

Exam III review Sheet

- The exam will consist of short answer questions and problems similar to the suggested problems/homework. If you have prepared for the exam, the 1hr and 20min provided will be ample time to finish the exam. If you are not prepared, you may not finish the exam.
- The practice exam questions have come from previous exams. They are good practice questions.
- This is not an exhaustive review sheet. It only outlines ideas that you should be familiar with.
- The best way to prepare is:
 - Do and understand all of the suggested problems in the book
 - Do and understand the homework assignment
 - Do and understand questions from the old exam
 - Understand the concepts listed below
- There will be one review session. This will not be another lecture. I will answer questions or work problems that you have had trouble with, so come prepared with your questions.

You should be able to work the following types of problems

- Bacterial Interrupted Conjugation Mapping
- Bacterial Transformation Mapping
- Phage Recombination Mapping
- Phage Complementation

Bacterial Genetics

- What are the differences between F⁻, F⁺, and Hfr bacterial cells
- Be able to do problems associated with conjugation and transformation of bacteria (assigned problems are good for this)

Phage genetics

- Be able to determine recombination distance from phage crosses
- Know the difference between recombination and complementation and what each tells you. (the phage genetics review sheet is a good place to start)
- Understand the experiments that Benzer did with the rII phage mutants.

Genetics of Emergent Disease: HIV and the Flu

- + strand, - strand, and retroviruses
- What is a Zoonosis?
- What is a reservoir?
- The Role of Reverse Transcriptase in HIV infection
- The function of Hemagglutinin in Flu virus infection
- The importance of the cleavage site, the antigenic sites and the receptor sites on Hemagglutinin.
- The role of sialic acid modification of surface proteins in defining what organisms a virus can infect.

- The difference between antigenic drift and antigenic shift
- Natural Selection and Fitness
- Empirical Example: HIV resistance to AZT
- Mechanism of AZT resistance
- How do new HIV variants arise?
- Population Genetics and Medicine: The Triple Cocktail how does it work?
- Molecular Evolution of HIV: Origins of the Virus
- Molecular Evolution of HIV: HIV Subtype Divergence and Vaccine Development
- Nucleotide variation
 - The difference between a synonymous and a nonsynonymous mutation
 - Why is the rate of synonymous change higher than nonsynonymous change?
 - Neutral theory of Evolution and Nucleotide Sequences and its predictions
- Molecular Evolution of the Flu
 - Evolution of the Hemagglutinin Gene
 - Predicting the next virus because of positive selection at particular antigenic loci
 - Antigenic Drift and Positive Selection

Transposons

- What is the difference between a transposon and a retrotransposon? How do they move?
- What is the difference between an autonomous and a nonautonomous transposable element?
- Understand the Ac-Ds instability example from Maize