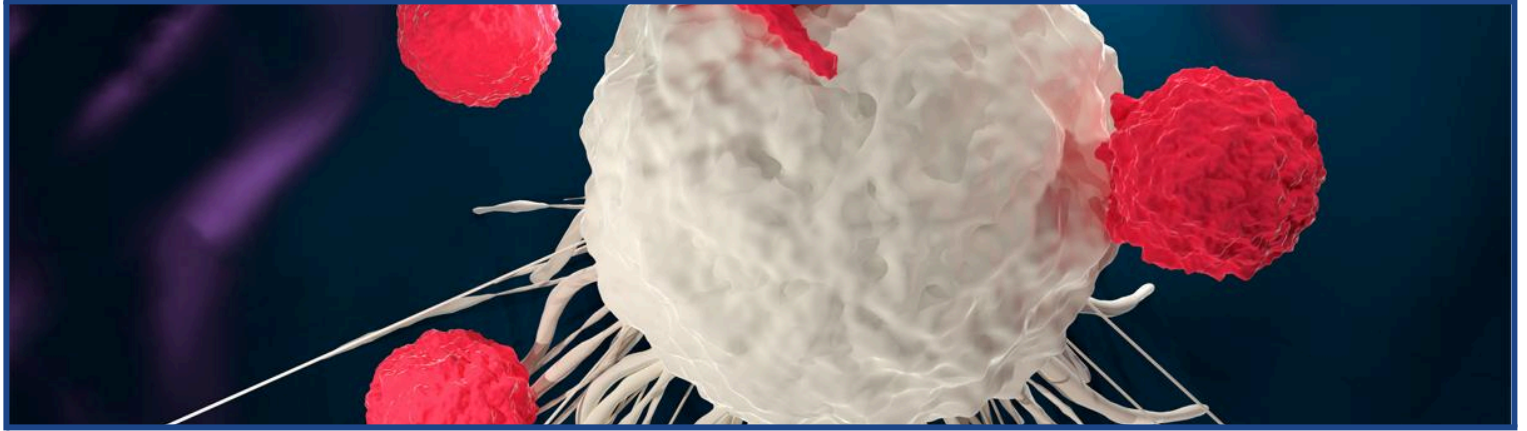


Unit 04 AP Biology HyperDoc of Expectations and Resources



Cell Communication and Cell Cycle: 10-15% of AP Exam

EXPECTATIONS:

Topic	Learning Targets (I can ...) and Success Criteria (I am learning how ...) <i>Learning targets are in bold with their success criteria listed beneath</i>	✓
4.1	Cell Communication	
	Describe the ways that cells can communicate with one another. <i>IST-3.A</i>	
	Cells communicate with one another through direct contact with other cells or from a distance via chemical signaling - a. Cells communicate by cell-to-cell contact.	
	Explain how cells communicate with one another over short and long distances. <i>IST-3.B</i>	
	Cells communicate over short distances by using local regulators that target cells in the vicinity of the signal-emitting cell- a. Signals released by one cell type can travel long distances to target cells of another cell type.	
4.2	Introduction to Signal Transduction	
	Describe the components of a signal transduction pathway. <i>IST-3.C</i>	
	Signal transduction pathways link signal reception with cellular responses.	
	Many signal transduction pathways include protein modification and phosphorylation cascades.	
	Describe the role of components of a signal transduction pathway in producing a cellular response. <i>IST-3.D</i>	
	Signaling begins with the recognition of a chemical messenger -a ligand- by a receptor protein in a target cell - a. The ligand-binding domain of a receptor recognizes a specific chemical messenger, which can be a peptide, a small chemical, or protein, in a specific, one-to-one relationship. b. G protein-coupled receptors are an example of a receptor protein in eukaryotes.	
	Signaling cascades relay signals from receptors to cell targets, often amplifying the incoming signals, resulting in the appropriate responses by the cell, which could include cell growth, secretion of molecules, or gene expression - a. After the ligand binds, the intracellular domain of a receptor protein changes shape initiating	

	<p>transduction of the signal.</p> <p>b. Second messengers (such as cyclic AMP) are molecules that relay and amplify the intracellular signal.</p> <p>c. Binding of ligand-to-ligand-gated channels can cause the channel to open or close.</p>	
4.3	Signal Transduction	
	<p>Describe the role of the environment in eliciting a cellular response. <i>IST-3.E</i></p> <p>Signal transduction pathways influence how the cell responds to its environment.</p>	
	<p>Describe the different types of cellular responses elicited by a signal transduction pathway. <i>IST-3.F</i></p> <p>Signal transduction may result in changes in gene expression and cell function, which may alter phenotype or result in programmed cell death (apoptosis).</p>	
4.4	Changes in Signal Transduction Pathways	
	<p>Explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway. <i>IST-3.G</i></p> <p>Changes in signal transduction pathways can alter cellular response -</p> <p>a. Mutations in any domain of the receptor protein or in any component of the signaling pathway may affect the downstream components by altering the subsequent transduction of the signal.</p> <p>Chemicals that interfere with any component of the signaling pathway may activate or inhibit the pathway.</p>	
4.5	Feedback	
	<p>Describe positive and/or negative feedback mechanisms. <i>ENE-3.A</i></p> <p>Organisms use feedback mechanisms to maintain their internal environments and respond to internal and external environmental changes.</p>	
	<p>Explain how negative feedback helps maintain homeostasis. <i>ENE-3.B</i></p> <p>Negative feedback mechanisms maintain homeostasis for a particular condition by regulating physiological processes. If a system is perturbed, negative feedback mechanisms return the system back to its target set point. These processes operate at the molecular and cellular levels.</p>	
	<p>Explain how positive feedback affects homeostasis. <i>ENE-3.C</i></p> <p>Positive feedback mechanisms amplify responses and processes in biological organisms. The variable initiating the response is moved further away from the initial set point. Amplification occurs when the stimulus is further activated, which, in turn, initiates an additional response that produces system change.</p>	
4.6	Cell Cycle	
	<p>Describe the events that occur in the cell cycle. <i>IST-1.B</i></p> <p>In eukaryotes, cells divide and transmit genetic information via two highly regulated processes.</p> <p>The cell cycle is a highly regulated series of events for the growth and reproduction of cells -</p> <p>a. The cell cycle consists of sequential stages of interphase (G1, S, G2), mitosis, and cytokinesis.</p> <p>b. A cell can enter a stage (G0) where it no longer divides, but it can reenter the cell cycle in response to</p>	

