AP Biology Syllabus - Unit 10: Prokaryotes & The Immune System

Essential Questions:
1. What characteristics of prokaryotes make them different from eukaryotes?
2. In what ways does the immune system help to insure an organism’s survival?

Required Reading:
- Chapter 27 (All)
- Chapter 43 (All)

Homework:
- Unit 10 Guided Reading Questions (Due at end of unit)

In-Class Work: CPS Reviews

Online Unit Exam (50 pts):
- 30 Multiple Choice Questions (1 pt per question)
- 1 Free Response Question (20 pts - 10 pts x 2)

Schedule: (See “Weekly Outline” on course website for potential adjustments)

<table>
<thead>
<tr>
<th>Date</th>
<th>Lesson Topics</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday 02/17</td>
<td>Distribute Unit 10 Syllabus &amp; Reading Guide</td>
<td>Read Concepts 27.1 &amp; 27.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Answer Guided Reading Questions (Due Monday, 02/20)</td>
</tr>
<tr>
<td>Monday 02/20</td>
<td>No School - Presidents’ Day</td>
<td>Read Concepts 27.3 - 27.5</td>
</tr>
<tr>
<td>Tuesday 02/21</td>
<td>Video: Understanding Bacteria</td>
<td>Read Concepts 43.1 &amp; 43.2</td>
</tr>
<tr>
<td>Wednesday 02/22</td>
<td>CPS: Chapter 27 Review</td>
<td>Answer Guided Reading Questions (Due Tuesday, 02/21)</td>
</tr>
<tr>
<td></td>
<td>Lecture: The Immune System</td>
<td></td>
</tr>
<tr>
<td>Friday 02/24</td>
<td>Finish Lecture</td>
<td>Read Concepts 43.3 - 43.5</td>
</tr>
<tr>
<td></td>
<td>-CPS: Chapter 43 Review</td>
<td>Answer Guided Reading Questions (Due Wednesday, 02/22)</td>
</tr>
<tr>
<td>Monday 02/27</td>
<td></td>
<td>Finish Guided Reading Questions (Due Monday, 02/27)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unit 10 Online Exam (Chapters 27 &amp; 43)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Due Monday, 02/27 at 7:45 am)</td>
</tr>
</tbody>
</table>

Unit 10: Prokaryotes & The Immune System

Learning Targets
- Explain why it might be said that the history of life on Earth is one long “age of prokaryotes.”
- Explain why prokaryotes are unable to grow in very salty or sugary foods, such as cured meats or jam.
- State the function(s) of each of the following prokaryotic features:
  a. capsule     b. fimbria     c. sex pilus     d. nucleoid     e. plasmid     f. endospore
- Describe how prokaryotes carry out cellular respiration when they lack compartmentalized organelles such as mitochondria.
- List the three domains of life.
- Describe the structure, composition, and functions of prokaryotic cell walls.
- Distinguish the structure and staining properties of gram-positive bacteria from those of gram-negative bacteria.
- Explain why disease-causing gram-negative bacterial species are generally more deadly than disease-causing gram-positive bacteria.
- Explain how the organization of prokaryotic genomes differs from that of eukaryotic genomes.
- Describe the evidence of parallel adaptive evolution found in Lenski’s experiments on E. coli.
- Distinguish, with prokaryotic examples, among photoautotrophs, chemoheterotrophs, and chemoheterotrophs.
- Distinguish among obligate aerobes, facultative anaerobes, and obligate anaerobes.
- Explain the importance of nitrogen fixation to life on Earth.
- Describe the specializations for nitrogen fixation in the cyanobacterium Anabaena.
- Explain why new assays for prokaryotic diversity that do not require researchers to culture microbes have been so fruitful.
- Explain why some archaea are known as extremophiles. Describe the distinguishing features of methanogens, extreme halophiles, and extreme thermophiles.
- In general terms, describe the role of chemoheterotrophic and autotrophic prokaryotes in the cycling of chemical elements between the biological and chemical components of ecosystems.
- Describe the mutualistic interaction between humans and Bacteroides thetaiotaomicron.
Distinguish among mutualism, commensalism, and parasitism. Provide an example of a prokaryote partner in each type of symbiosis.

