



COURSE SYLLABUS

Viruses & How to Beat Them: *CELLS, IMMUNITY, VACCINES*

Prof. Jonathan M. Gershoni, Tel Aviv University

Lesson 1: Cells are the Units of Life

- Life is More Than Just Being Alive
- Measuring the Physical World in Units
- Atoms, Chemical Elements, the Periodic Table
- From Leeuwenhoek to Schleiden & Schwann - the "Cell Doctrine"
- Cells – the Units of Life
- Inanimate vs Organic Chemistry
- Water and Hydrogen Bonds
- Sugars, Lipids and the Cell Membrane
- Cell Organelles



Interview with Prof. Michael Levitt: Water – the Essential Solvent of Life



Lab Demonstration: Hydrophilicity vs Hydrophobicity



Lab Demonstration: Staining Cells for Microscopy



Quiz 1

Lesson 2: Macromolecules – from DNA to Proteins

- The Structure of Linear Polymers
- Condensation and Hydrolysis Reactions
- DNA – the Discovery that DNA is the Stuff Genes are Made of.
- Nucleotides: Structure and DNA Composition – Chargaff's Rules
- The Double Helix – Discovery and Structure
- Semi-Conservative DNA Replication
- Information Flow - From DNA to Proteins
- Amino Acids and the Polymeric Structure of Proteins
- The Genetic Code
- Ribosomes - Translating RNA to Proteins



Interview with Prof. David Baltimore: The Central Dogma



Lab Demonstration: The Effect of Soap on Bacteria



Quiz 2

Lesson 3: Viruses: Structure, Function, Infection & Replication

- Non-Contagious (Non-Communicable) Diseases – (NCDs)
- Getting Rid of Damaged Proteins via the Ubiquitin/Proteasome System
- Pathogens and Infectious Disease
- Discovering Infectious Agents - Koch's Postulates
- Viruses: Structure and Function
- Classification of Viruses
- Tissue Culture and the Study of Viruses
- Cytopathic Effects - CPE
- Viruses: Infection and Replication



Interview with Prof. Aaron Ciechanover: Garbage Disposal
Interview with Prof. David Baltimore: Virus Classification



Lab Demonstration: Growing Bacteria on Agar



Quiz 3

Lesson 4: Human Viral Diseases

- Modes of Virus Transmission
- Smallpox
- Yellow Fever
- Ebola Hemorrhagic Fever
- Influenza
- Polio
- Why and How Epidemics Emerge



Interview with Prof. Scott C. Weaver: Zika Virus
Interview with Prof. Erica Ollmann Saphire: Ebola



Quiz 4

Live Session: Q&A with Prof. Gershoni



Join Prof. Gershoni - a live session where he will answer your questions.



Mid Course Exam

Lesson 5: Innate Immunity - Our First Line of Defense

- The Anatomy and Cells of Our Immune System
- Phagocytes and Lymphocytes
- Physical and Chemical Barriers: Skin and the Mucosa
- Mucus and Lysozyme
- Fleming's Discovery of Penicillin
- Macrophages and Pathogen Recognition: PRRs and PAMPS
- Inflammation: Redness, Swelling, Heat and Pain
- How the Microbiome Participates in Innate Immunity
- Innate vs Adaptive Immunity



Interview with Prof. Bruce Beutler: TLRs



Quiz 5

Lesson 6: Adaptive Immunity: Knocking Out the Enemy

- B-Cell Immunity: Antibodies Structure and Function
- How Antibodies Neutralize Viruses
- T-Cells and the MHC Reporting System
- IgE - Mast Cells and Fighting Worms and Allergy
- Immunodeficiency: Malnutrition, SCID and AIDS
- The Importance of Blood Tests and How They Work



Interview with Prof. Robert C. Gallo: The AIDS Blood Test



Quiz 6

Lesson 7: Vaccines – How They Work: Pros & Cons

- Vaccination – Basic Principles
- Eradication of Smallpox
- Live and Killed Polio Vaccines
- Subunit Vaccines
- Vaccine Challenges for the Future
- Pros and Concerns about Vaccines
- The Vaccine Schedule: Composition and Considerations



Interview with Prof. Peter Palese: Flu Vaccination
Experts Comment on What They Think About Vaccines



Quiz 7



Final Exam

Enjoy!