

# DEPARTMENT OF **CHEMISTRY**

## **CHEM UG Courses**

### **UG Courses offered in Spring Term 2020-2021**

<b>Course Code</b>	<b>Course Title</b>
CHEM 1004	Chemistry in Everyday Life
CHEM 1010	General Chemistry 1A
CHEM 1020	General Chemistry 1B
CHEM 1030	General Chemistry II
CHEM 1050	Laboratory for General Chemistry I
CHEM 1055	Laboratory for General Chemistry II
CHEM 2111	Fundamentals of Organic Chemistry
CHEM 2155	Fundamental Organic Chemistry Laboratory
CHEM 2311	Analytical Chemistry
CHEM 2355	Fundamental Analytical Chemistry Laboratory
CHEM 3120	Organic Chemistry II
CHEM 3220	Inorganic Chemistry II
CHEM 3320	Instrumental Analysis
CHEM 3420	Physical Chemistry II
CHEM 3550	Synthetic Chemistry Laboratory
CHEM 3555	Molecular Characterization Chemistry Laboratory
CHEM 4110	Structural Elucidation in Organic Chemistry
CHEM 4130	Medicinal Chemistry
CHEM 4150	Biomolecular Synthesis Laboratory

<b>CHEM 4155</b>	<b>Biomolecular Characterization Laboratory</b>
<b>CHEM 4210</b>	<b>Solid State Chemistry</b>
<b>CHEM 4250</b>	<b>Materials Preparation Laboratory</b>
<b>CHEM 4255</b>	<b>Materials Characterization Laboratory</b>
<b>CHEM 4310</b>	<b>Environmental Chemistry</b>
<b>CHEM 4350</b>	<b>Environmental Chemistry Laboratory</b>
<b>CHEM 4355</b>	<b>Instrumental Analytical Chemistry Laboratory</b>
<b>CHEM 4550</b>	<b>Advanced Synthetic Laboratory</b>
<b>CHEM 4555</b>	<b>Advanced Molecular Characterization Laboratory</b>
<b>CHEM 4620</b>	<b>Organometallic Chemistry</b>
<b>CHEM 4680</b>	<b>Undergraduate Research</b>
<b>CHEM 4689</b>	<b>Capstone Project</b>
<b>CHEM 4691</b>	<b>Capstone Research I</b>
<b>CHEM 4692</b>	<b>Capstone Research II</b>



## CHEM1004 (L1) Chemistry in Everyday Life

Spring Semester 2020-21

3 credits

<b>Lectures:</b>	Zoom Meetings – Visit Canvas for meeting links (pw: <b>chem1004</b> ) Mondays and Wednesdays 12:00 noon – 1:20 pm  No lectures on 15 Feb, (public holiday) 31 Mar, 5 Apr (mid-term break)
<b>Course Instructor:</b>	<b>Prof. K. K. Jason CHAN</b> Assistant Professor of Science Education Department of Chemistry  Email: <b>kkjchan@ust.hk</b> Office: Rm 4543, between Lifts 25/26 and 27/28
<b>Course website:</b>	<b><a href="https://canvas.ust.hk">https://canvas.ust.hk</a></b>

### Course Description

CHEM 1004 is an introductory course provided for students who have never taken a Chemistry course, but would like to learn what chemistry is and how it may affect the world we live in.

Course objectives are as follows:

1. Introduce basic concepts of Chemistry.
2. Connect Chemistry with everyday life and modern technology.
3. Explain the importance of Chemistry in the environment, medicine, and daily life.

### Course Outline

The course is divided into six Chapters:

- |            |                               |
|------------|-------------------------------|
| Chapter 1: | What is everything made of?   |
| Chapter 2: | The Air.                      |
| Chapter 3: | The air and our environment.  |
| Chapter 4: | The metals in our daily life. |
| Chapter 5: | Metals in the industry.       |
| Chapter 6: | Fire and fuels.               |

## Lectures

The lectures are critical to your understanding of course materials. You should try to attend all the lectures. Zoom meeting online lecture recordings will be available on Canvas after **each class**, so please catch up promptly when you missed a class.

## Course Contents

Comprehensive **lecture notes** will be provided for this course. These notes should be very helpful to you as they provide more details of the lecture materials than power point slides. However, the version of the notes you receive is incomplete. You will need to fill in some important details or draw diagrams to complete the notes during the lectures.

You should print out hard copies of the lecture notes and bring them to the class. You can staple each chapter's notes into a booklet.

It would be advisable to print them single sided, so that you can use the blank page to drop down extra notes that the lecturer mentions but are not in the notes, or to write some references you obtained from other sources or your revision notes.

The **power point slides** will be mostly pictures or graphics. These will also be released on Canvas after the end of each lecture. Please note that while the slides may be available before the lectures, they are sometimes released after the lectures, so please make notes on the lecture notes instead.

The lecture notes will be released by chapter. New chapters will be released on Canvas towards the end of the current chapter. You can read through the notes before the lecture to familiarise yourself with the materials.

