AP BIOLOGY CHEAT SHEET

Unit 4: Cell Communication & Cell Cycle

Quick Overview

- **Focus:** how cells send/receive signals, how the cell cycle is regulated, and differences between mitosis and meiosis.
- **Exam lens:** recognize pathways, checkpoints, and consequences of misregulation (like cancer).

Cell Communication

- **Types of signaling:**

-Autocrine: cell signals itself.
-Paracrine: local signaling between nearby cells.
-**Endocrine:** long-distance via hormones.
Direct contact: gap junctions, plasmodesmata.

- **Signal transduction pathway:**

1) Reception — ligand binds to receptor.
2) Transduction — signal relayed/amplified (often via phosphorylation cascades or second messengers like cAMP).
3) Response — activation of genes, proteins, or cell processes.

Mnemonic: "Receive → Relay → Respond."

Cell Cycle Basics

- **Interphase (90% of cycle):**
  -G_1: cell grows.
  -S: DNA replication.
  -G_2: preparation for division.
- **M phase:** mitosis + cytokinesis.

Mitosis

- **Purpose:** growth, repair, asexual reproduction.
- **Stages:** Prophase → Metaphase → Anaphase → Telophase (PMAT).
- **Produces:** 2 identical diploid cells.

Mnemonic: "Please Make A Taco."

Integrated Tutor Tip

When in doubt, ask: What is the purpose of this process?

- **If it's for identical body cells → mitosis.**
- **If it's for gametes and diversity → meiosis.**
- **This simple distinction clears up many tricky FRQs.**

Mini formula box

- **Cell cycle timing: Interphase ~90%, M phase ~10%.**
- **Independent assortment: 2^n possible combinations (n = haploid number).**

Meiosis

- **Purpose:** gamete production, genetic diversity.
- **Two divisions:** Meiosis I (homologs separate), Meiosis II (sister chromatids separate).
- **Produces:** 4 genetically unique haploid cells.
- **Key events:** crossing over (prophase I), independent assortment (metaphase I).

Checkpoints & Regulations

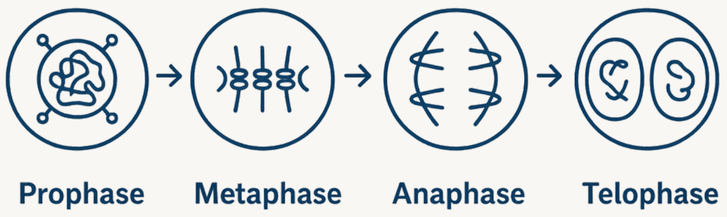
- **G_1 checkpoint:** DNA damage, growth signals.
- **G_2 checkpoint:** DNA replication errors.
- **M checkpoint:** spindle attachment.
- **Cyclins & CDKs:** regulate cycle progression.
- **Cancer:** uncontrolled cell division due to checkpoint failure.

Common exam pitfalls

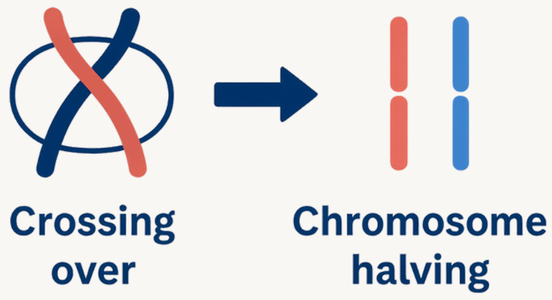
- **Mixing up mitosis and meiosis outputs.**
- **Forgetting meiosis increases genetic diversity through crossing over and independent assortment.**
- **Thinking all cells are always dividing — many enter G_0 (resting state).**
- **Confusing signal reception with the response (they're distinct steps).**

Visual Mnemonics

Signal Transduction



Mixing & reducing



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