

IB Bio Quiz Cell Cycle Questions and Answers PDF

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During which phase of the cell cycle does DNA replication occur?

- G1 Phase
- S Phase ✓
- G2 Phase
- M Phase

DNA replication occurs during the S phase of the cell cycle, which stands for synthesis. This phase is crucial for ensuring that each daughter cell receives an identical set of chromosomes after cell division.

Which of the following statements about the cell cycle are true?

- The cell cycle includes interphase and the mitotic phase. ✓
- DNA replication occurs during the G1 phase.
- The mitotic phase consists of mitosis and cytokinesis. ✓
- The G2 phase is when the cell checks for DNA errors. ✓

The cell cycle consists of distinct phases including interphase (G1, S, G2) and mitotic phase (mitosis and cytokinesis), during which the cell grows, replicates its DNA, and divides. Key regulatory mechanisms ensure proper progression through these phases, maintaining cellular integrity and function.

Explain the role of cyclins and cyclin-dependent kinases (CDKs) in the regulation of the cell cycle. How do they interact to ensure proper cell cycle progression?

Cyclins bind to CDKs, activating them to phosphorylate target proteins that advance the cell cycle. Different cyclin-CDK complexes are active at different stages, ensuring orderly progression

through the cell cycle.

What is the primary function of the G1 checkpoint in the cell cycle?

- To ensure DNA replication is complete
- To check for DNA damage and ensure the cell is ready for DNA synthesis ✓**
- To verify all chromosomes are attached to the spindle
- To separate sister chromatids

The G1 checkpoint is crucial for assessing whether the cell is ready to proceed to DNA synthesis. It ensures that the cell has adequate resources and is free from DNA damage before entering the S phase.

Which phases are part of mitosis?

- Prophase ✓**
- Metaphase ✓**
- Interphase
- Telophase ✓**

The phases of mitosis include prophase, metaphase, anaphase, and telophase, which are essential for cell division and the distribution of genetic material.

Discuss how mutations in tumor suppressor genes can lead to cancer. Provide examples of specific genes and their roles in the cell cycle.

Mutations in tumor suppressor genes like p53 can prevent the cell from repairing DNA damage or undergoing apoptosis, leading to uncontrolled cell division and cancer.

Which protein is crucial for DNA repair and cell cycle arrest in response to DNA damage?

- Cyclin D
- CDK1
- p53 ✓**

Cyclin B

The protein crucial for DNA repair and cell cycle arrest in response to DNA damage is p53. It plays a vital role in maintaining genomic stability by regulating the cell cycle and initiating DNA repair mechanisms.

Which of the following processes occur during cytokinesis?

- Division of the cytoplasm ✓
- Chromosome condensation
- Formation of two daughter cells ✓
- Nuclear envelope breakdown

Cytokinesis is the process where the cytoplasm of a parental cell divides into two daughter cells, typically involving the formation of a cleavage furrow in animal cells or a cell plate in plant cells.

Analyze the importance of the M checkpoint in mitosis. What could be the consequences of a malfunction at this checkpoint?

The M checkpoint ensures all chromosomes are properly attached to the spindle before anaphase. Malfunction can lead to aneuploidy, contributing to cancer.

During which phase do sister chromatids separate and move toward opposite poles?

- Prophase
- Metaphase
- Anaphase ✓
- Telophase

Sister chromatids separate during the anaphase of mitosis and meiosis, moving toward opposite poles of the cell. This is a crucial step in ensuring that each daughter cell receives an identical set of chromosomes.

What are the key events of prophase in mitosis?

- Chromosomes condense and become visible ✓
- Chromosomes align at the equatorial plane
- Nuclear envelope breaks down ✓
- Spindle fibers begin to form ✓

Prophase is the first stage of mitosis where chromatin condenses into visible chromosomes, the nuclear envelope breaks down, and the mitotic spindle begins to form. These events prepare the cell for the subsequent stages of mitosis.

Evaluate the role of checkpoints in the cell cycle. How do they contribute to the prevention of cancer?

Checkpoints ensure errors are corrected before progression, preventing mutations from being passed on, thus reducing cancer risk.

Which phase is characterized by the alignment of chromosomes at the cell's equatorial plane?

- Prophase
- Metaphase ✓
- Anaphase
- Telophase

The phase characterized by the alignment of chromosomes at the cell's equatorial plane is called metaphase. During this stage, chromosomes are maximally condensed and can be easily observed under a microscope.

Which of the following are true about interphase?