## Textbooks/Reading List

You don't need a textbook for this course, and since we draw examples from many different areas of chemistry in everyday life, no one textbook is a perfect fit for the course. Therefore for each chapter, some reading materials will be suggested to you for optional reference.

## End of Chapter Exercises and Tutorial Sessions

To help you prepare for the examination, each chapter will finish with a short **exercise**. These exercises will require you to work through a set of problems, using some knowledge from the lectures and also to teach you some new knowledge through the exercise.

These exercises will not be formally graded, but they will be examinable.

**Videos of detailed solutions** to the exercises will be released by chapter. In the videos, the instructor will go through the answers to the exercises. If you have questions on these exercises please feel free to contact the instructor or the TAs to ask.

## Office Hours of the Instructor and TAs

Please feel free to approach the instructor, Dr Jason Chan to ask questions or to discuss any chemistry or course-related issues. You may approach him after the lectures, or you may email him to arrange an appointment. There is no fixed office hour schedule: if you need one, feel free to email and book a time.



In addition, our TAs are all postgraduate research students working in the forefront of chemistry research. They are here to help you also if you want to ask any questions or if you want to find out more about their research. You should email them directly to arrange an appointment.

### Online Graded Quizzes (15 % of the course)

There will be two online graded quizzes in addition to the end-of-chapter exercises, the first quiz is after Chapter 4 (covering chapters 1 – 4), and the second quiz is at the end of the course (covering mainly Chapters 4-6). You should complete them within the given time (around 1 week). The accumulated points from the online quizzes will carry 10 % to the course grade, but the main purpose is to help you further understand the course materials and have a chance to practice and receive answers immediately after submission. When these quizzes are available, you will receive email notification as well as instructions during the lectures.

### Study-project (35 % of the course)

This course will have a study project component for you to learn more about a particular area of everyday chemistry that interests you. The project period will commence about 2 weeks into the course. In view of the time needed for this project, **there will be no mid-term examination** for this course.

For this semester, in view of the online teaching mode, most students will undertake an individual written study project. At the end of the project, each student should submit:

- An individual study report

For those students who are residing in the HKUST campus this semester, it is also possible to carry out a written group project. In order to prevent the spread of COVID-19, students who are not living in student halls on campus will not be offered this option. The group size will also be limited to a maximum of 4 students per group. At the end of the project, each group should submit:

- A small group study report

### Individual projects

Individual projects will be a piece of written original research. You will choose a topic yourself that is about any chemistry phenomenon or chemicals that is in your everyday life. Be creative and explore interesting topics!

You are expected to read widely, using resources available to you, not limited to the internet – you also have access to books, journal articles and other multimedia resources. You may report also real experiences yourself and report them. Photographs would be needed to demonstrate that your topic is truly something you can connect to in the real world.

The article should bring together many ideas to draw up an original story. Originality checks will be performed so you must do the writing yourself.

More information will be announced during a lecture around week 3.

### Small Group projects (only for students residing on HKUST campus)

2 - 4 students may form a group. Each group will work on a specific topic together. The group projects can involve some simple experimental investigation using materials that can be obtained from the supermarkets.

If the COVID-19 situation allows, it may be possible to provide some simple reagents/equipment for small groups to complete simple projects. These should be discussed with the instructor. However, if the COVID-19 situation worsens, the group project option may be cancelled for safety concerns.

More information will be announced during a lecture around week 3.

### Final Examination (50 %)

*On-campus proctored examination:* This course will end with a *close-book* final examination (2 hours). This will cover all the lecture materials and exercises that were taught in the course. You will mainly be tested on your understanding and ability to solve problems rather than on the memorisation of facts, but you should also be familiar with some key chemical details – some of these will inevitably require some memorisation.

The date, time and venue for the final exam will be announced later.

*Online mode assessment:* If the final exam will be offered in an online mode, an *open-book* final examination on Canvas will be carried out. It will be proctored through Zoom Meeting (webcam monitoring).

### Grades

The final grade for the course will be consisted of:

**15 % from the Online Quizzes**

**35 % from the Study Project**

**50 % from the Final Examination**

The course is graded from A+ to F. An F grade will not earn you credits for the course.

### Intended Learning Outcomes (ILOs)

At the end of the course, the students will have:

1. An ability to recognize physical/chemical properties, physical/chemical changes.
2. An ability to apply knowledge of chemical reactions, stoichiometry, atomic structure, chemical bonding, molecular structure, states of matter, acid-base chemistry, and redox reactions.
3. A basic knowledge of organic chemistry, polymer chemistry, biochemistry, and food chemistry.
4. An ability to link chemistry to modern technology, environment, and daily life.

