Description
The overall goal of the comprehensive or "qualifying" exam is to determine whether the student’s depth and breadth of knowledge and ability to integrate information is such that he or she should be advanced to candidacy for the PhD. The comprehensive exam is a required component of the PhD program and evaluates skills learned in the CTS core courses (CTS 301, 305, 310, 315, 320, 325). This is a rigorous exam and is designed to evaluate 1) how well students understand the concepts taught in the CTS core courses, and 2) how well students can apply these concepts to new research situations. Anything taught as part of the core courses may be evaluated as part of the exam. The exam involves both a written and oral component (see below).

Comprehensive Exam Committee
A Comprehensive Exam Committee will be assembled by the CTS Academic Advisor and student. Students have a right to request certain faculty not be appointed to their Committee, per UVM Graduate College policy. The Committee will consist of 3 members:

- 2 Key CTS Faculty Members. Please see the definition of Key CTS Faculty for current Members.
- 1 Graduate College Faculty with content expertise. This person may or may not be Key CTS Faculty.

Note: The Research Mentor, CTS Academic Advisor, and any member of the Dissertation Committee may not serve on the Comprehensive Exam Committee to avoid any real or perceived conflicts of interest. One Comprehensive Exam Committee member shall be appointed as chair by the committee and hold the responsibility of overseeing the exam and reporting to the student’s Academic Advisor with the student’s exam performance.

Comprehensive Exam Process
1. The comprehensive exam should be completed within 6 months of finishing the CTS core courses. The student should work with their CTS Academic Advisor to assemble a Comprehensive Exam Committee and submit form to CTS Program Specialist.
2. Once the student has identified a proposed research question for the exam (see Written Exam below), the student should present the research question to the Comprehensive Exam Committee for approval in an email. The student should have a minimum amount of contact with the Committee to ensure that the exam is completed independently.
3. Once the research question is approved by the Comprehensive Exam Committee, the student should identify a target date for the comprehensive exam and inform their CTS Academic Advisor and CTS Program Specialist. The comprehensive exam should be completed at least 6 months prior to the dissertation defense per UVM Graduate College policy.
4. Students should reserve a room on UVM campus for the oral exam at a time when all of the Committee can be present. The room should be reserved for 3 hours.
5. Students should submit their written exam to the Comprehensive Exam Committee at least 1 week in advance of the oral exam. See “Written Exam” below for specific instructions in preparing the written exam.
6. Students should send an email reminder to the Committee the day before the oral exam.

Note: The student may work with the CTS Student Services Specialist for assistance with room scheduling and exam process.
**Written Exam**

The written exam involves writing a grant protocol using the concepts learned in the core courses. Students must select a novel research question that meets the FINER criteria (feasible, interesting, novel, ethical, relevant). Although neither the CTS Academic Advisor nor the Research Mentor may serve on the Comprehensive Exam Committee or assist the student in completing the exam, students may review their ideas for research questions with their CTS Academic Advisor or Research Mentor to identify a question. *The research question must be different enough from the student’s thesis work that if both research questions were submitted for funding to NIH they would be considered separate applications.* Students should be aware that there is no obligation to pursue any of the proposed studies during the student’s graduate work and students are not required to submit the proposal as an extramural grant application. This protocol is specifically for exam purposes only.

To the students:
When you have selected a research question, ask yourself these questions before requesting approval and writing your protocol:

1. Is this research question FINER?
2. Can you state concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved? *(From NIH Specific Aims)*
3. Can you list succinctly the specific objectives of the research proposed, e.g. to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology? *(From NIH Specific Aims)*

The Comprehensive Exam Committee must approve the written exam research question before the student prepares his or her protocol.

**Prepare the protocol as a Word or PDF document in the style of a Parent R03:**

Refer to the following documents for specific information and instructions:


NIH Small Research Grant Program (R03) Description:
Small Research Grants support small research projects that can be carried out in a short period of time with limited resources for projects such as pilot or feasibility studies; secondary analysis of existing data; small, self-contained research projects; development of research methodology and/or development of new research technology.

