The following provides a summary of the CCN Chemistry Subcommittee's Recommendation Report decisions, with the exception of amended Minority Report recommendations, which appear in **red font** in the report.

RECOMMENDATION	STATUS
CH/CHE/CHEM 221Z	
Course Number and Subject Code: CH/CHE/CHEM 221Z	Yes 16 No 0 Abstain 0
Course Title: General Chemistry I	Yes 16 No 0 Abstain 0
Course Credits: 5 for lecture and lab	Yes 10 No 0 Abstain 0
Course Description: Explores and applies principles and applications of chemistry. Emphasis on measurement, components of matter, atomic and molecular structure, quantitative relationships including foundational stoichiometry, and major classes of chemical reactions. CH/CHE/CHEM 221Z is a lecture course; CH/CHE/CHEM 227Z is the laboratory component.	Yes 11 No 1 Abstain 2
Course Learning Outcomes: Students will be able to 1. Describe the phases and classifications of matter and differentiate between physical and chemical properties. 2. Represent physical measurements using SI and derived units and demonstrate systematic problem-solving including unit conversion. 3. Use the periodic table to solve problems in chemistry. 4. Describe the principles of electromagnetic energy, the Bohr model and quantum theory, and use electron configurations to identify periodic variations in chemical properties. 5. Interpret and apply ionic and covalent bonding theories including Lewis structures, formal charges, resonance, molecular structure, and polarity. 6. Quantify the composition of substances and solutions. 7. Identify and name various elements, ions, ionic and	Yes 10 No 3 Abstain 0

covalent compounds. 8. Write, balance, and classify chemical reactions and solve foundational stoichiometry calculations.	
CH/CHE/CHEM 222Z	
Course Number and Subject Code: CH/CHE/CHEM 222Z **Course Title:** General Chemistry II **Course Credits:** 5 for lecture and lab **Course Description:** Explores and applies principles presented in CH/CHE/CHEM 221Z to the study of the solid, liquid, and gaseous states of matter. Principles of stoichiometry, thermochemistry, kinetics, and foundational equilibrium are explored and applied to the study of aqueous and gas-phase chemical reactions. CH/CHE/CHEM 222Z is a lecture course; CH/CHE/CHEM 228Z is the laboratory component. **Course Learning Outcomes:** Students will be able to 1. Apply stoichiometry to a variety of problems involving reactions, gasses, liquids, solutions, thermochemistry, kinetics, and equilibrium expressions. 2. Apply kinetic molecular theory and gas laws to predict the behavior of gasses at various conditions. 3. Identify types of intermolecular forces and apply them to the physical properties of solids, liquids, and solutions. 4. Describe solution concepts and factors affecting solution properties. 5. Determine the effects of different factors on chemical reaction rates and examine the role of catalysis in modifying these rates. 6. Apply concepts of thermochemistry to explain thermal energy transfer and the energy changes that accompany chemical and physical changes	Yes 16 No 0 Abstain 0 Yes 16 No 0 Abstain 0 Yes 10 No 0 Abstain 0 Yes 11 No 1 Abstain 2 Minority Report Recommendation (see course learning outcome #7, which has been added).