**Assessment Scheme**

<b>Weight</b>	<b>Assessment</b>	<b>Course ILOs</b>	<b>CHEM Program ILOs</b>
<b>15%</b>	<b>Online Revision Quiz</b>	<b>1, 2, 3, 4</b>	<b>1, 2, 3</b>
<b>35%</b>	<b>Study Project</b>	<b>1, 2, 3, 4</b>	<b>3, 6, 11, 12, 13</b>
<b>50%</b>	<b>Final Exam</b>	<b>1, 2, 3, 4</b>	<b>1, 2, 3</b>

**Teaching and Learning Activities (Non-assessed)**

<b>Activities</b>	<b>Course ILOs</b>	<b>CHEM Program ILOs</b>
<b>Lecture</b>	<b>1, 2, 3, 4</b>	<b>1, 2, 3</b>
<b>End of chapter exercises and Tutorials</b>	<b>1, 2, 3, 4</b>	<b>1, 2, 3</b>



## Topics by Chapter

Chapter 1: What is everything made of?	<b>2 Lectures</b>	<p>Introduction of the course</p> <p>Discovery of the atomic structure</p> <p>Elements; relative atomic mass</p> <p>relative molecular mass</p> <p>The mole</p> <p>Chemical calculations</p> <p>Relationship between mole and mass, mole and concentration, mole and gas volume</p> <p>Calculations, Common elements</p>
Chapter 2: The Air	<b>3 Lectures</b>	<p>Gases in the Air, Electronic configuration</p> <p>Forming covalent bonds</p> <p>States of matter, separation of gases in air,</p> <p>Intermolecular forces: London dispersion force</p> <p>Electronegativity, Polar and non-polar molecules,</p> <p>Intermolecular forces: dipole-dipole interactions</p>
Chapter 3: The air and our environment	<b>5 Lectures</b>	<p>Electromagnetic waves</p> <p>Greenhouse gases, Greenhouse effect,</p> <p>Global Warming, Carbon cycle, Reducing CO<sub>2</sub> emission</p> <p>Acids and Bases</p> <p>Air Pollution: Acid Rain and other air pollutants</p> <p>Reading organic chemical structures</p> <p>Air Pollution: VOCs, smog, PMs</p> <p>Controlling air pollution</p> <p>Ozone and ozone depletion</p>
Chapter 4: The metals in our daily life	<b>5 Lectures</b>	<p>Different groups of metals in the periodic table:</p> <p>Alkali metals, Alkaline earth metals,</p> <p>Transition metals, Lanthanides,</p> <p>metals in Group 13-15,</p> <p>Radioactivity and the Actinide elements</p> <p>Structure of Metals, Metallic bonding</p> <p>Metal lattice systems</p>



		<p>Physical properties of typical metals; Alloys</p> <p>Alloys: types and applications</p> <p>Compounds of metals: Ionic bonding</p> <p>Name and Formula of ionic compounds</p> <p>Structure of complex ions</p> <p>Solid structure of ionic compounds</p> <p>Ionic lattice systems</p> <p>Physical properties of ionic compounds</p> <p>Reaction of metals with oxygen</p> <p>Reaction of metals with water</p> <p>Reaction of metals with acids</p>
Chapter 5: Metals in the industry	<b>6 Lectures</b>	<p>Metal extraction industry</p> <p>Calculate %mass of metal in a compound</p> <p>Redox</p> <p>Oxidation number</p> <p>Metal displacement reactions</p> <p>Metal displacement reactions</p> <p>Extraction of Metals by heating with carbon:</p> <p>Copper, Iron (Blast Furnace, Basic Oxygen Converter)</p> <p>Electrolysis of molten ionic compounds:</p> <p>Extraction of sodium</p> <p>Electrolysis of molten ionic compounds:</p> <p>Extraction of aluminium</p> <p>Electrolysis of aqueous solution</p> <p>The chloroalkali industry</p> <p>The refining of copper metal</p> <p>Electroplating</p> <p>Anodising aluminium</p> <p>Half cells and standard electrode potentials</p> <p>Electrochemical cells</p> <p>Fruit batteries, zinc-carbon batteries</p>

		Alkaline batteries Silver oxide cells Rechargeable batteries: Ni-MH batteries Lithium metal batteries Lithium-ion batteries
Chapter 6: Fire and fuels	<b>4 Lectures</b>	Fire and combustion, Fire triangle How to fight a fire Fire extinguishers Introduction to fossil fuels: coal, natural gas and crude oil Alkanes: naming and isomers Fractional distillation of crude oil Fractions from crude oil Cracking Alkenes Polymers Calculating energy from combustion reactions Starting a fire Fireworks Explosives



香港科技大學  
THE HONG KONG  
UNIVERSITY OF SCIENCE  
AND TECHNOLOGY

化學系  
DEPARTMENT OF CHEMISTRY

Updated 7 December 2021

# CHEM 1010: General Chemistry IA

## Spring 2020/21



Department of Chemistry, HKUST

# Course Instructors

## Prof. Emily M.W. Tsang

□ Office: **Rm 4536 (Lift 25/26)**

□ E-mail: [chetsang@ust.hk](mailto:chetsang@ust.hk)

**Lectures: Feb 1 – Feb 24**

*\*Maternity Leave from March - June*



## Prof. Jonathan Halpert

□ Office: **Rm 4545 (Lift 25/26)**

□ E-mail: [jhalpert@ust.hk](mailto:jhalpert@ust.hk)

**Lectures: Mar 1 – Mar 29**



## Prof. Jinqing Huang

□ Office: **Rm 4544 (Lift 25/26)**

□ E-mail: [jqhuang@ust.hk](mailto:jquhuang@ust.hk)

