Cells- The Next Generation: What You Need to Know for Chapter 9

Before you read or study chapter 9 do the following POGILS:
POGIL: Cell Cycle
POGIL: Mitosis

Once you have completed the two POGILS read chapter 9. Pay close attention to the ideas below. I highly recommend watching the Bozeman videos and doing the animations in Mastering Biology. Paul Anderson is excellent; he discusses the most important ideas in a clear manner. The Mastering Biology animations will help you understand the ideas quickly. Between the POGILS, Bozeman Videos, Mastering Biology animations, this study guide, and the book you should be able to learn this material well.

Listen and learn my lecture on **mitosis**:
ppt print audio

Read section 9.1 in the book. Make sure you understand the difference between **chromatin**, **chromosomes**, **sister chromatids**. Figure 9.5 on page 176 is excellent. Also, be able to distinguish between **centromeres** and **centrosomes**. Too many "c" words!!

In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.

Know the two main parts of the cell cycle (**interphase** and the **mitotic phase**). Also, make sure you know their sub-parts (page 177, see figure 9.6).
1. **Interphase**: Has three parts (G1, S, G2)
•Know the difference of each part and how the cell transitions from **G1** to **S** to **G2**.

2. **Mitotic Phase**: Has two parts (**mitosis**, **cytokinesis**) (page 178-179)
•Mitosis: Has 5 stages (prophase, prometaphase, metphase, anaphase, telophase)
- know the main events that happen in these 5 stages
•Cytokinesis
-know the difference between mitosis and cytokinesis and know how the cell transitions between these two processes.

Go to Mastering Biology and do "Activity: Mitosis and Cytokinesis Animation"
•This is EXCELLENT. Do not miss it!!

Go to Mastering Biology and do "BioFlix: Mitosis"
•There is a very cool 3D animation of mitosis and also an excellent slide show that walks you through the steps of mitosis.

Watch the following three videos:

1. Cell Division (Bozeman Biology)

2. Cell Cycle and Mitosis (Bozeman Biology)

3. Phases of Mitosis (Bozeman Biology)

Mitosis: Some of the things you need to know. . .
•Mitosis alternates with interphase in the cell cycle.
•When a cell specializes, it often enters into a stage where it no longer divides, but it can reenter the cell cycle when given appropriate cues. Non-dividing cells may exit the cell cycle; or hold at a particular stage in the cell cycle.
•Mitosis passes a complete genome from the parent cell to daughter cells.
•Mitosis occurs after DNA replication.
•Mitosis followed by cytokinesis produces two genetically identical daughter cells.
•Mitosis plays a role in growth, repair, and asexual reproduction
•Mitosis is a continuous process with observable structural features along the mitotic process. Know the order of the processes of mitosis (replication, alignment, separation).

The **cell cycle** is directed by internal controls or checkpoints. Internal and external signals provide stop-and-go signs at the checkpoints.
•Make sure you understand how the checkpoint system works to control the cell cycle (see page 184-187 "Checkpoints of the cell cycle control system").
•Understand how **cyclins** and **cyclin-dependent kinases** control the cell cycle (see page 185).

Go to Mastering Biology and do "Activity: The Cell Cycle"
•This is a great test of your understanding.

Suggestions for learning this material

To avoid the fluency illusion I recommend the following ideas. You will be tested on this the first week of the second semester (on Thursday, January 7th). Do as much or as little as you need to in order to learn the material. I DO NOT expect you to turn any of this material in to me. This is for your own learning.

1. Do the Concept Checks (9.1, 9.2, 9.3).
2. Do the Summary of Key Concepts at the end of the chapter (9.1, 9.2, 9.3).
3. Do the Test Your Understanding questions at the end of the chapter (1-7).
4. Go to Mastering Biology and take the Chapter 9 self-quiz and practice test.

Cells- The Next Generation: What You Need to Know for Chapter 10

Before you read or study chapter 10 do the following POGIL:
POGIL: Meiosis

Once you have completed the POGIL read chapter 10. Pay close attention to the ideas below. I highly recommend watching the Bozeman videos and doing the animations in Mastering Biology. Paul Anderson is excellent; he discusses the most important ideas in a clear manner. The Mastering Biology animations will help you understand the ideas quickly. Between the POGIL, Bozeman Videos, Mastering Biology animations, this study guide, and the book you should be able to learn this material well.

Listen and learn my lecture on **meiosis**:
ppt print audio

Read section 10.1 in the book. Make sure you understand the difference between **asexual reproduction** and **sexual reproduction**. Know the difference between a **somatic cell** and a **gamete**. What kind of reproduction creates a **clone**? What causes this- mitosis or meiosis?

