Rule 24 Matrix
Revised: March 2007
Table of Alignment of Standards and Assessments

Endorsement: Chemistry **Grade Levels: 7-12** **Endorsement Type: Subject**
Total Hours Required by Rule 24: 36 **Program Hours Required by Institution: 37** **Name of Institution: Concordia University**

Endorsement Program Requirements: Nebraska teacher education institutions offering this endorsement program must have on file, within the institution, a plan which identifies the courses and the course completion requirements which the institution utilizes to grant credit toward completion of this endorsement.

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Standard/Description

006.44D Certification Endorsement Requirements: This endorsement shall require a minimum of 36 semester hours of laboratory based courses in the natural sciences (biology, chemistry, earth science, and physics), of which 24 semester hours must be in chemistry and a minimum of 12 semester hours of laboratory-based courses among the remaining three natural science areas. A laboratory-based course provides activity based, hands-on experiences for all students. Laboratory activities shall be designed to allow students to develop scientific skills and processes, discover and construct science concepts, and allow for the application of the concept to the real lives of students.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Bio 110 Principles of Biology (4) Phys 110 Principles of Physics (4) Chem 115 General Chemistry (4) Chem 116 General Inorganic and Qualitative Analysis (4) Chem 231 Organic Chemistry I (4) Chem 353 Physical Chemistry I (3) Chem 355 Physical Chemistry Lab I (1) (seven or more additional hours of chemistry at or above the 300-level) Sci/Geog 281 Physical Geography and Geology (4) Educ 373 Methods in Secondary Science (2)							

Standard/Description

A. Demonstrate knowledge and understanding of and be able to teach the concepts, skills, and processes of science as defined in the Nebraska Content Standards for eighth and twelfth grades. Demonstrate the appropriate depth of understanding in the 36 hours of emphasis.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Educ 373 Methods in Secondary Science (2)	Year Plan	Year Plan	X	X	X	X	X

Standard/Description

B. Design and manage safe and supportive learning environments reflecting high expectations for the success of all students, including being able to:
1. Manage physical spaces within which science learning occurs;
2. Demonstrate proper treatment and ethical use of living organisms; and
3. Demonstrate safety in all areas related to science instruction.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Bio 110 Principles of Biology (4) Chem 115 General Chemistry (4) Educ 373 Methods in Secondary Science (2)	Laboratory Safety Lab Laboratory Safety Notes Microlesson Feedback Form	Chem 115 Lab safety Notes	X X X	X	X X X	X	X

Standard/Description

C. Relate science to the community and to use human and institutional resources in the community to advance the education of their students in science, including being able to:
1. Utilize social and community support networks;
2. Relate science teaching and learning to the needs and values of the community; and
3. Involve people and institutions from the community in the teaching of science.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Educ 373 Methods in Secondary Science (2)	Homework		X	X	X	X	X

Standard/Description

D. Apply the unifying concepts and processes that help students think about and integrate a range of basic ideas which build an understanding of the natural world, including:
1. Systems, order and organization;
2. Evidence, models and explanation;
3. Change, constancy and measurement;
4. Evolution and equilibrium; and
5. Form and function.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Chem 115 General Chemistry I	Test, Lab		X		X		
Phys 110 Principles of Physics (4)	Test, Lab		X		X		
Bio 110 Principles of Biology (4)	Test		X				
Geog 281 Physical Geography and Geology (4)	Test		X				

Standard/Description

E. Apply the processes of scientific inquiry, including the ability to:
1. Identify questions and concepts that guide scientific investigations;
2. Design and conduct scientific investigations;
3. Use appropriate tools and techniques to gather, analyze and interpret data;
4. Develop descriptions, explanations, predictions and models using evidence;
5. Think critically and logically to make relationships between evidence and explanation;
6. Recognize and analyze alternative explanations and models;
7. Communicate and defend a scientific argument; and
8. Understand the unique characteristics of scientific inquiry.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Phys 110 Principles of Physics (4)	Lab		X		X		
Chem 115 General Chemistry I (4)	Lab		X		X		
Chem 231 Organic Chemistry I (4)	Lab	Chem 231 Lab Report	X		X		
Chem 355 Physical Chemistry Lab I (1)	Lab		X		X		

Standard/Description

F. Apply physical science facts, concepts, principles, theories and models, including:
1. Structure and properties of the atom;
2. Structure and properties of matter;
3. Chemical reactions;
4. Motions and forces;
5. Conservation of energy and increase in disorder; and
6. Interactions of energy and matter.