**Lectures: Apr 7 – May 5**





# Course Description and Pre-requisite

- Lectures: 12:00 – 13:20, Every Monday and Wednesday
- Venue: Interactive Online Lecture by Zoom Meeting, access through CANVAS

Meeting ID: **990-1914-6052**  
Password: **9874123**

Canvas LMS Interface: CHEM1010 (L1) > CHEM1010 (L1) - General Chemistry IA

Zoom Meeting Details:

Start Time	Topic	Meeting ID	Join	Invitation
Mon, Feb 1 (Recurring) 12:00 PM	CHEM 1010 Spring 2020-21	990 1914 6052	Join	Invitation
Wed, Feb 3 (Recurring) 12:00 PM	CHEM 1010 Spring 2020-21	990 1914 6052	Join	Invitation
Mon, Feb 8 (Recurring) 12:00 PM	CHEM 1010 Spring 2020-21	990 1914 6052	Join	Invitation
Wed, Feb 10 (Recurring) 12:00 PM	CHEM 1010 Spring 2020-21	990 1914 6052	Join	Invitation
Mon, Feb 15 (Recurring) 12:00 PM	CHEM 1010 Spring 2020-21	990 1914 6052	Join	Invitation

## Course Description and Pre-requisite

### Pre-requisites:

- **HKDSE 0.5x Combined Science - Chemistry** (take **THIS** course)
- **Or CHEM 1004**
- **Or equivalent** (HKCEE, GCE AS-level, IB-SL, etc)

### Exclusions:

- **HKDSE 1.0x Chemistry (or equivalence)** (should take **CHEM 1020**)
- Have **NOT** taken any Chemistry Subject in High School (should take **CHEM 1004**)
- Eligible for **credit transfer**: HKALE CHEM, IB CHEM HL, College Board AP, etc

## Course Description and Pre-requisite

### □ Course Description:

This course targets students who have learnt the basic knowledge of Chemistry in high school and is **Part I** of a **two-semester course** "General Chemistry".

**[Part II (CHEM 1030) is offered every Spring term]**

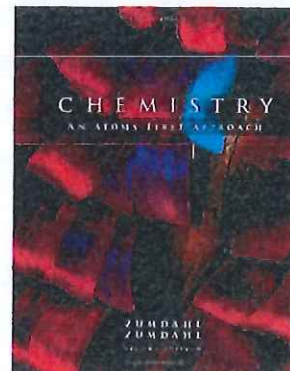
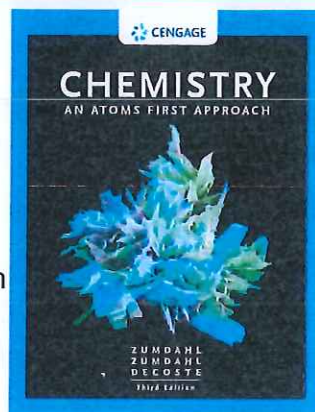
□ **Key Topics:** *atoms, atomic structures, chemical bonds, molecules, molecular structures, substances, chemical kinetics, energy*

□ **Supplementary Lab Course:** **CHEM 1050** [0-0-3:**1**]

# Course Outline and Textbook

- Chapter 1: Chemical Foundations
- Chapter 2\*: Atomic Structure and Periodicity
- Chapter 3: Bonding - General Concepts
- Chapter 4\*: Molecular Structure and Orbitals
- Chapter 5: Stoichiometry
- Chapter 6: Types of Chemical Reactions and Solution Stoichiometry
- Chapter 7: Chemical Energy
- Chapter 8: Gases

*\*Key Chapters!!!*



**Chemistry: An Atoms First Approach,  
3<sup>rd</sup> Edition (Asian Edition)**

S.S. Zumdahl; S. A. Zumdahl; D. DeCoste  
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ISBN: 9789814896993 (**Hardcopy Textbook, \$423.7**)

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*(The 2<sup>nd</sup> Edition textbook  
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## Course Grading (*tentative*)

□ Midterm Exam	50%
□ Final Exam	50%

### NOTE:

- exams cannot be waived under any circumstances
- *Exam questions will be similar to:*
  - *End-of-chapter exercises.*

# How to do well in this Course?

- **Attend Lectures**
- **Pre-read, Read, and Review** textbooks & lecture notes
- **Do the Recommended End-of-Chapter Exercises**
  - **Hint:** *exam questions will be similar to these!!!*
- **Email instructor for course help**

# Lecture Notes

- Lecture Notes are posted on **CANVAS** system:
  - <http://canvas.ust.hk>
  - Login: ITSC username and password

# Intended Learning Outcomes

*At the end of this course, you will be able to:*

1. Describe and apply **fundamental principles and terminologies of chemistry**.
2. Develop a **microscopic view** of the world in terms of **atoms** and **molecules** and their change
3. Describe and apply concepts of mass conservation and energy conservation in **chemical changes**.
4. Describe the atoms and ions in terms of **atomic structure, atomic orbitals, electron configuration, and periodicity of chemical properties**
5. Describe **molecules** in terms of **bonding theory, energy, molecular geometry and interactions**.
6. Describe a chemical reaction from a **thermodynamic** point of views.
7. Describe the **physical states and properties of gases**
8. Recognize and appreciate the **impact of chemistry to our society**.