	appropriate cues. Nondividing cells may exit the cell cycle or be held at a particular stage in the cell cycle.	
	Explain how mitosis results in the transmission of chromosomes from one generation to the next. <i>IST-1.C</i>	
	<p>Mitosis is a process that ensures the transfer of a complete genome from a parent cell to two genetically identical daughter cells -</p> <ol style="list-style-type: none"> Mitosis plays a role in growth, tissue repair, and asexual reproduction. Mitosis alternates with interphase in the cell cycle. Mitosis occurs in a sequential series of steps (prophase, metaphase, anaphase, and telophase). 	
4.7	Regulation of Cell Cycle	
	Describe the role of checkpoints in regulating the cell cycle. <i>IST-1.D</i>	
	A number of internal controls of checkpoints regulate progression through the cycle.	
	<p>Interactions between cyclins and cyclin-dependent kinases control the cell cycle.</p> <p><i>Exclusion Statement: Knowledge of specific cyclin-Cdk pairs or growth factors is beyond the scope of the course and the AP exam.</i></p>	
	Describe the effects of disruptions to the cell cycle on the cell or organism. <i>IST-1.E</i>	
	Disruptions to the cell cycle may result in cancer and/or programmed cell death (apoptosis).	

RESOURCES: *(Tip: add your own (GSN) and helpful resources in the table below to a copy of this document)*

Additional Materials:

[Khan Academy: Cell Communication and Cell Cycle](#)

Bozeman:

- [Evolution of Cell Communication](#)
- [Cell Communication](#)
- [Signal Transduction in Pathways](#)
- [Effects of Changes in Pathways](#)
- [Cooperative Interactions](#)

Knuffke Prezis:

- [AP Bio Cellular Communication, Part 1](#)
- [AP Bio Cellular Communication, Part 2: Hormonal Control](#)

Quizizz:

- [AP Cell Communication](#)
- [Plant Responses](#)

TedTalk: [How bacteria "talk" - Bonnie Bassler](#)

Bozeman:

- [Homeostasis Preview](#)
- [Homeostatic Evolution](#)
- [Homeostatic Disruptions](#)
- [Review: Homeostasis](#)
- [Positive and Negative Feedback Loops](#)
- [Plant and Animal Defenses](#)
- [Immune System](#)

Knuffke Prezis:

- [Organism Organization](#)
- [AP Bio Immunity](#)

Quizizz: <ul style="list-style-type: none"> • Homeostasis and Feedback Mechanisms
Bozeman: <ul style="list-style-type: none"> • Cell Division • Cell Cycle Mitosis and Meiosis • Lab: Mitosis and Meiosis Knuffke Prezis: <ul style="list-style-type: none"> • AP Bio Mitosis • AP Bio Cell Cycle Control Quizizz: <ul style="list-style-type: none"> • Mitosis: Easy • Cell Cycle and Mitosis

CONNECTIONS: A Step Further *(Choose one connection below and take a step further for assessment)*

Sustainability	UN Sustainability Goal #3 Update : Ensure healthy lives and promote well-being for all at all ages The World Health Organization (WHO): Monitoring Health for the SDGs
NGSS	HS-LS1-3 HS-LS1-4 Identify which Science Practices you have “practiced” this unit - provide evidence Identify which Cross-Cutting Concepts you can identify in this unit - provide evidence
Careers	Bioscience Careers - Immunologist Serimmune Physicians and Surgeons Infectious Disease Specialists Medical Careers in Oncology
Interesting Information	Vaccinations create ‘umbrella of immunity’ against global measles outbreaks, says UNICEF Kurzgesagt: The Side Effects of Vaccines - How High is the Risk? Kurzgesagt: The Most Gruesome Parasites – Neglected Tropical Diseases – NTDs

Big Idea	Enduring Understandings:	Topic
IST-3	Cells communicate by generating, transmitting, receiving, and responding to chemical signals.	4.1-4
ENE-3	Timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues.	4.5
IST-1	Heritable information provides for continuity of life.	4.6-7

Document framework provided by Winnie Litten