WHAT TO EXPECT WHEN YOU'RE EXPECTING A QUALIFYING EXAM!

Frequently asked questions about the qual in Chemistry at Reed

Q. "What is the qualifying exam?"

A. The Chemistry Qualifying exam is an oral (or written) response to questions about an interesting and approachable published journal article. It is a requirement for students majoring in CHEM, ES-CHEM, BMB, and other interdisciplinary chemistry majors. The qualifying exam is a way to demonstrate and get feedback on your foundational chemistry knowledge before embarking on your senior thesis. Upon successful completion, you will be able to advance to senior standing, match with a thesis advisor, and complete a thesis in Chemistry.

Q. "This is scary! Will I be able to do this?"

A. It is key to understand that as your professors, we want you to pass and we go into your exam believing you will. Even if your exam doesn't go like you hoped, we understand that life happens and lots of factors can lead to an incomplete or unsatisfactory answer or two. Do take studying seriously, but do not feel like all is lost if you don't remember everything from every course you've taken. We strongly prefer the oral format because we can remind you of a tidbit you might have overlooked, or to nudge you to think about something differently. At some point in the discussion, you will probably hit something you don't fully understand and *that's okay.* Knowing what you don't know and what you need to ask for help on is also important and valuable. We are rooting for you, and we are here to help you before, during, and after your qual.

Q. "Do I only have to qual in one subject?"

A. We categorize qual papers based on their subject (analytical, biological, environmental, inorganic, organic, physical), and you will select which subject(s) your two paper options will be from. Naturally, your qual will likely focus mostly on your selected paper's subject. However, the qual is a culmination of all your chemistry coursework, and is thus comprehensive. The boundaries between subjects are often blurry, and you may be asked to (or find it useful to) draw on information from other chemistry subjects/courses you have taken. Nearly all chemistry qual discussions come back to ideas from CHEM 101-102 at some point.

Q. "Do I have to do my thesis in the subject of my qual paper?"

A. No! The qual paper is a platform to have an exciting and interesting chemistry discussion. It does not limit your thesis options.

Q. How do I pick a qual subject?

A. Great question! It depends. Did you like the subject? Do you remember the course fairly well? Does the topic feel like a good fit with your broader interests? You can always discuss your subject options with your academic advisor and any professor(s) who have taught course(s) relevant to the subjects you're considering. They are good resources to give you a sense of how you might approach preparing! However, we strongly advise that you *do not* base your choice on who you think will administer the exam. Qual boards are scheduled in a thrilling day-long game of Tetris. Your qual will be administered by 2 encouraging and enthusiastic faculty, but they may not be the professor(s) you had for the corresponding course(s).

Q. "Great, but what is the oral qualifying exam like?"

A. It is a 45 minute structured meeting with two chemistry professors. After a brief encouraging welcome, we will jump into the questions you were given in advance.. Through discussion of these questions, you will demonstrate your chemistry knowledge and reasoning. This is done using drawings, spoken words, mechanisms, derivations, and/or displaying a graph from the paper and talking us through your answer. No matter what, your examiners will gently interrupt you at some point(s), and you will almost certainly be asked to use the whiteboard or chalkboard. We may ask you to elaborate on your answer, we may nudge you toward a refinement of your

answer, or we may simply be excited and engaged and want to know what you think about a related idea. This continues until the time is up, and *we may not get through all of the questions.*

Q. "What if I get stuck or overwhelmed in the moment during the oral exam?"
That's totally okay! Remember this is not the same as a course exam, this is looking forward toward the senior thesis. Yes we are interested in seeing what you know, but we are also interested in seeing what you do when you don't know something (becuase that *will* happen in thesis!). Don't be afraid to say, "I'm not sure, but my guess would be…" or "I was really confused by this, I am not sure what to do with {x}." That is normal! We will be there to talk you through it. If you feel overwhelmed at any time, it's okay to pause to take some deep breaths, drink some water, and collect your thoughts. Just tell your examiners that you need a moment.

Q. "OK, so what is the written qualifying exam like?"
A. The basic idea for a written qual is identical to that for an oral qual. The difference is that instead of a 45-minute conversation with 2 faculty, you will turn in written answers to the questions to your 2 examiners. In the written format we cannot ask follow-up questions or guide you along the way, so it is very important that your answers are thorough and clear. Do not submit your first draft! Be sure to draft and *then* edit (and re-edit) your answers to polish your answers as much as possible.

Q. How do I choose between the oral and written formats?
A. We strongly encourage the oral exam format because your examiners can help you with follow-up questions and nudges. It's a conversation and you'll be thinking on your feet, but you can get more "help" from your examiners than in the written format. The oral format also works to scaffold you toward the thesis oral, and we believe it is a uniquely valuable experience to prepare you for other oral exams/presentations after Reed. For the oral exam, we provide questions in advance and encourage you to bring notes so you have time to think. However, if you feel that you will be better able to demonstrate your understanding in the written format, it is an available option. Since all students usually take the oral format, this document and our seminar is often more focused on that. Thus, if you choose the written format, we'll ask you to meet with the Junior Qual organizer(s) to ensure everything is clear.