Go to Mastering Biology and do "Activity: Asexual and Sexual Life Cycles"
•This is a nice overview.

Read section 10.2 in the book. Understand what a **homologous chromosome** is. Be able to distinguish between a **sex chromosome** and an **autosome**. Know the difference between a **haploid cell** and **diploid cell;** know the difference between **sister chromatids**, **non-sister chromatids**, **pairs of homologous chromosomes**, **maternal chromosomes** and **paternal chromosomes** (see figure 10.4).

Know the human life cycle. Distinguish between **meiosis** and **fertilization** (as well as mitosis and development). Figure 10.5 is excellent. Know what a **zygote** is and that it is **diploid**; know what a **gamete** is and that it is **haploid.** Think about why sexual reproduction evolved. What purpose does it serve and how does it help organisms adapt and succeed?

If you prefer a short lecture on the difference between **diploid** and **haploid**, Paul Anderson does a great job in this video: Diploid vs. Haploid (Bozeman Biology)

Be aware that different organisms that have a **sexual life cycle** do it differently than humans. You DO NOT need to memorize or know the details of these cycles but you DO need to be aware that they exist, and that they are different from one another. Page 146, figure 10.6 illustrates this nicely.

Read section 10.3 in the book. Be aware that the key thing that makes meiosis different from mitosis is that the chromosome number is **reduced by half**. Figure 10.7 does a great job of illustrating this. Be familiar with the stages of meiosis and the significant events that happen at each stage (figure 10.8 on pages 198-199).

Go to Mastering Biology and do "Activity: Meiosis"
•This is EXCELLENT. Do not miss it!!

If you prefer a short lecture on meiosis, Paul Anderson does a great job in these two videos:
Meiosis (Bozeman Biology)
Phases of Meiosis (Bozeman Biology)

If you can compare and contrast **mitosis** from **meiosis** than you really understand them both. Study figure 10.9 really well (page 200). The text on page 201 supports figure 10.9. Understanding the similarities and differences may be the most important thing in all of chapters 9 & 10. If you think the similarities and differences are confusing then you need to watch the two versions of the, "Hitler confused by mitosis and meiosis" videos (see the video section in Canvas). These videos are hilarious but are also very instructive. Watch each of these two videos at least once to be entertained, then go back and watch them again, stopping them when necessary to see if you understand everything that is being said. Do you see any mistakes in the videos? Are they perfectly accurate in their description of mitosis and meiosis? If you really understand the difference between mitosis and meiosis then you will fully understand everything in both videos. Watch the videos and see how you do- it's a fun way to test your understanding. Watch them with a friend and talk about them. Slay the dragon of the fluency illusion!

If you want another perspective go to **Mastering Biology and do MP3 Tutor**: "Comparing Mitosis and Meiosis." He has a great graphic you can download while he walks you through all the important similarities and differences between mitosis and meiosis. To access the graphic click on the "mitosis and meiosis" link in the first paragraph of the text.

Read section 10.4 in the book. Three processes contribute to the variation in sexually reproducing organisms: **independent assortment of chromosomes**, **crossing over**, and **random fertilization**. Make sure you understand these three processes and how they occur. Figures 10.10 and 10.11 are excellent visual representations of two of these processes.

Meiosis: Some of the things you need to know. . .

•**Meiosis**, a reduction division, followed by fertilization ensures genetic diversity in sexually reproducing organisms.

•Meiosis ensures that each gamete receives one complete **haploid** (1n) set of chromosomes.

•During meiosis, **homologous chromosomes** are paired, with one homologue originating from the **maternal parent** and the other from the **paternal parent**. Orientation of the chromosome pairs is random with respect to the cell poles.

•Separation of the **homologous chromosomes** ensures that each gamete receives a **haploid** (1n) set of chromosomes composed of both maternal and paternal chromosomes.

•During meiosis, **homologous chromatids** exchange genetic material via a process called "**crossing over**," which increases genetic variation in the resultant gametes.

•**Fertilization** involves the fusion of two **gametes**, increases genetic variation in populations by providing for new combinations of genetic information in the **zygote**, and restores the **diploid number of chromosomes**.

•**Sexual reproduction** in eukaryotes involving gamete formation, including **crossing-over** during meiosis and the **random assortment of chromosomes** during meiosis, and **fertilization** serve to increase variation. Reproduction processes that increase genetic variation are evolutionarily conserved and are shared by various organisms.

<u>Suggestions for learning this material</u>

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2. Do the Summary of Key Concepts at the end of the chapter (10.1, 10.2, 10.3, 10.4).
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