

This is the first review for the first midterm. It covers Chapters 1 through 6 in Dimmock et. al. The emphasis for the exam is on understanding, not memorizing. The test will be essay/problems, NOT multiple choice/true-false.

Growth, assay, and chemistry of viruses

What is the basic growth curve of viruses as seen by Ellis and Delbrück? What are the latent period, rise period, burst size, and plaque forming units (pfu)?

How does a plaque assay work?

What is the basic growth curve of viruses as seen by Doermann? What are the basic differences between the Doermann and Ellis and the Delbrück experiments. Know how to explain the curves, including eclipse periods and burst sizes.

How were viruses shown to have DNA or RNA as the genetic material (Hershey and Chase, and Frankel-Conrat & Singer)?

How did the Hershey et al. & related experiments further explain the eclipse periods?

Methods of studying viruses

What are the different types of culture systems that are normally used for studying viruses? What are some advantages or disadvantages of each system?

How are viruses detected in culture? What are cytopathic effects (CPE)?

Which serological techniques are used to detect viruses? Know the basics of agglutination, neutralizing antibodies, fluorescent staining, and ELISA.

How are PCR and RT-PCR used to detect viruses?

Structure of Viruses

Why do viruses need protective coats? Why are many proteins required for the coats? What is the efficiency principle for the structure of viruses?

Filamentous viruses: know what they look like and what a representative filamentous virus might be.

Spherical viruses: What are minimum energy structures? Why do most have multiples of 60 subunits in their coats? What are capsomeres? What are some representative spherical viruses and how are the proteins arranged to form the capsid?

Non-identical subunits (Spherical): What some of the variations of this group?

Reoviruses: What is the structure of the two shells?

Enveloped viruses: How do they differ from other viruses? What are some typical enveloped viruses and what are their structures?

Head-Tail viruses: What do they look like? What are some typical representatives? How do the heads and tails differ?

What do poxviruses and mimivirus look like?

What is the principle of disassembly?

Classification of viruses

What properties can we use to classify viruses? How are viruses classified by the various systems we discussed? What advantages and disadvantages does each method have?

What are the types of nucleic acids that are found in viruses? What classes of viruses are there in the Baltimore system? How do these classes interrelate?

What are satellite viruses, helper viruses, and viroids?

Attachment and Penetration

What are required in the cell and the virus for attachment of the virus to occur? Where do viruses attach in bacterial and animal cells, and why are these desirable sites (for the virus)?

What are the three types of receptors for viruses and how do they differ?

What are the modes of entry of animal viruses? How is the structure of viruses related to their entry?

How do plant viruses enter cells?

Where do the various types of phages attach to bacteria and how do they enter the cells?

Replication of DNA viruses

How does DNA replication occur in organisms? What enzyme makes the DNA, what direction does it move, and what are Okazaki fragments? What is the “end-replication problem”?

How do circular dsDNA viruses such as papovaviruses replicate? What is θ -replication? Of the proteins needed for replication, how many are viral coded and how many are from the host? What is the function of the T antigen?

How do linear dsDNA viruses such as herpesviruses and λ viruses replicate? What is the structure of HSV, and what is the evidence for this? How do herpesviruses and λ solve the end-replication problem? What are concatamers and how are they related to replication?

How do linear dsDNA viruses such as adenoviruses and poxviruses replicate? How do these viruses overcome the end-replication problem?

How do circular ssDNA viruses replicate (e.g., M13 or ϕ X174)? What are the major differences between circular ssDNA and dsDNA replication? How do these viruses overcome the 5'-end replication problem?

How do linear ssDNA viruses replicate (e.g., autonomous parvoviruses)? What is hairpin transfer, why do they need terminal repeats, and how do they overcome the end-replication problem?