties and pressure
1.2. The gas laws
1.3. The ideal gas law: Applications
1.4. Dalton's law of partial pressures
1.5. The kinetic molecular theory of gases
1.6. Diffusion and effusion
1.7. Deviation from ideal behaviour

Section 2: Thermochemistry

2.1. Basic concepts
2.2. Enthalpy of chemical reactions
2.3. Calorimetry
2.4. Hess' law: Applications
2.5. Examples of enthalpy changes that refer to specific processes (self-study)

Section 3: Chemical Kinetics

3.1. The rate of a reaction
3.2. The rate law
3.3. The relation between reactant concentration and time
3.4. Activation energy and temperature dependence of rate constants
3.5. Reaction mechanisms
3.6. Catalysis

Section 4: Acid-Base Equilibrium

4.1. Acid-Base concepts
4.2. Acidity of a solution
4.3. Acid-base strength and equilibrium
4.4. Problems involving weak-acid and weak-base equilibria
4.5. Acid-base properties of salt solutions (Hydrolysis)
4.6. Lewis theory of acids and bases (self-study)

Section 5: Buffers, Titrations & Solubility Equilibria

5.1. Buffer solutions: pH calculations
5.2. Acid-base titrations
5.3. Solubility equilibria

Section 6: Entropy, Free Energy & Electrochemistry

6.1. Spontaneous and non-spontaneous processes
6.2. Entropy and entropy changes
6.3. The Gibbs free energy
6.4. Thermodynamics of redox reactions