Candidate Proficiencies

Course #, Title, and Credits	Course Assessment(s)	Key Program Assessment(s)	Content Knowledge	Pedagogical Knowledge	Skills	Dispositions	P-12 Student Learning
Chem 115 General Chemistry (4)	Tests	Chem 115 ACS Exam Score	X				
Chem 116 General Inorganic and Qualitative Analysis (4)	Tests		X				
Chem 231 Organic Chemistry I (4)	Tests	Chem 231 ACS Exam Score	X				
Chem 353 Physical Chemistry 1 (3)	Tests	Chem 353 ACS Exam Score	X				

Standard/Description							
G. Apply life science facts, concepts, principles, theories and models, including: 1. The cell; 2. Molecular basis of heredity; 3. Biological evolution; 4. Interdependence of organisms; 5. Matter, energy and organization in human and other living systems; and 6. Behavior of organisms.			**Candidate Proficiencies**				
Course #, Title, and Credits	**Course Assessment(s)**	**Key Program Assessment(s)**	**Content Knowledge**	**Pedagogical Knowledge**	**Skills**	**Dispositions**	**P-12 Student Learning**
Bio 110 Principles of Biology (4)	Tests		X				

Standard/Description							
H. Apply earth and space science facts, concepts, principles, theories and models, including: 1. Structure of the earth system; 2. Earth's history; 3. Earth in the solar system; 4. Energy in the earth system; 5. Geochemical cycles; 6. Origin and evolution of the earth system; and 7. Origin and evolution of the universe.			**Candidate Proficiencies**				
Course #, Title, and Credits	**Course Assessment(s)**	**Key Program Assessment(s)**	**Content Knowledge**	**Pedagogical Knowledge**	**Skills**	**Dispositions**	**P-12 Student Learning**
Geog 281 Physical Geography and Geology (4)	Tests		X				

Standard/Description							
I. Establish connections between the natural and designed world, linking science and technology, including being able to: 1. Plan, create or modify, and evaluate a technological solution to a scientific problem; 2. Describe the relationship between science and technology, including the cyclical relationship for advancement; and 3. Demonstrate an understanding of the interdisciplinary nature of science as it approaches human problems, e.g., engineering, geophysics and biochemistry.			**Candidate Proficiencies**				
Course #, Title, and Credits	**Course Assessment(s)**	**Key Program Assessment(s)**	**Content Knowledge**	**Pedagogical Knowledge**	**Skills**	**Dispositions**	**P-12 Student Learning**
Phys 110 Principles of Physics (4)	Homework, Labs		X		X		

Standard/Description

J. Apply science concepts, principles, and processes to personal and social decision making, including: 1. Personal and community health; 2. Population growth; 3. Natural resources; 4. Environmental quality; 5. Natural and human-induced hazards; and 6. Science and technology in local, national, and global challenges.			**Candidate Proficiencies**				
Course #, Title, and Credits	**Course Assessment(s)**	**Key Program Assessment(s)**	**Content Knowledge**	**Pedagogical Knowledge**	**Skills**	**Dispositions**	**P-12 Student Learning**
Bio 110 Principles of Biology (4) Geog 281 Physical Geography and Geology (4)	Tests Tests		X X				

Standard/Description							
K. Demonstrate an understanding of the history and nature of science, including: 1. An understanding of science as a human endeavor, including the ability to: a. Describe significant scientists, including individuals from both genders, and of different races and ethnic groups; b. Describe the societal, cultural, and personal beliefs that influence scientists; and c. Demonstrate the nature and practice of scientists, for example, ethical behaviors, peer review, truthful reporting, public disclosure. 2. The nature of scientific knowledge; and 3. The history of science.			**Candidate Proficiencies**				
Course #, Title, and Credits	**Course Assessment(s)**	**Key Program Assessment(s)**	**Content Knowledge**	**Pedagogical Knowledge**	**Skills**	**Dispositions**	**P-12 Student Learning**
Chem 355 Physical Chemistry Lab I (1)	Class presentations		X				