Q. "What is the conditional pass outcome? What happens then?"
A. If there is some key foundational information, or important element(s) of the paper that you struggled with, we may feel like it would be helpful for you to review this content. This can result in a formal "conditional pass," where you will be asked to provide additional written answers to questions after the oral exam. These written answers will be reviewed by your examiners before making the final decision on your qualifying exam. This is not a common outcome, but it does happen and there is also no shame in it: we sincerely view it as a valuable learning experience. <u>A pass is a pass</u>, no matter if it was gained via the conditional step!

Q. "What if I fail the qual?"
A. Failing the qual is rare, but it has happened. Often this is due to lack of preparation, not lack of knowledge. In the unlikely case you do not pass the qual, we are confident that you will be able to learn from this experience. You can re-take the qual with a new paper, typically in August shortly before Fall classes begin (and before seniors are matched with thesis advisors). Again, we honestly view this as an important and forward-looking learning opportunity–there is no shame in this. Once a student passes this second attempt, all is done, and <u>a pass is a pass</u>!

Q. "How do I prepare for the exam before I even pick my papers?"
A. Great thinking! One good tip is to look over your course notes and textbooks/readings from the paper subject(s) you are interested in. Especially if you have (or had) courses that incorporate(d) a critical review of the chemistry literature: take those seriously! Use the time you

are already spending (or have spent) to get better at parsing journal articles, and look back over the feedback you receive(d) to see how to focus your efforts to improve. In particular, really focus on interpreting graphs and figures! Try talking through not just what the graph shows, but what that *means* for the study described in the paper.

Q. "How do I prepare for qual once I have selected a paper?"
A. We encourage students to limit themselves to no more than 8 hours of focused preparation, but there are many different ways to use those 8 hours. Some general advice: do not start by reading "to" the assigned questions! First, read the paper for what it is, and get a sense of what it's doing. Highlight important parts and portions you're uncertain about. Read the Supplementary Information, if applicable. Pay attention to the data and figures: if they involve a technique or instrument you feel hazy on, don't just gloss over it. Look it up in your course notes, textbooks, online, etc. If they cite a reference about it, it can be helpful to look up that reference! The introduction should provide insight into the "big picture" context for the study, but you can also look up the authors and see if their website or other publications give useful context. But, don't spin your wheels on that and neglect to dive into the techniques, instruments, and overall chemistry in the paper. After (re-re-)reading the paper: take a reasonably long break. You will find the paper much more digestible when you come back to it. Then, you are ready to approach the questions. Jot down any key points for your answers that you know from your initial reading. Then read the paper again with the questions in mind. Add to your answers as you go, and make notes of places to dig in for further review. Finally, once the questions are more or less answered, go back through all your notes and consolidate/clarify them. You might want to draft a fresh, "final" set of notes to bring with you. There's no limit on the notes you can bring, but remember these are a reference. You won't be reading from them verbatim, you'll be explaining them as part of a discussion. It can help to practice talking through things out loud before the exam! Once all that's done, if you still have time: you can sit back and brainstorm what other questions that may arise. What concepts were really emphasized in your courses? What drawings or graphs might help to explain those things? Most importantly, get a *good night's sleep* before your exam, and be sure to eat breakfast and/or lunch!

Q. "How do I do well on my qual during the exam?"
A. There is no one-size-fits-all perfect qual performance. To do well, take the preparation step seriously, drawing on some tips above and/or other strategies that work for you. Be sure to bring any notes you want to be able to refer to in the exam, and a copy of the paper. We expect you to be able to verbalize or draw your answers relatively quickly after a glance or two of your notes, in your own words, so make sure you are organized! And if you stumble or get stuck, remember *that is okay.* Don't let it shake your confidence–part of being a scientist is drawing on what you DO know to make an educated guess. You've certainly heard us, your professors, say things like, "I am not sure but I would think {x}," or "I don't know, but {similar thing} works like this (...)" Remember, we are on your side. We think you can do this!

Q. "I passed, but I want more feedback about how I did. Is that possible?"
A. Sure! Just reach out to your examiners and ask.

Q. "When can I talk with my peers about what was on my exam?"
A. The short answer is: not for a long time. EVERYONE else has to fully complete their qual. This can extend past the qual dates if students have a conditional pass, so plan on waiting until mid-April at least. The Reed Honor Principle applies here. If you are nervous for the oral exam and really need some public speaking practice, you may practice talking about your answers in front of a peer who has not taken chemistry courses at Reed and who is not in Biology, Chemistry, Math, Physics, or related majors. Your rehearsal audience should not provide content assistance. If in doubt if something is ok to discuss, contact the Qual Organizer(s) and ask!