7. Predict responses of various chemical systems to changing conditions using equilibrium calculations and Le Chatelier's Principle. 8. Identify and apply appropriate equations related to gas laws, solutions, colligative properties, thermochemistry, kinetics, and equilibrium expressions.	
CH/CHE/CHEM 223Z	
Course Number and Subject Code: CH/CHE/CHEM 223Z **Course Title:** General Chemistry III **Course Credits:** 5 for lecture and lab **Course Description:** Builds upon the principles presented in CH/CHE/CHEM 222Z, explores thermodynamics and chemical equilibrium, and applies them to the study of aqueous acid-base reactions, solubility, and electrochemistry. CH/CHE/CHEM 223Z is a lecture course; CH/CHE/CHEM 229Z is the laboratory component. **Course Learning Outcomes:** Students will be able to 1. Apply concepts of thermodynamics to explain the favorability of chemical reactions. 2. Apply the principles of spontaneity, entropy, free energy, and the laws of thermodynamics to predict and rationalize the behavior of chemical reactions. 3. Interpret the behavior and relative strengths of acids and bases, buffers, and the hydrolysis of salts. 4. Analyze and evaluate equilibrium reactions including solubility, acids and bases, and other equilibria. ~~5. Predict responses of various chemical systems to changing conditions using equilibrium calculations and LeChatelier's Principle.~~ 5. Use redox reactions and electrochemical principles to determine cell potentials and analyze the relationship	Yes 16 No 0 Abstain 0 Yes 16 No 0 Abstain 0 Yes 10 No 0 Abstain 0 Yes 11 No 1 Abstain 2 Minority Report Recommendation (see the course learning outcome stricken and added to CH/CHE/CHEM 222Z).

between voltage, free energy, and equilibrium. 6. Identify or formulate and apply the appropriate equations related to electrochemistry, thermodynamics, equilibrium reactions, acids, bases, and buffers.	
CH/CHE/CHEM 227Z	
Course Number: 227Z **Subject Code:** CH/CHE/CHEM **Course Title:** General Chemistry I Laboratory **Course Credits:** 5 for lecture and lab **Course Description:** Explores and applies principles and applications of chemistry. Emphasis on measurement, components of matter, atomic and molecular structure, quantitative relationships including foundational stoichiometry, and major classes of chemical reactions. CH/CHE/CHEM 221Z is a lecture course; CH/CHE/CHEM 227Z is the laboratory component. **Course Learning Outcomes:** Students will be able to 1. Follow standard safety procedures while working with chemicals and equipment in a laboratory setting. 2. Keep an accurate and detailed laboratory record. 3. Measure, calculate, and report data and results using proper units and appropriate measures of uncertainty. 4. Analyze experimental results qualitatively and quantitatively with measures of accuracy and precision. 5. Interpret and communicate the results of experiments applying chemical concepts in CH/CHE/CHEM 221Z in a clear and concise manner. 5. Investigate chemical concepts in CH/CHE/CHEM 221Z qualitatively and quantitatively using scientific methods.	Yes 9 No 1 Abstain 0 Yes 14 No 0 Abstain 0 Yes 14 No 0 Abstain 0 Yes 10 No 0 Abstain 0 Yes 14 No 0 Abstain 0 Yes 13 No 0 Abstain 0
CH/CHE/CHEM 228Z	

Course Number: 228Z	Yes 9 No 1 Abstain 0
Subject Code: CH/CHE/CHEM	Yes 14 No 0 Abstain 0
Course Title: General Chemistry II Laboratory	Yes 14 No 0 Abstain 0
Course Credits: 5 for lecture and lab	Yes 10 No 0 Abstain 0
Course Description: Experiments correspond to the topics covered in CH/CHE/CHEM 222Z, including the fundamentals of intermolecular interactions, stoichiometric relationships, chemical equilibria, and their application to the synthesis, identification, and analysis of chemical compounds. CH/CHE/CHEM 228Z is the laboratory component; CH/CHE/CHEM 222Z is the lecture course.	Yes 14 No 0 Abstain 0
Course Learning Outcomes: Students will be able to 1. Follow standard safety procedures while working with chemicals and equipment in a laboratory setting. 2. Keep an accurate and detailed laboratory record. 3. Measure, calculate, and report data and results using proper units and appropriate measures of uncertainty. 4. Analyze experimental results qualitatively and quantitatively with measures of accuracy and precision. 5. Interpret and communicate the results of experiments applying chemical concepts in CH/CHE/CHEM 222Z in a clear and concise manner. 5. Investigate chemical concepts in CH/CHE/CHEM 222Z qualitatively and quantitatively using scientific methods.	Yes 13 No 0 Abstain 0
CH/CHE/CHEM 229Z	
Course Number: 229Z	Yes 9 No 1 Abstain 0
Subject Code: CH/CHE/CHEM	Yes 14 No 0 Abstain 0
Course Title: General Chemistry III Laboratory	Yes 14 No 0 Abstain 0
Course Credits: 5 for lecture and lab	Yes 10 No 0 Abstain 0
Course Description:	Yes 14 No 0 Abstain 0