# **CHEM 1020: General Chemistry IB**

**Spring 2020/21**

# Course Instructors

## Prof. Emily M.W. Tsang

□ Office: **Rm 4536 (Lift 25/26)**

□ E-mail: [chetsang@ust.hk](mailto:chetsang@ust.hk)

**Lectures: Feb 1 – Feb 24**

*\*Maternity Leave from March - June*



## Prof. Jonathan Halpert

□ Office: **Rm 4545 (Lift 25/26)**

□ E-mail: [jhalpert@ust.hk](mailto:jhalpert@ust.hk)

**Lectures: Mar 1 – Mar 29**



## Prof. Jinqing Huang

□ Office: **Rm 4544 (Lift 25/26)**

□ E-mail: [jqhuang@ust.hk](mailto:jquhuang@ust.hk)

**Lectures: Apr 7 – May 5**



# Instructional Assistant (IA)

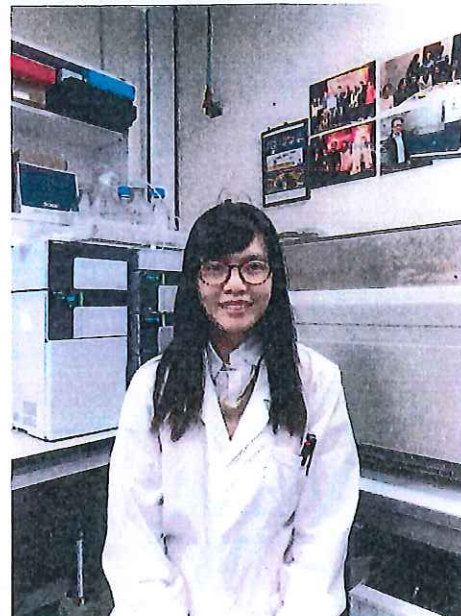
## Miss Elaine YL Wong

- Office: **Rm 4524 (Lift 25/26)**
- E-mail: [wylelaine@ust.hk](mailto:wylelaine@ust.hk)
- Office Tel: **2358 7243**

### Two Tutorial Sessions instructed by IA:

- One before Midterm Exam
- One before Final Exam

The exact date and time for these tutorials will be announced in due course



# Course Description and Pre-requisite

- ❑ Lectures: 9:00 – 10:20 am, Every Monday and Wednesday
- ❑ Venue: Interactive Online Lecture by Zoom Meeting, access through CANVAS

Meeting ID: **914-1460-4914**  
Password: chem1020

CHEM1020 (L1) > CHEM1020 (L1) - General Chemistry IB

2020-21 SPRING

Home

**Zoom Meeting**

Announcements

Discussions

Grades

People

Syllabus

History

Help

zoom

Your current Time Zone is (GMT+08:00) Hong Kong. 2

Upcoming Meetings Previous Meetings Cloud Recordings Get Training 2

Start Time	Topic	Meeting ID	Join	Invitation
Mon, Feb 1 (Recurring) 9:00 AM	CHEM1020 (L1) - General Chemistry IB (pw: chem1020)	914 1460 4914	<b>Join</b>	Invitation
Wed, Feb 3 (Recurring) 9:00 AM	CHEM1020 (L1) - General Chemistry IB (pw: chem1020)	914 1460 4914	Join	Invitation
Mon, Feb 8 (Recurring) 9:00 AM	CHEM1020 (L1) - General Chemistry IB (pw: chem1020)	914 1460 4914	Join	Invitation
Wed, Feb 10 (Recurring) 9:00 AM	CHEM1020 (L1) - General Chemistry IB (pw: chem1020)	914 1460 4914	Join	Invitation
Wed, Feb 17 (Recurring) 9:00 AM	CHEM1020 (L1) - General Chemistry IB (pw: chem1020)	914 1460 4914	Join	Invitation



## Course Description and Pre-requisite

### Pre-requisites:

- HKDSE 1.0x Chemistry
- Or equivalent (Mainland JEE, Taiwan GSAT, IB Chem HL, SAT Chem, College Board AP, etc)

## Course Description and Pre-requisite

### □ Course Description:

This course targets students who have acquired more advanced knowledge in fundamental Chemistry in high school and is **Part I** of a **two-semester course** "General Chemistry".