- It includes G1, S, and G2 phases. ✓
- It is the phase where the cell divides.
- DNA replication occurs during this phase. ✓
- The cell grows and carries out normal functions. ✓

Interphase is the phase of the cell cycle where the cell prepares for division, consisting of three stages: G1, S, and G2. During interphase, the cell grows, duplicates its DNA, and synthesizes proteins necessary for mitosis.

Describe the process of mitosis and its significance in the cell cycle. How does it ensure genetic consistency in daughter cells?

Mitosis involves prophase, metaphase, anaphase, and telophase, ensuring each daughter cell receives an identical set of chromosomes, maintaining genetic consistency.

What is the primary role of the G2 checkpoint?

- To ensure cell size and nutrients are adequate
- To confirm DNA replication is complete and undamaged ✓**
- To verify chromosome alignment
- To initiate cytokinesis

The G2 checkpoint is crucial for ensuring that the cell is ready to enter mitosis by checking for DNA damage and ensuring that DNA replication has been completed accurately.

Which of the following can result from uncontrolled cell cycle progression?

- Cancer ✓**
- Increased cell death
- Formation of tumors ✓**
- Enhanced DNA repair mechanisms

Unchecked cell cycle progression can lead to uncontrolled cell growth, resulting in conditions such as cancer. This occurs when regulatory mechanisms fail, allowing cells to divide without the normal checks and balances.

Critically analyze how the malfunction of cyclins and CDKs can lead to diseases such as cancer. What therapeutic strategies could target these proteins?

Malfunction of cyclins/CDKs can lead to unchecked cell division. Therapies targeting these proteins aim to restore normal cell cycle control, such as CDK inhibitors.

Which phase of the cell cycle is primarily responsible for cell growth and normal function?

- G1 Phase ✓**
- S Phase
- G2 Phase
- M Phase

The interphase, particularly the G1 phase, is crucial for cell growth and normal metabolic functions. During this phase, the cell increases in size, synthesizes proteins, and prepares for DNA replication.

Which processes are checked at the G2 checkpoint?

- DNA replication completion ✓**
- DNA damage repair ✓**
- Chromosome alignment
- Cell size adequacy

The G2 checkpoint primarily checks for DNA damage, ensures that DNA replication has been completed accurately, and assesses the overall readiness of the cell to enter mitosis.

Discuss the implications of a malfunction in the G1 checkpoint. How might this affect the cell cycle and potentially lead to cancer?

A malfunction in the G1 checkpoint can allow damaged DNA to replicate, leading to mutations and potentially cancerous growths.

What occurs during telophase of mitosis?

- Chromosomes condense
- Chromatids arrive at poles and nuclear envelope re-forms ✓**
- Chromosomes align at the equatorial plane
- Sister chromatids separate

During telophase of mitosis, the chromosomes begin to de-condense back into chromatin, the nuclear envelope re-forms around each set of chromosomes, and the cell prepares to divide into two daughter cells.

Which of the following are involved in the regulation of the cell cycle?

- Cyclins ✓**
- CDKs ✓**
- Spindle fibers
- DNA polymerase

The regulation of the cell cycle involves various proteins and enzymes, including cyclins, cyclin-dependent kinases (CDKs), and tumor suppressor proteins like p53. These components work together to ensure proper cell division and prevent uncontrolled growth.

Explain how the cell cycle is linked to cancer treatment strategies. What are some current approaches that target cell cycle regulation in cancer therapy?

Cancer treatments often target cell cycle regulation to halt tumor growth, such as using CDK inhibitors or drugs that induce cell cycle arrest.

What is the main purpose of cytokinesis in the cell cycle?

- To replicate DNA
- To divide the cytoplasm and form two daughter cells ✓**
- To condense chromosomes
- To separate sister chromatids

Cytokinesis is the process that divides the cytoplasm of a parental cell into two daughter cells, ensuring that each new cell has the necessary organelles and cytoplasmic components to function properly.

What are the roles of tumor suppressor genes in the cell cycle?

- Promote cell division
- Repair DNA damage ✓**
- Induce apoptosis ✓**
- Halt cell cycle progression if errors are detected ✓**

Tumor suppressor genes play a critical role in regulating the cell cycle by preventing uncontrolled cell division and promoting DNA repair. They act as checkpoints to ensure that cells do not progress through the cycle with damaged DNA, thereby helping to prevent cancer development.

Evaluate the significance of the S phase in the cell cycle. How does accurate DNA replication during this phase impact overall cellular function and health?

Accurate DNA replication in the S phase ensures genetic stability, preventing mutations that could lead to diseases like cancer.