Experiments correspond to the topics covered in CH/CHE/CHEM 223Z, including the principles of chemical equilibria and their application to chemical analysis through the use of volumetric and electrochemical methods. CH/CHE/CHEM 229Z is the laboratory component; CH/CHE/CHEM 223Z is the lecture course. **Course Learning Outcomes:** Students will be able to 1. Follow standard safety procedures while working with chemicals and equipment in a laboratory setting. 2. Keep an accurate and detailed laboratory record. 3. Measure, calculate, and report data and results using proper units and appropriate measures of uncertainty. 4. Analyze experimental results qualitatively and quantitatively with measures of accuracy and precision. 5. Interpret and communicate the results of experiments applying chemical concepts in CH/CHE/CHEM 223Z in a clear and concise manner. 6. Investigate chemical concepts in CH/CHE/CHEM 223Z qualitatively and quantitatively using scientific methods.	Yes 13 No 0 Abstain 0
Review Cycle Recommendation	
There will be an annual review cycle of these courses beginning in Winter 2027. The annual review will have a twofold purpose: (1) to review the transfer effectiveness of the courses and (2) to gather information about challenges, concerns, or changes needed from the OPUs and CCs. These reviews are to take place in the winter term. Every third year beginning in 2030, the subcommittee will conduct a deeper review of the alignment of these courses; this is the only time that the subcommittee will consider a vote to modify the aligned content of the course, using the previous two years of data. The choice in these third-year reviews will be to either affirm our existing alignment decisions or to revise a particular	Yes 14 No 0 Abstain 0

aspect to keep our curriculum based on the data gathered from the previous two years. We would like as many members as possible of the original subcommittee to be invited to participate in these discussions. Historical memory and original context will be useful in informing future decisions.	

CCN Chemistry Subcommittee Minority Report

Subcommittee Members
Paula Weiss (OSU) and Eric Sheagley (PSU)

Cochairs Christopher Walsh (EOU) and Kenneth Friedrich (PCC)
November 7, 2024

Re: Recommendation from the subcommittee

Be it resolved that the following members

Paula Weiss	OSU
Eric Sheagley	PSU

of the CCN Chemistry Subcommittee would like to file a Minority Report to provide a record of their disagreement with the following motion:

I. CH/CHE/CHEM 223Z Course Learning Outcomes

Students will be able to

1. Apply concepts of thermodynamics to explain the favorability of chemical reactions.

2. Apply the principles of spontaneity, entropy, free energy, and the laws of thermodynamics to predict and rationalize the behavior of chemical reactions.

3. Interpret the behavior and relative strengths of acids and bases, buffers, and the hydrolysis of salts.

4. Analyze and evaluate equilibrium reactions, including solubility, acids and bases, and other equilibria.

5. Predict responses of various chemical systems to changing conditions using equilibrium calculations and Le Chatelier's Principle.

6. Use redox reactions and electrochemical principles to determine cell potentials and analyze the relationship between voltage, free energy, and equilibrium.

7. Identify or formulate and apply the appropriate equations related to electrochemistry, thermodynamics, equilibrium reactions, acids, bases, and buffers.

Students are better served by moving learning outcome number 5 from the CH/CHE/CHEM 223Z Course Learning Outcomes into CH/CHE/CHEM 222Z Course Learning Outcomes.

Section A: Rationale & Alternative Recommendations

It was our pleasure to serve on the Common Course Numbering subcommittee for General Chemistry. Our discussions were consistently collegial and respectful, uniting a diverse group of educators from a range of backgrounds and institutions.

