GENERAL

ap biology chapter 35 study guide answers

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Introduction

For many students, the AP Biology exam is a pivotal milestone that can open doors to advanced college courses and scholarships. One of the most frequently discussed chapters is **Chapter 35**, which covers the intricacies of the cell cycle, DNA replication, and the mechanisms of cell division. Whether you're a first time taker or a seasoned AP student, having a reliable *AP Biology Chapter 35 study guide answers*resource can make the difference between a solid performance and a missed opportunity.

This article is designed to provide a comprehensive, SEO friendly guide that walks you through the core concepts of Chapter 35, offers detailed explanations, and presents a curated set of practice questions along with their answers. By the end of this read, you should feel confident in tackling any question on the AP exam that involves cell cycle regulation, mitosis, meiosis, or related cellular processes.

What Makes Chapter 35 a Cornerstone of the AP Biology Exam?

Chapter 35 is pivotal for several reasons:

- Fundamental Biology – It covers the universal processes that all eukaryotic cells undergo.
- Exam Frequency – Questions about the cell cycle and division appear in every AP Biology exam.
- Conceptual Depth – Understanding the regulatory checkpoints, genetic controls, and the differences between mitosis and meiosis is essential for higher level analysis questions.

Because of this, a robust **AP Biology Chapter 35 study guide answers**set can serve as a cornerstone for your overall exam prep strategy.

Key Concepts Covered in Chapter 35

1. The Cell Cycle: Phases and Timing

The cell cycle is a highly regulated series of events that allows a cell to grow, duplicate its DNA, and divide. It can be broken down into two main components:

- Interphase – The cell spends the majority of its life in this phase, which includes:\n\nG1 (Gap 1) – Growth and normal metabolic processes.
- S (Synthesis) – DNA replication.
- G2 (Gap 2) – Preparation for mitosis.

2. Checkpoints and Regulatory Mechanisms

Checkpoints act as quality control systems that ensure each stage of the cell cycle is completed accurately before progressing. The major checkpoints are:

- G1/S Checkpoint – Evaluates cell size, nutrient availability, and DNA integrity.
- G2/M Checkpoint – Confirms DNA replication is complete and free of damage.
- Metaphase/Anaphase Checkpoint (Spindle Assembly Checkpoint) – Ensures chromosomes are properly attached to the spindle before segregation.

Key regulatory proteins include cyclins and cyclin dependent kinases (CDKs). The cyclin–CDK complexes activate or inhibit other proteins to drive the cell cycle forward.

3. Mitosis and Meiosis: Similarities and Differences

Mitosis and meiosis share many steps but serve different biological purposes. Mitosis results in two genetically identical daughter cells, while meiosis produces four genetically diverse gametes. The main stages common to both are:

1. Prophase – Chromosomes condense; spindle apparatus forms.
2. Metaphase – Chromosomes align at the metaphase plate.
3. Anaphase – Sister chromatids (mitosis) or homologous chromosomes (meiosis) separate.
4. Telophase – Nuclear envelopes reform; chromosomes decondense.

Differences include:

- Number of Divisions – Mitosis has one division; meiosis has two.
- Genetic Variation – Meiosis introduces recombination and independent assortment.
- Chromosome Number – Mitosis maintains diploidy; meiosis reduces it to haploidy.

4. DNA Replication and Repair Mechanisms

During the S phase, DNA polymerase replicates the genome. Key enzymes and proteins involved include:

- DNA Polymerase ; Â ´, ;R b FB àucleotides to the growing strand.
- Helicase – Unwinds the double helix.
- Primase – Synthesizes RNA primers.
- Ligase – Seals nicks in the sugar phosphate backbone.

Repair mechanisms such as mismatch repair and nucleotide excision repair correct errors that arise during replication, ensuring genomic integrity.

Detailed Breakdown of Each Subtopic

1. The G1 Phase: Growth and Decision Making

In G1, the cell grows in size, synthesizes mRNA, and produces proteins necessary for DNA synthesis. The **Retinoblastoma protein (Rb)** and **E2F transcription factors**play a pivotal role in controlling the transition to S phase.

Students should remember:

- Large cells with abundant nutrients typically progress to S phase.
- DNA damage in G1 triggers p53 mediated cell cycle arrest.

2. The S Phase: DNA Replication Fidelity

DNA replication is semi conservative. Each new double helix consists of one old strand and one new strand. The process is highly coordinated to avoid replication stress.

