

ASSESSMENT PLAN
University Core Curriculum
Dept. of Chemistry and Biochemistry
2017-2018

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A. Mission and Vision

The mission of the University of Arkansas is to prepare students for lives of the highest individual quality and the greatest potential for contribution toward making a better world. The comprehensive program of university core courses serves as the basis for all majors or professional concentrations to provide students with the necessary knowledge and skills to become successful professionals and citizens and to engage in current research and outreach that serves Arkansas and the nation.

The vision of the general education core is to help prepare students to become critical thinkers and effective communicators, to afford an understanding of our richly diverse human heritage, to develop adaptability to a rapidly changing world, and to develop a capacity and enthusiasm for lifelong learning and creativity.

B. General Goals for the Science Core Courses:

A primary goal of these courses is to develop an appreciation of the basic principles that govern natural phenomena and the role of experiment and observation in revealing these principles. Students should acquire an understanding of the relationship between hypothesis, experiment, and theory, and develop the skills common to scientific inquiry, including the ability to frame hypotheses and defend conclusions based on the analysis of data. These courses are designed to prepare a student for informed citizenship by illustrating the importance of science and technology to the present and future quality of life and the ethical questions raised by scientific and technological advances.

Each course should be broad and provide a fundamental knowledge base for future courses in the discipline. For the student who is not going on to future courses, they should provide an understanding of how the particular disciplines approach observing the world.

C. General Objectives of Science Core (course specific objectives listed under specific courses)

1. Integration of ideas from different sections of the course should be sought.
2. The importance of science and technology to present quality of life should be presented. Examples should include applications to current technology and recognition of unresolved problems.
3. The increasing overlap of scientific disciplines and growth of the role of interdisciplinary team research should be made clear.
4. Incorporation of a historical perspective on the role of science in the development of society is desirable.
5. Each course should address how the fundamental knowledge base was developed and how it evolves.
6. A laboratory class that provides the students with hands-on experiences with the knowledge base and how it is developed should accompany the lecture course.

D. General Outcomes Expected from Science Core (course specific outcomes listed under specific courses)

Upon completion of eight hours of science courses, students will:

1. Understand how scientific inquiry is performed.
2. Understand the boundaries of scientific data.
3. Have a basic working knowledge of a few areas of science.
4. Be able to make informed decisions regarding potential government policies that involve science.
5. Have improved problem solving skills.
6. Be able to identify the challenges and problems created by modern advances in technology.

E. Methods of Assessment:

The primary means of assessment will be direct measures of students' work in each of the courses approved for the science core. The assessment will be incorporated into the grading process of each course. Examples of direct measures may include exams, essays, papers, journals, capstone classes, or projects. Faculty members of each discipline represented in the science core will determine the objectives/outcomes desired and the direct measures that are to be utilized for assessing the stated outcomes. Since these courses are foundation courses within each discipline, the results will be reported to the appropriate discipline faculty for discussion and suggestions for improvements.

In addition, assessment will be performed through comparisons of assessment exams given within the first two weeks of the course and at the end of the course. These are to contain a minimum of 10 questions addressing common goals and relevant objectives.

Each course is expected to have student outcomes selected from the lists of objectives and outcomes. Assessment criteria will be revised and established by the fall semester of each academic year. Results and interpretations will be provided to the campus administration and the science core subcommittee for annual reporting requirements. Reports will also be submitted to the General Education Core committee, which will review the findings and provide feedback to the departments and the general education core subcommittee.

G. Timeline

Sampling and assessment are completed in the fall and spring semesters by the various faculty members who are instructors in the core areas.

H. Recommendations for Improving Student Learning

Course-embedded assignments and tests will be reviewed by the instructors of all university core courses. Each department will conduct an annual departmental meeting in which each instructor will share his or her assignments, criteria, and evaluation of student work, along with recommendations for improving student learning. The faculty members should discuss the pedagogy, technology, teaching and learning formats, and other factors of the core course. The results and suggestions will be reported to the appropriate discipline department for discussion for improvements with a copy of the report provided to the sciences core committee. Reports to the campus general education core committee will be provided, as needed, with a suggested time period for improvements, determined by university administration.

Catalogue Number	Course Description	Objectives (from page 1)*					
		1	2	3	4	5	6
CHEM 1053/1051L	Chemistry in the Modern World	√	√	√	√	√	√
CHEM 1074/1071L	Fundamentals of Chemistry	√	√	√	√	√	√
CHEM 1103/1101L	University Chemistry I	√	√	√	√	√	√
CHEM 1123/1121L	University Chemistry II	√	√	√	√	√	√
CHEM 1213/1211L	Chemistry for Majors I	√	√	√	√	√	√
CHEM 1223/1221L	Chemistry for Majors II	√	√	√	√	√	√

Specific Course Objectives : CHEM 1053 Chemistry in Modern World

1. Introduce the concept of atoms
2. Introduce the concept of molecules and how they are represented graphically.
3. Introduce the concept of the mole and chemical equations
4. Explore the basics of chemical equilibria
5. Develop an understanding of acids, bases, pH and buffers.
6. Introduce students to the how chemical processes impact the environment and society.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar with the language of the chemistry.
2. Students will learn about the composition of atoms
3. Students will become familiar with the structures of molecules
4. Students will develop an understanding of chemical equilibria and how various equilibria affect the outcome of a reaction
5. Students will learn about acids or a bases
6. Students will learn about the chemistry of water
7. Students will learn about the chemistry of air

Assessment: Specific means of determining how well the goals and objectives for each course are met.