Distinguish between exotoxins and endotoxins and give an example of each.

Describe the evidence that suggests that the dangerous E. coli strain O157:H7 arose through horizontal gene transfer.

Define bioremediation. Describe two examples of bioremediation involving prokaryotes.

Chapter 43: The Immune System

Explain what is meant by nonspecific defense and list the nonspecific lines of defense in the vertebrate body.

Distinguish between: a. innate and acquired immunity b. humoral and cell mediated response

Explain how the physical barrier of skin is reinforced by chemical defenses.

Define phagocytosis. Name four types of phagocytic leukocytes.

Explain how interferon limits cell-to-cell spread of viruses.

Describe the inflammation response, including how it is triggered.

Describe the factors that influence phagocytosis during the inflammation response.

Explain how the action of natural killer cells differs from the action of phagocytes.

Explain what occurs during the condition known as septic shock.

Describe the roles of antimicrobial proteins in innate immunity.

Distinguish between antigens and antibodies.

Distinguish between antigen and epitope.

Explain how B lymphocytes and T lymphocytes recognize specific antigens.

Explain how the particular structure of a lymphocyte's antigen binding site forms during development.

Explain the role of recombinase in generating the staggering variability of lymphocytes.

Explain why the antigen receptors of lymphocytes are tested for self-reactivity during development. Predict the consequences that would occur if such testing did not take place.

Describe the mechanism of clonal selection. Distinguish between effector cells and memory cells.

Distinguish between primary and secondary immune responses.

Describe the cellular basis for immunological memory.

Describe the variation found in the major histocompatibility complex (MHC) and its role in the rejection of tissue transplants. Explain the adaptive advantage of this variation.

Compare the structures and functions of cytotoxic T cells and helper T cells.

Compare the production and functions of class I MHC and class II MHC molecules.

Distinguish between humoral immunity and cell-mediated immunity.

Describe the roles of helper T lymphocytes in both humoral and cell-mediated immunity.

Describe the functions of the proteins CD4 and CD8.

Explain how cytotoxic T cells and natural killer cells defend against tumors.

Distinguish between T-dependent antigens and T-independent antigens.

Explain why macrophages are regarded as the main antigen-presenting cells in the primary response but memory B cells are the main antigen-presenting cells in the secondary response.

Explain how antibodies interact with antigens.

Diagram and label the structure of an antibody and explain how this structure allows antibodies to (a) recognize and bind to antigens, and (b) assist in the destruction and elimination of antigens.

Distinguish between the variable (V) and constant (C) regions of an antibody molecule.

Describe the production and uses of monoclonal antibodies.

Compare the processes of neutralization, opsonization, and agglutination.

Distinguish between active and passive immunity and describe examples of each.

Explain how the immune response to Rh factor differs from the response to A and B blood antigens.

Describe the potential problem of Rh incompatibility between a mother and her unborn fetus and explain what precautionary measures may be taken.

Explain what is done medically to reduce the risk of tissue transplant rejection due to differences in the MHC. Explain what is unique about the source of potential immune rejection in bone marrow grafts.

Describe an allergic reaction, including the roles of IgE, mast cells, and histamine.

Explain what causes anaphylactic shock and how it can be treated.

List three autoimmune disorders and describe possible mechanisms of autoimmunity.

Distinguish between inborn and acquired immunodeficiency.

Describe how general health and mental well-being might affect the immune system.

Describe the infectious agent that causes AIDS and explain how it enters a susceptible cell.

Explain how HIV is transmitted and describe its incidence throughout the world. Note strategies that can reduce a person’s risk of infection.