



AP[®] Biology Study Guide: Tips, Strategies, and Common Mistakes To Avoid

Use this study guide to review some of the most difficult concepts on the AP Biology exam and some common mistakes to avoid with your students. As you go through the study guide with your class, you can remind students to be mindful of these misconceptions as they prepare.

Instructions:

1. You can either present this guide on a screen and go through each topic with your students or you can share this document with your students and encourage them to use it for self-studying.
2. Click on the links in each topic to review and discuss all the difficult concepts that could show up on the exam.
3. The list has been ordered unit by unit, so it is meant to promote step-by-step exam review in an organized manner.
4. When clicking on the links, each concept can be used as the topic for a mini-lecture, where the content can be reviewed with students. This is the time to allow students to ask last-minute questions if they are still struggling with any of these challenging concepts.
5. Once you have gone through these topics, you can assign practice questions to your students using our [Learning Tools for AP Courses](#) or another quality resource that allows them to apply what they have learned to exam-like questions with detailed answer explanations and performance data.



AP[®] Biology's Most Difficult Concepts

Unit 1: Chemistry of Life

Water and macromolecules

1. Properties of water

- Students have difficulty understanding how the [polarity of water](#) determines its properties.

2. Macromolecules

- Students often struggle with knowing the basic structural and functional characteristics of the [four main types of macromolecules](#).

Unit 2: Cell Structure and Function

Plasma membrane and tonicity

1. Plasma membranes

- It can be challenging to understand the [interactions](#) that occur between phospholipids and water and how these interactions shape cell membrane structure.
- Students often have difficulty understanding the basis for the [selective permeability](#) of the plasma membrane to polar, nonpolar, and ionic substances.
- Another particularly challenging concept is the [basis for protein localization in membranes](#). Students tend to have a hard time recognizing the properties of a membrane, the properties of a particular protein, and assessing if and how that protein would embed within that membrane.



2. Tonicity and Osmoregulation

- Students often confuse the terms [iso-, hypo-, and hypertonic](#) and have a hard time predicting the effects of isotonic, hypotonic, and hypertonic solutions on different types of cells.

3. Water Potential

- The concept of [water potential](#) can also be particularly tricky and students often struggle to perform relevant mathematical calculations to predict the movement of water into or out of cells.

Unit 3: Cellular Energetics

Enzymes, cellular respiration, and photosynthesis

1. Enzyme structure and function

- It can be confusing to understand the [effects of temperature and pH on enzyme activity](#), especially because both can have unique effects.

2. Cellular respiration

- Although necessary, some students find it confusing to determine how [the outputs of one stage of cellular respiration serve as inputs](#) for another stage in the same process.

Unit 4: Cell Communication and the Cell Cycle

Cell signaling

1. Signal transduction pathways

- The [steps of signal transduction and types of cellular responses](#) that result from signal transduction pathways can be confusing to students, so it's important to know these very well.



Unit 5: Heredity

Meiosis

1. Process of meiosis

- Understanding [key concepts regarding meiosis](#) such as the actual process, its differences from mitosis, and the outcome can be difficult because there are so many steps in cell division and students often struggle to differentiate between the meiosis and mitosis.

Unit 6: Gene Expression and Regulation

Nucleic acids and gene expression

1. Structure of DNA and RNA

- It can be hard to distinguish between [covalent and hydrogen bonds within DNA and RNA](#), some AP Bio exam questions are specifically designed to trip students up.
- The [concept of 5' and 3' designations in DNA](#) is also sometimes challenging to grasp because students have to visualize what is happening to the DNA strand in 3D space and orient it accordingly.

2. Gene expression

- Distinguishing between [transcription, translation, genes, and gene products](#) can be difficult because these are so intertwined in the gene expression cascade.
- The steps of [transcription initiation](#) is a topic that students often struggle with, especially when they have to define and apply this knowledge or when they have to differentiate it from elongation and termination or other processes.
- The definition and effects of [different types of mutations](#) can also be challenging to learn because they can have differing effects on an organism's fitness.



Unit 7: Natural Selection

Natural selection and Hardy-Weinberg equilibrium (HWE)

1. Natural selection

- Students sometimes fail to understand the [concept of natural selection](#) and its consequences.

2. HWE

- It can be difficult to use [HWE equations](#) and to differentiate between allele and genotype frequencies while doing HWE calculations.

Unit 8: Ecology

Response to environment

1. Organism responses

- Often, students have difficulty understanding that [organism behaviors](#) are subject to natural selection and that environmental selective pressures can direct the evolution of specific behaviors, such as cooperation among members of a species.

If you've had the chance to finish this study guide with your students, have them try their hand at one of UWorld's [AP Bio sample questions](#) that tests one of the challenging concepts mentioned above.

We hope this study guide has helped to make reviewing for AP Biology with your class a bit easier. We wish your students the best of luck in their studies. Please feel free to [contact us](#) with any questions, and we will be more than happy to answer them.

Regards,

UWorld's AP Science Team