Exam IV Study Guide

My advice about what to study: Know the answers to all the quiz questions, the color cards questions, and the questions for the Exam IV review day. Some of the multiple choice questions at the ends of the textbook chapters will also appear on Exam IV.

Chapter 8: Recombinant DNA Technology

1. Where are **restriction enzymes** found in nature, and what is their function there? How are they used in recombinant DNA technology? Know how the restriction enzymes get their names (to be covered again during review game).
2. What are laboratory uses for synthetic nucleotide sequences?
3. Know the steps necessary to create and produce many copies of a recombinant vector carrying a human gene. The figure which shows the overview of this procedure (figure 8.1) omits the detail about using reverse transcriptase to make a cDNA from mature human mRNA. Know why this is necessary if you want to produce the human protein in the bacterium, but not necessary if you just want to make many copies of the human DNA sequence.
4. Describe the role of electrical charge for the movement of DNA during **gel electrophoresis**.
5. Know the difference between Southern and northern blotting.
6. What are some **applications** of DNA fingerprinting?
7. What is the goal of **gene therapy**?
8. Know the definition of a transgenic organism, and some uses for these, including xenotransplantation.
9. One therapeutic application of recombinant DNA technology is recombinant vaccines, in which protein-coding genes from pathogens are inserted into vectors, which are then used to vaccinate patients. Any such proteins against which the patient's immune system reacts are called **antigens**.
10. Distinguish among **electroporation, gene gun, injection by micropipette**, and **protoplast fusion**.
11. Know what a microarray slide is made out of, what we test for binding (hybridizing) to it, and what we can learn by seeing what binds to it.

Chapter 13: Viruses, Viroids, and Prions

1. Describe the **structure of a virion**. What do all virions have in common? What can vary?
2. What can make up the genome of a virus? (i.e. **types and structure of nucleic acids**)
3. What is the term for nucleic acid sequences which can act as **mRNA**?
4. What is meant by the **"host specificity"** of a virus? What causes this?
5. Know the steps in the **lytic pathway** of bacteriophages. Compare it to the **lysogenic pathway** for bacteriophages. What benefits does using the lysogenic pathway provide for the bacteriophage?
6. What is a plaque assay, and what information do we get from it?
7. What is **reverse transcriptase**, and what type of virus relies on it for producing copies of its genome?
8. What types of viruses may have **enveloped virions**? How do virions acquire their viral envelopes?

9. Is the outermost layer of a virion always an envelope? What is always on the outermost layer?
10. Know how a latent virus stays hidden and what can cause it to be reactivated.
11. Know the oncogene theory of induction of cancer what role viruses play in this.
12. Know the differences between viroids, prions and viruses, and know some diseases caused by each.
13. What is special about Tobacco mosaic virus?
14. Know the possible geometric shapes of virions, and be able to identify the parts of a virion.

Chapter 14: Infection, Infectious Diseases, and Epidemiology

1. What are different **types of symbiosis** that can exist between two types of organisms?
2. What are the different **portals of entry** for pathogens; what is a **parenteral** route?
3. What are the differences between the **signs and symptoms** of disease?
4. What are the **stages** of infectious disease? (figure 14.10 is helpful)
5. What is the definition of a disease reservoir? What are the types of reservoirs?
6. How are **normal microbiota** acquired? What conditions may permit **normal microbiota** to become pathogenic? Be familiar with the concepts of *resident* and *transient* normal microbiota.
7. What are **virulence factors**, and what are some examples?
8. List and compare the different **modes of transmission** for infectious diseases. What is a **fomite**?
9. A disease is **nosocomial** if it is acquired by patients OR by staff in a health care facility.
10. What are the definitions of endemic, epidemic, sporadic and pandemic?
11. Know endotoxin and exotoxin examples.
12. Be familiar with the 3 modes of infectious disease transmission, and remember the main examples we've covered in lecture of diseases spread by each mode.