1. Students will demonstrate an understanding of the material through the solution of problems that specifically address each concept. The problems will be presented in the homework and on the examinations.
2. Students will be given an assessment questionnaire in the first week of the course and at the end of the course and the results will be compared.

Specific Course Objectives : CHEM 1074 Fundamentals of Chemistry

1. Introduce the concept of atoms
2. Introduce the concept of molecules and how they are represented graphically.
3. Introduce the concept of the mole and chemical equations
4. Explore the basics of chemical equilibria
5. Develop an understanding of acids, bases, pH and buffers.
6. Introduce some of the fundamentals concepts of organic chemistry.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar with the language of the chemistry.
2. Students will learn about the composition of atoms
3. Students will become familiar with the structures of molecules
4. Students will learn how to balance a chemical equation and determine reactions yields.
5. Students will develop an understanding of chemical equilibria and how various equilibria affect the outcome of a reaction.
6. Students will learn how to recognize an acid or a base using the molecular structure
7. Students will learn how to calculate pH of a solution including buffers.

Assessment: Specific means of determining how well the goals and objectives for each course are met.

1. Students will demonstrate an understanding of the material through the solution of problems that specifically address each concept. The problems will be presented in the homework and on the examinations.
2. As the course progresses student will be given problems that integrate new concepts with material previous introduced. The problems will be presented in the homework and on the examinations.
3. Students will also be given an assessment questionnaire in the first week of the course and at the end of the course and the results will be compared.

Specific Course Objectives : CHEM 1103 University Chemistry I

1. Introduce the concept of molecules and how they are represented graphically.
2. Introduce the concept of the mole and chemical equations
3. Explore the current theories that describe atomic and molecular structure
4. Develop an understanding chemical bonding and molecular structure.
5. Introduce some of the fundamentals used to describe gases.
6. Introduce some of the fundamentals used to describe solutions.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar with the language of the chemistry.
2. Students will learn about the current and past views of the structure of atoms.
3. Students will become familiar with the graphical representations of molecules
4. Students will learn how to balance a chemical equation and determine reactions yields.
5. Students will learn how to describe the electronic configuration of atoms.
6. Students will learn how to determine the structure of a molecule.
7. Students will learn the relation between pressure, volume, temperature and moles of a gas
8. Students will learn how to calculate concentrations of solution phase components.
9. Students will learn how solutes affect the properties of solvents.

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1. Students will demonstrate an understanding of the material through the solution of problems that specifically address each concept. The problems will be presented in the homework and on the examinations.
2. As the course progresses student will be given problems that integrate new concepts with material previous introduced. The problems will be presented in the homework and on the examinations.
3. Students will also be given an assessment questionnaire in the first week of the course and at the end of the course and the results will be compared.

Specific Course Objectives : CHEM 1213 Chemistry for Majors I

1. Introduce the concept of molecules and how they are represented graphically.
2. Introduce the concept of the mole and chemical equations
3. Explore the current theories that describe atomic and molecular structure
4. Develop an understanding chemical bonding and molecular structure.
5. Introduce some of the fundamentals used to describe gases.
6. Introduce some of the fundamentals used to describe solutions.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar with the language of the chemistry.
2. Students will learn about the current and past views of the structure of atoms.
3. Students will become familiar with the graphical representations of molecules
4. Students will learn how to balance a chemical equation and determine reactions yields.
5. Students will learn how to describe the electronic configuration of atoms.
6. Students will learn how to determine the structure of a molecule.
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Specific Course Objectives : CHEM 1123 University Chemistry II

1. Introduce the fundamentals of reaction kinetics.
2. Introduce the fundamentals of thermodynamics
3. Introduce the fundamentals of equilibrium, in general
4. Explore specific examples of equilibria in solution including acids and bases.
5. Introduce some of the fundamentals of electrochemistry.
6. Introduce some of the fundamentals nuclear chemistry
7. Give a brief introduction to organic chemistry.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar how to manipulate reaction rate data.
2. Students will learn how various thermodynamic parameters affect reactions.
3. Students will learn how to predict the direction of a reaction
4. Students will learn how to calculate equilibrium concentrations for a variety of reactions.
5. Students will learn about titrations of acids and bases.
6. Students will learn about pH and buffers.
7. Students will learn how to determine electrochemical potentials of reactions
8. Students will learn how to balance nuclear reactions.
9. Students will learn how name simple organic molecules.

Assessment: Specific means of determining how well the goals and objectives for each course are met.

1. Students will demonstrate an understanding of the material through the solution of problems that specifically address each concept. The problems will be presented in the homework and on the examinations.
2. As the course progresses student will be given problems that integrate new concepts with material previous introduced. The problems will be presented in the homework and on the examinations.
3. Students will also be given an assessment questionnaire in the first week of the course and at the end of the course and the results will be compared.

Specific Course Objectives : CHEM 1223 Chemistry for Majors II

1. Introduce the fundamentals of reaction kinetics.
2. Introduce the fundamentals of thermodynamics
3. Introduce the fundamentals of equilibrium, in general
4. Explore specific examples of equilibria in solution including acids and bases.
5. Introduce some of the fundamentals of electrochemistry.
6. Introduce some of the fundamentals nuclear chemistry
7. Give a brief introduction to organic chemistry.

Student Learning Outcomes: What student should be able to demonstrate at a specified level of performance in order to meet course objectives?

1. Student will become familiar how to manipulate reaction rate data.
2. Students will learn how various thermodynamic parameters affect reactions.
3. Students will learn how to predict the direction of a reaction
4. Students will learn how to calculate equilibrium concentrations for a variety of reactions.
5. Students will learn about titrations of acids and bases.
6. Students will learn about pH and buffers.
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