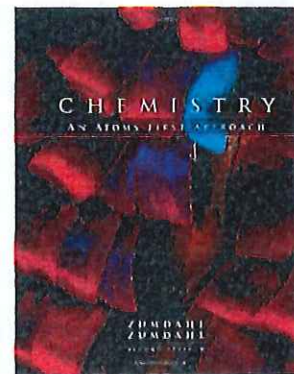
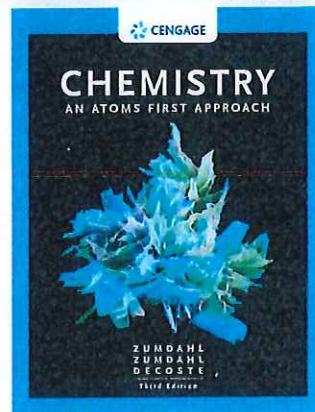
**[Part II (CHEM 1030) is offered every Spring term]**

- **Key Topics:** *atoms, atomic structures, chemical bonds, molecules, molecular structures, substances, chemical kinetics, energy*
- **Supplementary Lab Course:** **CHEM 1050** [0-0-3:**1**]

# Course Outline and Textbook

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# Course Grading

- |   |     |
|---|-----|
| □ Midterm Exam (Tentative Time: Week 9) | 50% |
| □ Final Exam                            | 50% |

## NOTE:

- exams **cannot** be waived under any circumstances
- ***Exam questions will be similar to:***
  - ***End-of-chapter exercises.***

# How to do well in this Course?

- **Attend Lectures**
- **Pre-read, Read, and Review** textbooks & lecture notes
- **Do the Recommended End-of-Chapter Exercises**
  - ▣ **Hint:** *exam questions will be similar to these!!!*
- **Email instructor for course help**

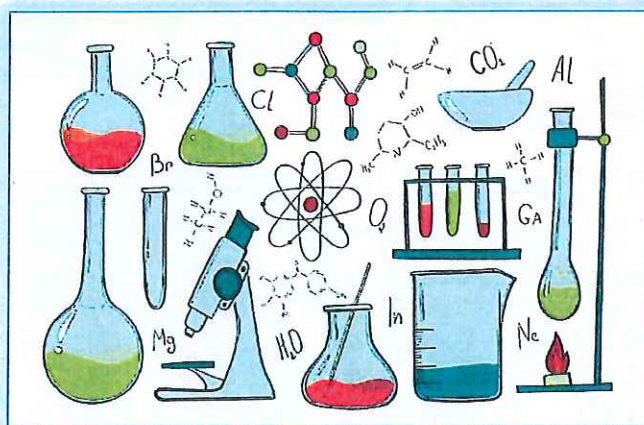


# Lecture Notes and Lecture Videos

- Lecture Notes and Lecture Videos are posted on **CANVAS** system:
  - ▣ <http://canvas.ust.hk>
  - ▣ Login: **ITSC username** and **password**

# Course Objectives

- **Chemistry** is a science that studies **composition**, **structure**, **properties**, and the changes (reactions) of matter.

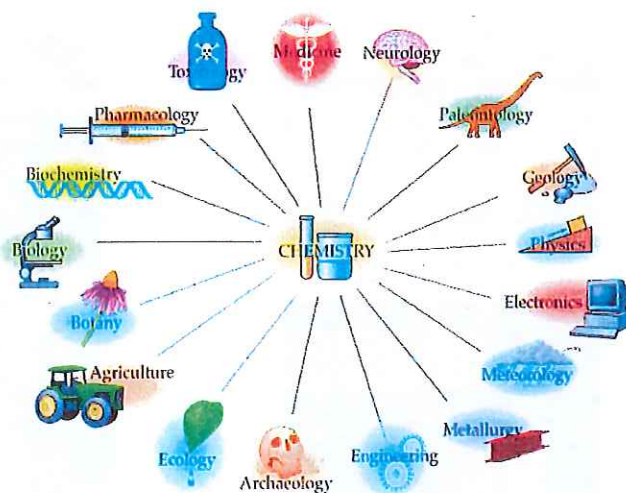


# Chemistry in our Daily Life

We encounter and use chemicals every days.



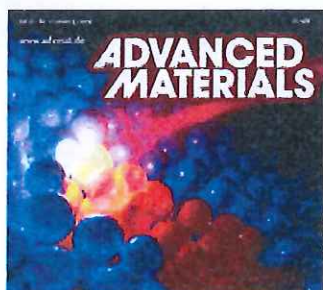
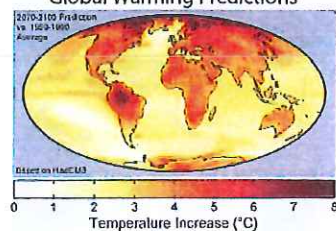
# Chemistry: Its Central Role



**Chemistry** is a central science. It is related to many modern technologies and industries.

# Chemistry and Future

Global Warming Predictions



New medicines



# Intended Learning Outcomes

*At the end of this course, you will be able to:*

1. Describe and apply **fundamental principles and terminologies of chemistry**.
2. Develop a **microscopic view** of the world in terms of **atoms** and **molecules** and their change
3. Describe and apply concepts of mass conservation and energy conservation in **chemical changes**.
4. Describe the atoms and ions in terms of **atomic structure**, **atomic orbitals**, **electron configuration**, and **periodicity of chemical properties**
5. Describe **molecules** in terms of **bonding theory**, **energy**, **molecular geometry** and **interactions**.
6. Describe a chemical reaction from a **thermodynamic** point of views.
7. Describe the **physical states and properties of gases**
8. Recognize and appreciate the **impact of chemistry to our society**.



