**Topic Review Guide**: Cell Division

**To Think About**: How do living things use energy and matter to survive in an ecosystem? In what ways do interactions between and within populations influence the amount of local and global ecosystem changes over time? What role does the environment play in sustaining homeostasis in biological systems? What are the consequences of human actions on both local and global ecosystems? In what ways do communities interact within their environments that result in the movement of matter and energy?

**Watch:**

**First:** [Mr. Andersen’s “Mitosis” video](http://viewpure.com/1cVZBV9tD-A)

**Then**: [Mr. Andersen’s “Mitosis, Meiosis and Cell Cycle” video](http://viewpure.com/2aVnN4RePyI&list=PLFCE4D99C4124A27A)

**Read:** Hillis, et. al Principles of Life, 1st edition: Chapter 7.1, 7.2, and 7.3, pages 124-134

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

* 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)

**Listen and Look**: Here is a list of key terms and concepts you will hear about and see during these podcasts and chapter readings. Get to know them! Be able to connect them to one another using a concept map.

**KEY TERMS**

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| Mitosis | Diploid (2n) | Cell cycle | MPF |
| Cyclin | Meiosis | Haploid (n) | Cytokinesis |
| cdk | Crossing over | Homologous chromosomes | Asexual reproduction |
| Sexual reproduction | Somatic cells | Gametes | Alternation of generations |
| Binary fission |  |  |  |

**Recall and Review:** Use the lecture in the video and your textbook reading to help you answer these questions in your BILL.

1. **Explain** what is meant by the term “alternation of generations.”
2. **Explain** how the goal of mitosis differs from the goal of meiosis.
3. **Explain** the relationship among these terms:  DNA, gene, genome, chromatin, chromosome, sister chromatid.
4. **Create** a Venn Diagram to compare and contrast the processes of sexual and asexual reproduction.
5. **Create** a t-chart that outlines the similarities and differences between binary fission and mitosis. **Explain** why binary fission cannot be considered mitotic division.
6. **Discuss** the advantages and disadvantages of sexual vs. asexual reproduction. **Explain** why each type of reproduction is important to the evolution of multicellular organisms.
7. 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.
8. **Explain** how cytokinesis differs in plant and animal cells.
9. 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, G2 and M checkpoints
   2. CDK’s and Cyclins
   3. MPF (mitosis-promoting factor)
   4. p53 gene  (use this site:  <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/C/CellCycle.html> to find information on p53)
10. Certain chemotherapeutic agents used to treat cancer such as vincristine act on the formation of microtubules. **Explain** what would happen to a dividing cell treated with vincristine during metaphase.

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| 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) |