DEB Qualifying Exam Guidelines for DEB Faculty

The DEB faculty representative on the students PhD Qualifying exam should question the student on topics related to material covered in MCB 263 (Biotechnology Fundamentals and Application), GGG 296 (Scientific Professionalism and Integrity) or related ethics course and/or biotechnology related areas of the student’s research proposal.

MCB 263 is designed to train graduate students interested in careers in biotechnology research and development. In addition to lectures and guest seminars, the course will also emphasize student-directed team projects. MCB 263 will:

1) Present core concepts in biotechnology (molecular biology, recombinant DNA technology and bioprocess engineering)
2) Focus on Cross-disciplinary Team Science by drawing on instructors from both the biological and engineering disciplines
3) Provide opportunities to practice Cross-disciplinary team science by assigning students with project groups where they design and present biotech projects as a team
4) Introduce basic principles of bioentrepreneurship and issues associated with enterprise development and regulatory affairs

MCB 263 curriculum
A. Molecular Biology: Expression of Recombinant Proteins of Medical, Industrial and Environmental Importance

1. Identifying and capturing gene sequences of interest and strategies for their expression in foreign hosts (e.g., bacteria, yeast, plants and mammalian cells) as well as cell free systems.
2. Strategies for optimizing recombinant protein expression
3. Addressing issues of post-translational modification and protein stability
4. Discussion of issues of public perception/acceptance and basic principles of risk communication

B. Bioprocess Engineering: Upstream and Downstream Processing, Biomanufacturing Facilities and Regulatory Compliance

1. Upstream Processing: Bioreactor designs, operational strategies, quantitative modeling, scale-up, and impact of host cell/expression system on upstream processing.
2. Downstream processing: Unit operations and design principles for the recovery, purification, formulation and fill/finish of biotech products, impact of host cell/expression system on downstream processing.

3. Steps involved in bringing a biopharmaceutical to the market, economic considerations for the large-scale production of biologics, new biomanufacturing technologies (e.g. single use systems), and regulatory requirements (current Good Manufacturing Practice or cGMP).

The QE reviewer for the Designated Emphasis in Biotechnology (DEB) graduate program may also ask questions related to core bioethics issues covered in GGG 296 or related bioethics course.

Topics include scientific conduct, manuscript preparation, grant writing, seminar presentations, and time management. These courses emphasize responsibilities of scientists to factually and thoughtfully communicate results.