# CHEM 1030      General Chemistry II

**Instructor:**

Zhenyang Lin 林振陽 (Room 4511; Tel no. x-7379; Email: [chzlin@ust.hk](mailto:chzlin@ust.hk))

**Instructional Assistant:**

Elaine Y L Wong (Room 4524; Tel: 23587243; Email: [wylelaine@ust.hk](mailto:wylelaine@ust.hk))

**Teaching Assistants:**

Miss	LEI, Siqi	<a href="mailto:sleiab@connect.ust.hk">sleiab@connect.ust.hk</a>
Mr.	HASAN, Muhammad	<a href="mailto:mhasanaa@connect.ust.hk">mhasanaa@connect.ust.hk</a>
Mr.	LUO, Siwei	<a href="mailto:sluoak@connect.ust.hk">sluoak@connect.ust.hk</a>
Mr.	PAN, Mingao	<a href="mailto:mpanac@connect.ust.hk">mpanac@connect.ust.hk</a>
Mr.	Wilwin	<a href="mailto:wilwin@connect.ust.hk">wilwin@connect.ust.hk</a>
Mr.	XU, Xin	<a href="mailto:xxube@connect.ust.hk">xxube@connect.ust.hk</a>
Mr.	YIN, Junli	<a href="mailto:jyinah@connect.ust.hk">jyinah@connect.ust.hk</a>
Mr.	YU, Eric Yan Hung	<a href="mailto:eyhyu@connect.ust.hk">eyhyu@connect.ust.hk</a>

**Textbook:**

**Chemistry – an atoms first approach (3e)**

**Authors:**

**Steven S. Zumdahl, Susan A. Zumdahl and Donald J. Decoste**

**Chapter 10: Properties of Solutions**

**Chapter 11: Chemical Kinetics**

**Chapter 12: Chemical Equilibrium**

**Chapter 13: Acids and Bases**

**Chapter 14: Acid-Base Equilibria**

**Chapter 15: Solubility and Complex Ion Equilibria**

**Midterm Exam (Chapters 10-15)**

**Chapter 16: Spontaneity, Entropy, and Free Energy**

**Chapter 17: Electrochemistry**

**Chapter 18: The Nucleus: A Chemist's View**

**Chapter 19: The Representative Elements**

**Chapter 20: Transition Metals and Coordination Chemistry**

**Final Exam (Chapters 16-20)**

## Learning Outcomes

On completion of the course, students will be able to

1. Analyze properties of solutions and determine stoichiometry of chemical transformations.
2. Describe different definitions of acids and bases theories and understand acid-base equilibrium.
3. Apply the laws of thermodynamics and account for the factors that lead to spontaneous physical and chemical changes.
4. Describe redox reactions, use electrochemical data to predict the spontaneity of redox reactions, and comprehend the structures of electrochemical cells.
5. Describe and explain the trends and patterns of structures, physical properties and reactivities of selected main group compounds, transition metal compounds.
6. Recognize the impact of chemistry to society.



**Lecture Hours:** 4:30 pm – 5:50 pm; Tuesday, Thursday

**Instructor's Office Hours:**

**Wednesday Mornings: via Zoom or face-to-face Meetings (upon email request)**

**Instructional Assistant's Office Hours:**

**Email Elaine ([wylelaine@ust.hk](mailto:wylelaine@ust.hk)) when you want to discuss with her.**

**Assessment:** Mid-term exam

(4:30-6:30pm Tuesday 30 March 2021)

**45%**

Final exam

**45%**

Assignments 1 & 2

**5% × 2**

**Assessment Scheme:**

<b>Weight</b>	<b>Assessment</b>	<b>Course ILOs</b>
5%	Assignment 1	1, 2
5%	Assignment 2	3, 4, 5
45%	Midterm exam	1, 2, 6
45%	Final exam	3, 4, 5, 6
	Participation	1, 2, 3, 4, 5, 6

**Ungraded homework/quizzes will be given via Canvas for each chapter.**

The Hong Kong University of Science and Technology

## CHEM 1050 Laboratory for General Chemistry I

Spring 2020–21

### Course Outline

#### **Instructor**

Prof. TSANG Emily Ming Wai (Rm 4536; Tel: 3469-2100; Email: [chetsang@ust.hk](mailto:chetsang@ust.hk))

#### **Instructional Assistants (IAs)**

Ms. CHEUNG Ruby S. W. (Rm 4522; Tel: 2358-8450; Email: [rubycheung@ust.hk](mailto:rubycheung@ust.hk))

Ms. WONG Cherry C. T. (Rm 4523; Tel: 3469-2080; Email: [cctwong@ust.hk](mailto:cctwong@ust.hk))

#### **Technical Officers**

Mr. SEETO K. (Rm 4531; Tel: 2358-7371; Email: [chkseeto@ust.hk](mailto:chkseeto@ust.hk))

Mr. TSE M. L. (Rm 4531; Tel: 2358-7371; Email: [mltse@ust.hk](mailto:mltse@ust.hk))

#### **Class Schedule**

<u>Section</u>	<u>Date</u>	<u>Time</u>	<u>Online Platform</u>
LA1	Friday	03:00 – 05:50 PM	Canvas & Zoom

#### **Course Information**

Credit Units: 1

Pre-requisite: Level 3 or above in HKDSE 1/2× Chemistry OR level 3 or above in HKDSE 1× Chemistry OR CHEM 1004

Co-requisite: CHEM 1010 OR CHEM 1020

Exclusion: Nil

Grade: P/F

#### **Description:**

This course is the laboratory class designed for students who enrolled in CHEM 1010 or CHEM 1020. With laboratory experience acquired in this course, students will be able to relate the physical and chemical principles and theories in practice.

## Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

### Knowledge/Content Related:

1. recognize various kinds of equipment in chemistry laboratory
2. conduct standard laboratory procedures involved in basic chemistry experiments

### Academic Skills/Competencies:

3. conduct risk assessments concerning the use of chemicals in basic chemistry experiments
4. keep records of experimental work in basic chemistry experiments
5. interpret experimental results for physical and chemical phenomena in basic chemistry experiments

## Assessment Scheme

<u>Assessment</u>	<u>Assessing Course ILOs</u>
Tests and Lab Quizzes	1, 2, 3
Lab Reports	4, 5

To pass the course, students have to get satisfactory performances in all abovementioned assessment tasks/activities.

## Student Learning Resources

- Reference Book: James Hall, *Experimental Chemistry: An Atoms First Approach*, Brooks/Cole, Cengage Learning, **2012**.
- Other learning resources can be accessed through Canvas.

## Teaching and Learning Activities

Laboratory Demonstration: focus on experiments related to co-requisite course

## Course Schedule

Keyword Syllabus:

- Laboratory safety
- Common laboratory apparatus
- Basic techniques for measurements in chemistry laboratory
- Gas law
- Boiling point and intermolecular forces
- Solution stoichiometry and volumetric titration
- Chemical energy and calorimetry

**CHEM 1055 Laboratory for General Chemistry II****2020–21 Spring****Course Outline****Instructor**Dr. CHEUNG Man Sing (Rm4535; Tel: 2358 7401; Email: [sing@ust.hk](mailto:sing@ust.hk))**Instructional Assistants (IAs)**Ms. CHEUNG Ruby S. W. (Rm4522; Tel: 2358 8450; Email: [rbycheung@ust.hk](mailto:rbycheung@ust.hk))Ms. WONG Cherry C. T. (Rm4523; Tel: 3469 2080; Email: [cctwong@ust.hk](mailto:cctwong@ust.hk))**Technical Officers**Mr. SEETO K. (Rm4531; Tel: 2358 7371; Email: [chkseeto@ust.hk](mailto:chkseeto@ust.hk))Mr. TSE M. L. (Rm4531; Tel: 2358 7371; Email: [mltse@ust.hk](mailto:mltse@ust.hk))**Class Schedule**

<u>Section</u>	<u>Date</u>	<u>Time</u>	<u>Venue</u>
LA1	Monday	10:30AM – 01:20PM	Online: Canvas & Zoom  Face-to-face: UG001, CYT Building
LA2		01:30PM – 04:20PM	
LA3	Tuesday	10:30AM – 01:20PM	
LA4		01:30PM – 04:20PM	
LA5	Wednesday	10:30AM – 01:20PM	
LA6		01:30PM – 04:20PM	

**Course Information**

Credit Units: 1

Pre-requisite: CHEM 1010 OR CHEM 1020

Co-requisite: CHEM 1030

Exclusion: Nil

Grade: P/F

**Description:**

This course is the laboratory class designed for students who enrolled in CHEM 1030. Students will perform experiments based on the theory they learned in courses. By conducting experiments independently, students are able to experience the whole process, from pre-lab and studying Material Safety Data Sheet (MSDS), to using suitable labwares, experimental techniques and data treatment.



## Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

### Knowledge/Content Related:

1. recognize various kinds of equipment in chemistry laboratory
2. conduct standard laboratory procedures involved in basic chemistry experiments

### Academic Skills/Competencies:

3. conduct risk assessments concerning the use of chemicals in basic chemistry experiments
4. keep records of experimental work in basic chemistry experiments
5. interpret experimental results for physical and chemical phenomena in basic chemistry experiments

## Assessment Scheme

<u>Assessment</u>	<u>Assessing Course ILOs</u>
Lab Reports	1, 2, 3, 4, 5

To pass the course, students have to get satisfactory performances in all abovementioned assessment tasks/activities.

## Student Learning Resources

- Reference Book: James Hall, *Experimental Chemistry: An Atoms First Approach*, Brooks/Cole, Cengage Learning, **2012**.
- Reference Book: Jo Allan Beran, *Laboratory Manual for Principles of General Chemistry*, 9<sup>th</sup> edition, McGraw-Hill, **2011**.
- Other learning resources can be accessed through Canvas.

## Teaching and Learning Activities

Laboratory Demonstration: focus on experiments related to co-requisite course

## Course Schedule

Keyword Syllabus:

- Liquids and solids
- Properties of solutions
- Acids and bases
- Acid-base equilibria
- Solubility and ionic equilibria
- Spontaneity, entropy and free energy
- Electrochemistry
- Transition metals