On nearly every issue, we reached a consensus that satisfied all parties. However, there was one key issue on which we were unable to find agreement. The majority voted to shift a very important topic in the study of chemistry, foundations of equilibrium, from CH/CHE/CHEM 222Z to 223Z—a decision with which we must respectfully disagree, as we believe this will have far-reaching implications for both courses.

The preliminary version of the CH/CHE/CHEM 223Z course learning outcome #5 reads as follows:

5. Predict responses of various chemical systems to changing conditions using equilibrium calculations and LeChatelier's Principle.

We believe that this is a foundational equilibrium concept, and in the common text that we referenced while discussing the learning outcomes, Le Chatelier's Principle is included in the chapter on fundamental equilibrium concepts and is considered by the authors of this minority report to be a foundational concept that belongs in CH/CHE/CHEM 222Z.

Recommendation: Therefore, we propose that this outcome should be added to CH/CHE/CHEM 222Z and removed from CH/CHE/CHEM 223Z.

As this minority report requests, the equilibrium concept spans both CH/CHE/CHEM 222Z and 223Z, allowing students to learn the foundations in 222Z and then apply them in 223Z. This pacing, with a break between terms, gives students valuable time to consolidate their understanding. Removing this complex topic from CH/CHE/CHEM 222Z, as suggested in the Recommendation Report, would deprive the course of one of its most challenging and critical concepts, only to compress it into an already full CH/CHE/CHEM 223Z curriculum.

Including this learning goal in CH/CHE/CHEM 222Z should result in students having a stronger foundation in the content, which will aid in balancing the course load and may increase student retention and success. This is achieved by providing a more even distribution of topics across the three quarters.

Additionally, a few majors require only CH/CHE/CHEM 221Z and 222Z; under our request, these students would gain adequate foundational knowledge in this topic even if they do not complete the full sequence.

This redistribution, however, would dilute the rigor of CH/CHE/CHEM 222Z while overloading 223Z, which already has a demanding schedule. Shifting this material adds approximately two weeks of additional content to CH/CHE/CHEM 223Z, which would require reducing the depth of coverage for all topics to manage the time constraints. The content in CH/CHE/CHEM 223Z is foundational for upper-division

courses, including Organic Chemistry, Quantitative Analysis, Biochemistry, and Physical Chemistry. Although not all students will take Physical Chemistry, a large number will continue to Organic Chemistry and Biochemistry, making it untenable to effectively teach the essential topics in CH/CHE/CHEM 223Z under the proposed plan in the Recommendation Report, as it compromises both depth and quality, potentially impacting student success in upper-division courses.

While our community college representatives expressed confidence in their ability to cover the additional material in CH/CHE/CHEM 223Z, faculty from OSU and PSU believe it is unwise to compress so much content into 223Z while removing it from 222Z. With over 3,600 students at OSU and 600 at PSU enrolling in General Chemistry each year, this shift could significantly impact a substantial number of undergraduates.

Section B: Considerations

In conclusion, we ask the Transfer Council to consider these issues carefully and to do/consider the following:

I. The alignment of a three-course lecture and lab sequence was a challenging task. The committee had many discussions on the best way to split the content between the courses. Compromises were made, but splitting the foundational aspects of a concept across terms is not in the best interest of the students in our courses.
II. Due to the size of the committee, finding a time that accommodated all members was challenging. Committee members who could not attend a meeting were unable to vote on behalf of their institutions. Notably, the representative from the U of O was absent from this important vote.

Signed by:

Name Paula Weiss Signature Paula Weiss

Name Eric Sheagley Signature Eric Sheagely

Date: November 12, 2024

Provide copies to:

CCN Chemistry Chair/Co-chairs	Christopher Walsh Kenneth Friedrich

Transfer Council Co-chairs	Jose Coll David Plotkin
Cc	Donna Lewelling, Director of Community Colleges and Workforce Development, HECC Veronica Dujon, Director of Academic Policy and Authorization, HECC

— END OF REPORT–