

**ASSESSMENT OF STUDENT PERFORMANCE ON
PhD QUALIFYING EXAMINATION IN CHEMICAL ENGINEERING**

Outcome 1: Demonstrate ability to perform PhD-level research by providing a critical review of a research article chosen by Oral Exam Committee Chair.

Specifically, students should be able to

- (a) Carry out thorough and independent research (via analysis of the article and related literature),
- (b) Show critical thinking (how are CHBE concepts used in the research article? Do the data warrant the conclusions?), and
- (c) Have strong communication skills (through the critical oral and written presentation of the article).

Outcome 2: Demonstrate satisfactory fundamental knowledge at the graduate level in four core areas of chemical engineering: applied mathematics, kinetics and reaction engineering, thermodynamics, and transport phenomena.

Specifically, students should be prepared to

- (d) Conceptualize a model for a specified physical situation or phenomenon (involving kinetics, thermo, and/or transport). Include diagrams as needed and list appropriate technical assumptions.
- (e) Analyze the situation based on this model; for example, give the governing equations and boundary conditions or other constraints and show how they are simplified by the assumptions made previously.
- (f) If appropriate, select suitable mathematical techniques and solve these equations. Discuss advantages and limitations of the model and its underlying assumptions.

Examination Date: _____

Student Name (+ Advisor Name): _____

Oral Exam Committee Chair Name: _____

Oral Exam Committee Member Name: _____

Oral Exam Committee Member Name: _____

Criteria for Outcome 1	Assessment (excellent/good/fair/unsatisfactory)
(a) Independent research	
(b) Critical thinking	
(c) Presentation skills	

Criterion for Outcome 2	Assessment (excellent/good/fair/unsatisfactory)
(d) Conceptualize a model	
(e) Analyze the situation	
(f) Select technique, solve	

Based on the assessments listed above, the student has:

_____ **Passed** the entire examination (Outcomes 1 and 2 achieved)

_____ **Partially passed** the examination (Outcome 1 achieved; Outcome 2 not achieved)
 → subject(s) to be re-tested: _____

_____ **Partially passed** the examination (Outcome 2 achieved; Outcome 1 not achieved)
 → recommended course of action (e.g., re-do oral presentation; re-do written report; analyze new research article; provide addendum to written report):

_____ **Did not pass** the examination (Outcomes 1 and 2 not achieved)

→ recommended course of action:

→ subject(s) to be re-tested: _____

Signature of Chair

Signature of Committee Member

Signature of Committee Member

GUIDELINES FOR ASSESSMENT OF STUDENT PERFORMANCE ON QUALIFYING EXAMINATION IN CHEMICAL ENGINEERING

<i>Independent research</i>	Excellent:	Performed a rigorous and in-depth analysis and description of the research article, and provided an appropriately comprehensive background beyond the contents of the article
	Good:	Incomplete aspects in analysis and background information
	Fair	Marginal analysis, marginal background research
	Unsatisfactory:	Insufficient analysis, insufficient background research

<i>Critical thinking</i>	Excellent:	Provided objective analysis and made well-supported opinions in the critique of research article, no technical errors
	Good:	Minor errors in the critique of research article
	Fair	Some errors in the critique of research article
	Unsatisfactory:	Significant errors in the critique of research article

<i>Presentation skills</i>	Excellent:	Writing was clear, viewgraphs were high quality, high level of professionalism, answered questions clearly
	Good:	Minor errors in writing and oral presentation
	Fair	Noticeable amount of errors, mediocre quality
	Unsatisfactory:	Stoppiness, insufficient clarity in the presented materials

<i>Conceptualize a model</i>	Excellent:	Exhibits a clear understanding of situation, makes all important assumptions
	Good:	Exhibits general understanding of situation, correctly states most assumptions
	Fair	Exhibits marginal understanding of situation, correctly states some assumptions
	Unsatisfactory:	Shows lack of understanding of important features of situation, omits key assumptions or makes incorrect assumptions

<i>Analyze the situation</i>	Excellent:	States governing equations, boundary conditions correctly in form consistent with assumptions
	Good:	Formulation of problem generally correct but with some errors in equations or boundary conditions
	Fair	Formulation of problem is somewhat correct
	Unsatisfactory:	Major errors in analysis of problem

<i>Select technique, solve</i>	Excellent:	Chooses suitable mathematical technique, obtains correct solution and understands its limitations
	Good:	Chooses suitable technique but solution is somewhat in error or incomplete; understands most limitations
	Fair	Chooses suitable technique but solution is in error or incomplete; understands some of the limitations
	Unsatisfactory:	Chooses unsuitable technique or is unable to apply the chosen technique; lacks understanding of limitations

Reminder to the Student

1. Email your review + pdf of article to the committee members prior to your oral exam
2. Bring one printed copy of this document, filled out with date and names
3. Bring one printed copy of the research article
4. Bring one printed copy of your review