**Topic Review Guide**: Cell Cycle (4.6) and Regulation (4.7)

**To Think About**: What is the role of interphase and what occurs there? What is the role of mitosis and what occurs during each stage? What is the role of Cytokinesis? What are cell cycle checkpoints and what role do they play in regulating the cell cycle? How are proteins involved in the cell checkpoints? What happens if the cell cycle is disrupted?

**Watch:** AP Daily Videos [4.6 “Cell Cycle” Video 1](https://apclassroom.collegeboard.org/d/xkmbj08la7?sui=6,4), [4.6 “Cell Cycle” Video 2](https://apclassroom.collegeboard.org/d/r05a51jerq?sui=6,4), [4.7 “Regulation of the Cell Cycle”](https://apclassroom.collegeboard.org/d/b42duv5t77?sui=6,4)

**Read:** Chapter 9, Biology in Focus.

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* Guided Notes 4.6 Video [1](https://docs.google.com/document/d/192v0JWh5tQcMsbrh49b2SUQ6sV6RfGtpa5WBJpa86Do/edit?usp=sharing) and [2](https://docs.google.com/document/d/1CtR1ICRsnCSUiG8BAGpuwenvhKm_BWamGsUfCszKmmc/edit?usp=sharing) and [4.7](https://docs.google.com/document/d/1IGjuaxvqf28kTZnFA9fGKw-rxijd1rlW9CS5XN2A-T4/edit?usp=sharing)
* [Slideshow Presentation: Cell Cycle and Cell Division](https://docs.google.com/presentation/d/1WDcFJ1_HxRub4fWYJgr1P0KCXnbSeE4R2a_IxS2tqfI/edit?usp=sharing)
* [Mr. Andersen’s “Mitosis” video](http://youtu.be/1cVZBV9tD-A)
* Principles of Life Companion Website: [Chapter 7 Resources](http://bcs.whfreeman.com/hillis1e/#667501__669667__)
* Crash Course Biology: [Mitosis—Splitting Up is Complicated](http://viewpure.com/L0k-enzoeOM)
* Kimball’s Biology Pages: [Tumor Suppressor Genes (p53 gene)](http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/T/TumorSuppressorGenes.html#p53)
* Cells Alive: [Interactive Animal Cell Mitosis](http://www.cellsalive.com/mitosis.htm)
* Harvard: [Checkpoints and Cell Cycle Control (Animation)](http://outreach.mcb.harvard.edu/animations/checkpoints.swf)
* Scitable: [Cell Cycle and Cell Division](http://www.nature.com/scitable/topic/cell-cycle-and-cell-division-14122649)
* Scitable: [p53—The Most Frequently Altered Gene in Human Cancers](http://www.nature.com/scitable/topicpage/p53-the-most-frequently-altered-gene-in-14192717)

**Recall and Review:** Use the lecture in the video and your textbook to help you answer these questions in your BILL. Before you start, mark your level of understanding. After you have completed the questions, then check to see what level of understanding you have achieved. If you’re still at a level N or level A, it is recommended that you stop in for office hours.

| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
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| Levels of Mastery | | | | *I can describe the events that occur in the cell cycle. (Topic 4.6)* |
| **N** | **A** | **E** | **M** | **Questions You Should Be Able to Answer** |
|  |  |  |  | 1. **Write a hashtag** that describes the major event of each of the following stages of the cell cycle: 2. G1 phase 3. S phase 4. G2 phase |
|  |  |  |  | 1. Cells can enter a non dividing phase known as G0. **Explain** how it is possible for a cell to enter and exit this non dividing phase of the cell cycle. |
| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
| Levels of Mastery | | | | *I can explain how mitosis results in the transmission of chromosomes from one generation to the next. (Topic 4.6)* |
| **N** | **A** | **E** | **M** | **Questions You Should Be Able to Answer** |
|  |  |  |  | 1. **Describe** what the goal of mitosis is. **Identify** two instances in which the cells of an organism would undergo this process. |
|  |  |  |  | 1. **Explain** the difference between haploid and diploid chromosome numbers. |
|  |  |  |  | 1. **Draw a picture** to illustrate the difference between a chromatid and a chromosome. |
|  |  |  |  | 1. **Create a Venn Diagram** that shows the relationship among these terms:  DNA, gene, genome, chromatin, chromosome, chromatid. |
|  |  |  |  | 1. The term “mitosis” is Greek in origin and means “division of the nucleus.”  **Explain** how the steps of this process fit the definition of the word. |
|  |  |  |  | 1. **Explain** how the spindle apparatus ensures that daughter cells receive a full copy of the genetic material of the parent cell. |
| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
| Levels of Mastery | | | | *I can describe the role of checkpoints in regulating the cell cycle.*  *I can describe the effects of disruptions to the cell cycle on the cell or the organism. (Topic 4.7)* |
| **N** | **A** | **E** | **M** | **Questions You Should Be Able to Answer** |
|  |  |  |  | 1. The cell cycle is regulated by several checkpoints as well as a class of specialized protein kinases known as cyclin-dependent kinases. **Explain** how cyclin and the cyclin-dependent kinase interact to propel a cell through the cell cycle. |
|  |  |  |  | 1. The cell cycle is controlled by a multitude of factors.  **Explain** the role of each of the following in ensuring that cells divide appropriately.    1. G1, S, G2 and M checkpoints |
|  |  |  |  | 1. **Compare and contrast** healthy cell division with cancer development. |

| Learn More: For more information about cell division and its regulators look at the links below.   * Nobelprize.org: [Control of the Cell Cycle Game](http://www.nobelprize.org/educational/medicine/2001/index.html) * Nobelprize.org: [2001 Nobel Prize in Physiology/Medicine awarded to Leland Hartwell, Tim Hunt and Sir Paul Nurse “for their discoveries of key regulators of the cell cycle.”](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2001/) * The Biology Project: [Onion Root Tips—Determining Time Spent in Different Phases of the Cell Cycle](http://www.biology.arizona.edu/cell_bio/activities/cell_cycle/cell_cycle.html) * Rebecca Skloot: [The Immortal Life of Henrietta Lacks](http://rebeccaskloot.com/the-immortal-life/excerpt/) (about the woman from whom HeLa cells are derived) |
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