The required sections for the written exam include:

<table>
<thead>
<tr>
<th>Section</th>
<th>Limited to 1 page</th>
<th>Required Information</th>
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<tbody>
<tr>
<td>Title Page</td>
<td>No NIH format for the title page. Include the following:</td>
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<tr>
<td></td>
<td>• Name</td>
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<td>• Title of Protocol</td>
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<td></td>
<td>• Names of Comprehensive Exam Committee Members</td>
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<td>• Date Submitted</td>
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<tr>
<td>Project Summary / Abstract</td>
<td>The Project Summary is meant to serve as a succinct and accurate</td>
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description of the proposed work when separated from the application. State the application's broad, long-term objectives and specific aims. Describe concisely the research design and methods for achieving the stated goals. This section should be informative to other persons working in the same or related fields and as possible understandable to a scientifically or technically literate reader. Avoid describing past accomplishments and the use of the first person.

**Specific Aims** Limited to 1 page

State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved. List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.

**Research Strategy** Limited to 6 pages

Organize the Research Strategy in the specified order and using the instructions provided below. Start each section with the appropriate section heading – Significance, Innovation, Approach.

(a) Significance
- Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

(b) Innovation
- Explain how the application challenges and seeks to shift current research or clinical practice paradigms.
- Describe any novel theoretical concepts, approaches or methodologies, instrumentation or interventions to be developed or used, and any advantage over existing methodologies, instrumentation, or interventions.
- Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation, or interventions.

(c) Approach
- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.
- Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised.
- If an applicant has multiple Specific Aims, then the applicant may address Significance, Innovation and Approach for each Specific Aim individually, or may address Significance, Innovation and Approach for all of the Specific Aims collectively.
- As applicable, also on Preliminary Studies.

<table>
<thead>
<tr>
<th>Human Subjects (if applicable)</th>
<th>No page limits but be succinct</th>
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<tr>
<td></td>
<td>Include the following sections:*</td>
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<tr>
<td></td>
<td>• Risks to Human Subjects</td>
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<td>• Adequacy of Protection Against Risks</td>
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<td>• Potential Benefits of the Proposed Research to Human Subjects and Others</td>
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<td>• Importance of the Knowledge to be Gained</td>
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<td></td>
<td>• Data Safety and Monitoring Plan</td>
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<td>• Inclusion of Women and Minorities</td>
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*Refer to the SF424 Guidelines for further information on each subheading

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<tr>
<th>Vertebrate Animals (if applicable)</th>
<th>No page limits but be succinct</th>
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<td></td>
<td>If Vertebrate Animals are involved in the project, address each of the five points below. This section should be a concise, complete description of the animals and proposed procedures. While additional details may be included in the Research Strategy, the responses to the five required points below must be cohesive and include sufficient detail to allow evaluation. If all or part of the proposed research involving vertebrate animals will take place at alternate sites (such as project/performance or collaborating site(s)), identify those sites and describe the activities at those locations.</td>
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<td>The five points are as follows:</td>
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<td>• Provide a detailed description of the proposed use of the animals in the work outlined in the Research Strategy section. Identify the species, strains, ages, sex, and numbers of animals to be used in the proposed work.</td>
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<td>• Justify the use of animals, the choice of species, and the numbers to be used. If animals are in short supply, costly, or to be used in large numbers, provide an additional rationale for their selection and numbers.</td>
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<td>• Provide information on the veterinary care of the animals involved.</td>
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<td>• Describe the procedures for ensuring that discomfort, distress, pain, and injury will be limited to that which is unavoidable in the conduct of scientifically sound research. Describe the use of analgesic, anesthetic, and tranquilizing drugs and/or comfortable restraining devices, where appropriate, to minimize discomfort, distress, pain, and injury.</td>
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• Describe any method of euthanasia to be used and the reasons for its selection. State whether this method is consistent with the recommendations of the American Veterinary Medical Association (AVMA) Guidelines on Euthanasia. If not, include a scientific justification for not following the recommendations.

