Graduate Learning Objectives/Outcomes for Ph.D. & MS Programs
***Biochemistry and Biophysics*, College of Science**

The following table indicates what we have identified as "universal" **graduate learning objectives**, by which we assess **graduate learning outcomes**; also for each we include the broadly used means of assessment. Individual programs and Departments may have additional graduate learning objectives; most often these are explicitly stated in a Departmental Graduate Handbook, in documentation provided by a professional organization or society, or included as degree requirements. The overarching objectives in the table address what are considered to be critical areas of competency (a comprehensive appreciation of the field of study, an understanding of current issues of importance in the field, a grounding in ethics, and a demonstration of creativity) at various points on the path through graduate studies (admissions, matriculation to candidacy, graduation). Some of the objectives apply to any degree program, and some are specific to the non-thesis (coursework) MS, the non-thesis (project) MS, the thesis MS, or the PhD, as indicated. Likewise there is some variation amongst the degree programs as regards means of assessment.

Means of assessment referenced in the table below include:
(1) minimum admission standards, assessment of application materials, admissions process interviews;
(2) meeting a predetermined standard in graduate level coursework (content/subject matter and GPA);
(3) a pass/fail oral preliminary exam;
(4) delivery of 3rd-year seminar
(5) written thesis or research paper;
(6) oral defense;

Ph.D. Objective	MS Objective
Students **will have met the objectives for learning outcomes in an undergraduate discipline** relevant to their graduate field of study. *Scoring methods:* 1	Students **will have met the objectives for learning outcomes in an undergraduate discipline** relevant to their graduate field of study. *Scoring methods:* 1
Graduates **will be able to summarize major central issues and current research problems** in their field. *Scoring methods:* 2,3,4,5,6	Graduates **will be able to summarize major central issues and current research problems** in their field. *Scoring methods:* 2,5,6
Graduates **will be able to communicate the major tenets of their field and their work orally and in writing** for students, peers and the lay public. *Scoring methods:* 2	Graduates **will be able to communicate the major tenets of their field and their work orally and in writing** for students, peers and the lay public. *Scoring methods:* 2
Graduates **will be able to explain and identify areas of uncertainty** in their fields. *Scoring methods:* 2,3,4	
Graduates **will be able to identify areas where ethical issues may arise** in their work or discipline. *Scoring methods:* 2,5,6	Graduates **will be able to identify areas where ethical issues may arise** in their work or discipline. *Scoring methods:* 2,5,6
Graduates **will be able to articulate strategies for dealing with ethical issues** in their field. *Scoring methods:* 2,4,5,6	
Graduates **will have designed, carried out and presented an original work of research** at the leading edge of their discipline. *Scoring methods:* 2,5,6	Graduates **will have completed and defended:** **(1) an original manuscript** based on either a review and synthesis of the primary literature [non-thesis (project) MS] or original research [thesis MS]; or **(2) mastery of appropriate advanced coursework in the field.** [non-thesis (coursework) MS] *Scoring methods:* 2,5,6

Scoring Guide (Rubric) for Graduate Learning Outcome Assessment DRAFT 9-1-2011, College of Science

Ph.D. PRELIMINARY EXAM in *Biochemistry and Biophysics*

Candidate Name: _____ Date: _____
Title of Thesis: _____

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition:** States the research problem clearly, providing motivation for undertaking the research			
2. **Literature and Previous Work:** Demonstrates sound knowledge of literature in the area, and of prior work on the specific research problem			
3. **Impact of Proposed Research:** Demonstrates the potential value of the proposed solution to the research problem in advancing knowledge within the area of study			
4. **Solution Plan:** Provides a sound plan for applying state of-the-art research methods/tools to solving the defined problem and shows a good understanding of how to use methods/tools effectively			
5. **Expected Results:** Provides a sound plan for analyzing and interpreting research results/data			
6. **Quality of Written Communication:** Communicates research proposal clearly and professionally in **written** form			
7. **Quality of Oral Communication:** Communicates research proposal clearly and professionally in **oral** form			
8. **Critical Thinking:** Demonstrates capability for independent research in the area of study, preparedness in core disciplines relevant to research, and ability to complete the proposed research			
9. **Broader Impact:** Demonstrates awareness of broader implications of the proposed research. Broader implications may include social, economic, technical, ethical, business, etc. aspects.			

Overall Assessment: The assessment of the overall performance of the candidate based on the evidence provided in items 1 – 9 above.

CRITERIA	PERFORMANCE RATINGS for PRELIMINARY EXAM		
	Does NOT PASS Exam	***PASSES Exam***	
OVERALL, My rating of this preliminary exam indicates that it:	**Does not meet expectations**	**Meets expectations**	**Exemplary performance**

Name of the Examining Committee Member: _____
Signature of the Examining Committee Member: _____

Examiner: Please use the reverse side of this form for written commentary as needed.

Attachment 2

Scoring Guide (Rubric) for Graduate Learning Outcome Assessment DRAFT 9-1-2011, College of Science

Ph.D. THESIS DEFENSE EXAM in *Biochemistry and Biophysics*

Candidate Name: _____ Date: _____
Title of Thesis: _____

Evaluation/Guidance	Does not meet Expectations	Meets Expectations	Exemplary Performance
1. **Problem Definition:** Has stated the research problem clearly, providing motivation for undertaking the research			
2. **Literature and Previous Work:** Demonstrated sound knowledge of literature in the area, and of prior work on the specific research problem			
3. **Impact of Proposed Research:** Demonstrated the potential value of solution to the research problem in advancing knowledge within the area of study			
4. **Solution Approach:** Has applied sound state-of-the field research methods/tools to solve the defined problem and has described the methods/tools effectively			
5. **Results:** Analyzed and interpreted research results/data effectively			
6. **Quality of Written Communication:** Communicates research results clearly and professionally in **written** form			
7. **Quality of Oral Communication:** Communicates research results clearly and professionally in **oral** form			
8. **Critical Thinking:** Has demonstrated capability for independent research in the area of study and expertise in the area			
9. **Broader Impact:** Demonstrated awareness of broader implications of the concluded research. Broader implications may include social, economic, technical, ethical, business, etc. aspects.			
10. **Publications:** Journal or conference publications have resulted (or are anticipated) from this research			

Overall Assessment: The assessment of the overall performance of the candidate based on the evidence provided in items 1 – 10 above.

CRITERIA	**PERFORMANCE RATINGS for THESIS EXAM**		
	Does NOT PASS Exam	***PASSES Exam***	
OVERALL, My rating of the Thesis indicates that it:	**Does not meet expectations**	**Meets expectations**	**Exemplary performance**

Name of the Examining Committee Member: _____
Signature of the Examining Committee Member: _____

Examiner: Please use the reverse side of this form for written commentary as needed.

Attachment 3