Key points for exam recall:

- Replication forks move bidirectionally.
- Leading strand synthesis is continuous; lagging strand is discontinuous.
- Origin recognition complex (ORC) marks replication origins.

3. The G2 Phase: Final Checks

During G2, the cell continues to grow and produce proteins needed for mitosis. Checkpoint proteins such as **Chk1** and **Chk2** monitor for DNA damage before the cell enters mitosis.

4. Mitosis: The Mechanics of Division

Each stage of mitosis has distinct structural changes:

- Prophase – Chromatin condenses to visible chromosomes; centrosomes duplicate.
- Prometaphase – Nuclear envelope breaks down; spindle microtubules attach to kinetochores.
- Metaphase – Chromosomes align at the metaphase plate.
- Anaphase – Cohesin proteins are cleaved, allowing sister chromatids to separate.
- Telophase – Nuclear membranes re form; chromosomes begin to decondense.

Key proteins: **Separase** (cleaves cohesin), **Kinesin** (motor proteins), and **Aurora kinases** (spindle assembly).

5. Meiosis: Generating Genetic Diversity

Meiosis comprises two consecutive divisions: meiosis I and meiosis II. The major differences lie in the pairing of homologous chromosomes during meiosis I, which introduces genetic variation through crossing over.

Important terms:

- Synapsis – Pairing of homologous chromosomes.
- Crossing Over – Exchange of genetic material between chromatids.
- Independent Assortment – Random orientation of homologous pairs during metaphase I.

Practice Questions & Answers

Below is a curated set of practice questions that reflect the types of questions you might encounter on the AP Biology exam. Each answer is provided with an explanation to reinforce learning.

Question 1: Which checkpoint is responsible for ensuring that all chromosomes are properly attached to the spindle before anaphase?

- A. G1/S checkpoint
- B. G2/M checkpoint
- C. Metaphase/Anaphase checkpoint (Spindle Assembly Checkpoint)
- D. Telophase checkpoint

Answer: C– The metaphase/anaphase checkpoint, also known as the spindle assembly checkpoint, monitors kinetochore attachment and spindle tension before allowing the separation of sister chromatids.

Question 2: During which phase does the cell synthesize RNA primers to initiate DNA synthesis?

- A. G1
- B. S
- C. G2
- D. M

Answer: B– Primase synthesizes short RNA primers during the S phase to provide a free 3 2 hydroxyl group for DNA polymerase to begin synthesis.

Question 3: Which of the following best describes the difference between mitosis and meiosis?

- A. Mitosis produces four genetically diverse cells; meiosis produces two identical cells.
- B. Mitosis reduces the chromosome number; meiosis maintains it.
- C. Mitosis involves one division; meiosis involves two divisions.

- D. Mitosis occurs only in somatic cells; meiosis occurs only in germ cells.

Answer: C– Mitosis involves one division resulting in two diploid daughter cells, whereas meiosis involves two divisions resulting in four haploid gametes.

Question 4: Which protein complex is directly responsible for the progression through the G1/S transition?

- A. Cyclin D/CDK4/6
- B. Cyclin E/CDK2
- C. Cyclin A/CDK2
- D. Cyclin B/CDK1

Answer: A– Cyclin D/CDK4/6 complexes are active during the early G1 phase and phosphorylate Rb, releasing E2F to promote S phase entry.

Question 5: What is the primary function of the cohesin complex during mitosis?

- A. To separate sister chromatids during anaphase.
- B. To attach microtubules to kinetochores.
- C. To maintain cohesion between sister chromatids until anaphase.
- D. To initiate DNA replication.

Answer: C– Cohesin holds sister chromatids together from S phase until the onset of anaphase, ensuring proper segregation.

Question 6: Which event occurs first in meiosis I?

- A. Crossing over between homologous chromosomes.
- B. Separation of sister chromatids.
- C. Chromosome condensation.
- D. Formation of the metaphase plate.

Answer: A– Crossing over occurs during prophase I (specifically during the pachytene stage) before the homologous chromosomes are segregated.

Question 7: A mutation in the gene encoding the enzyme DNA polymerase ;R ÆV G2 Fò v† B G— R öb cellular consequence?

- A. Increased rate of cell division.
- B. Accumulation of replication errors.
- C. Enhanced DNA repair capacity.
- D. Overactivation of cyclin dependent kinases.

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