References
No page limits


Oral Exam
Students will meet with their Comprehensive Exam Committee to answer questions related to the written exam and concepts taught as part of the CTS core courses. No formal presentation of the written protocol is required as part of the oral exam. Students should dress appropriately for a formal exam and be prepared for 2-3 hours of examination. After the Committee is satisfied that all questions have been answered, the student will be excused from the room while the Committee discusses the student’s performance (See Grading below)

Guidance for the Comprehensive Exam Committee

Approving the Research Question
The purpose of approving the research question is to ensure that the Committee is aware of the question prior to the student submitting their written exam. The Committee should assume that the proposed research question is scientifically distinct from the thesis work and novel enough that the written exam could be submitted as a new R03. The Committee may clarify with the CTS Academic Advisor or Research Mentor if there are questions. Although the Committee may be tempted to assist the student in designing the written exam, students should complete their exam independently. The Committee should grant their approval to the student by email. If the Committee rejects the question, they must provide reasons. The student should work with the CTS Academic Advisor to propose a different or revised question.

Grading
The Comprehensive Exam Committee will discuss the student’s performance immediately following the oral exam. The Committee will evaluate both the written and oral exam. The Committee should consider, but is not limited to, the following questions in making their assessments:

• Is the proposed research question FINER? Does it address the “so what” factor?
• Is the proposed research consistent with the student’s stage of research development?
• Is the student’s writing and discussion the research of high scientific quality?
• How well did the student describe and/or answer questions related to the:
  o research design, subjects, intervention (if applicable), and methods, including data collection and management
  o analytic plan including plans for descriptive, basic and multivariate statistics and sample size requirements
  o protection of human subjects including: Human Subjects Involvement and Characteristics, Sources of Materials, Potential Risks, Recruitment and Informed Consent, Protections against Risk, Potential Benefits of the Proposed Research, Importance of the Knowledge to be Gained, and Data and Safety Monitoring Plan
  o potential limitations and threats to validity and any plans to address them
  o translational or policy implications of the proposed research.
The exam grade outcomes are: Pass (no revisions), Provisional Pass (revisions required with defined timeline), and Fail. If revisions are required, the Chair will solicit comments from the other panel members and communicate them in writing to the student. The Chair will work with the student on a reasonable process and timeline for the revisions. In most cases, the student should be offered at least 30 days to make revisions. The final results will be sent to the Academic Advisor and CTS Program Specialist who will forward to the Graduate College.
CTS COMPREHENSIVE EXAM COMMITTEE MEMBERSHIP

Candidate’s Name ___________________________ Student ID ___________________________
Department _______________________________ Date of Exam: __________________________
Phone(s) _________________________________ E-mail _________________________________

CTS Academic Advisor _____________________ Dept _________________________________
Phone _______________________________ E-mail _________________________________

Research Mentor __________________________ Dept _________________________________
Phone _______________________________ E-mail _________________________________

Committee Requirements: Committee consists of 3 members: 2 Key CTS Faculty Members and 1
Graduate College Faculty with content expertise who may or may not be Key CTS Faculty. The
Research Mentor, CTS Academic Advisor, and any member of the Thesis/Dissertation Committee
may not serve on the Comprehensive Exam. Students have a right to request certain faculty not be
appointed to their Committee, per UVM Graduate College policy.

Refer to CTS policy on Key CTS Faculty definition and members.

Key CTS Faculty
Committee Member __________________________ Campus Address __________________________
Dept __________________ Phone __________________ E-mail ___________________________

Key CTS Faculty
Committee Member __________________________ Campus Address __________________________
Dept __________________ Phone __________________ E-mail ___________________________

Graduate College Faculty
Committee Member __________________________ Campus Address __________________________
Dept __________________ Phone __________________ E-mail ___________________________

Optional
Committee Member __________________________ Campus Address __________________________
Dept __________________ Phone __________________ E-mail ___________________________

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