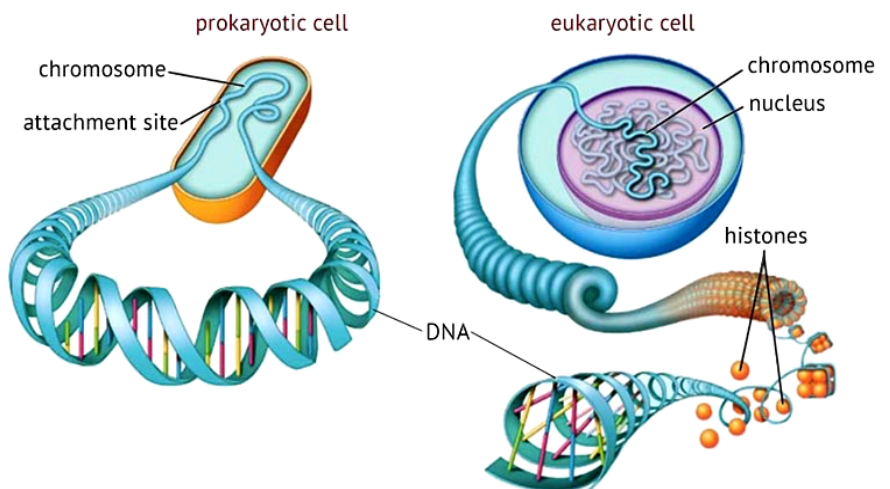


- **PHYSICALLY PRINT OUT this PDF and HANDWRITE (with a black or blue pen) your answers directly on this PDF.** Typed or digitally-written work is **not** accepted. Do **not** answer questions on separate paper.
  - **Importantly, study guides are NOT GROUP PROJECTS!!!** You, and you alone, are to answer the questions as you **read** your assigned textbook. You are **not** to share answers with other students. You are **not** to copy any answers from any other source, including the internet.
  - **Get in the habit of writing LEGIBLY, neatly, and in a medium-sized font.** AP essay readers and I will skip grading anything that cannot be easily read so start perfecting your handwriting, and don't write so large you can't add all the relevant details and key elaborations in the space provided.
  - **SCAN physical documents in color and with good resolution. Then, upload your final work as PDFs to Archie.** Avoid uploading dark, shaded, washed-out, sideways, or upside-down scans of homework. Keep completed physical study guides organized in your biology binder to use as future study and review tools.
  - **READ FOR UNDERSTANDING and not merely to complete an assignment.** *First*, read a section quickly to get an overview of the topic covered. Then, read it a **second** time slowly, paraphrasing each paragraph **out loud** and analyzing every figure. Finally, read it a **third** time as you answer the study guide questions if assigned and start building your memory. Try to write answers out in your own words, when possible, and try to purposefully and accurately use all new terminology introduced.
1. a. At the cellular level, cell division results in the making of more cells. As you will review, when Eukaryotic and Prokaryotic cells divide into two daughter cells, the goal is to produce cells that are genetically identical to not only each other, but also to the original parent cell. Briefly, describe the **role (function) of cell division in unicellular (single-celled) prokaryotic and unicellular (single-celled) eukaryotic organisms.**
- b. Briefly, describe the **two roles of cell division in multi-cellular organisms.** (In Ch.13, you will learn about a third role of cell division in sexually reproducing eukaryotic organisms: making the reproductive cells needed to form a new offspring).
- 1.
- 2.
2. a. What do we mean when we refer to a cell or organism's **genome**?
- b. How does a **eukaryotic cell's genome contrast with a prokaryotic cell's genome**?



3. a. What are the **genes**?

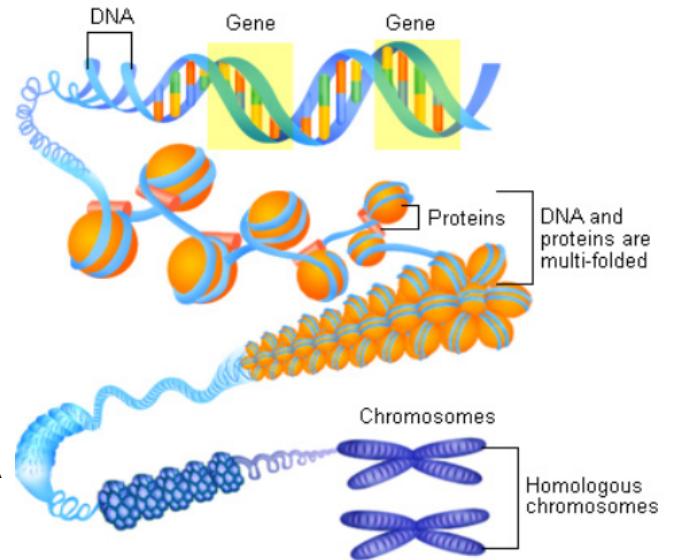
b. Eukaryotic DNA (unlike Eubacteria's DNA) is said to exist in the nucleus of the cell as chromatin for most of a cell's cell cycle. What is **chromatin**?

c. Prokaryotic DNA is said to be naked while Eukaryotic DNA is associated with many proteins. What do these DNA-associated proteins (**histone** proteins) help with?

1.

2.

d. How are **eukaryotic chromatin and chromosomes related**?



4. **Each eukaryotic species has a characteristic number of chromosomes in a typical cell's nucleus.**

a. What is the **difference between a somatic cell** (body cells) **and a gamete** (reproductive cells)?

**Somatic Cell:**

**Gametic Cell:**

b. What is the **total number of chromosomes found in a HUMAN somatic cell**?

c. Name your own **two examples of somatic cells in your own body** not listed in this section of the textbook.

1. \_\_\_\_\_

2. \_\_\_\_\_

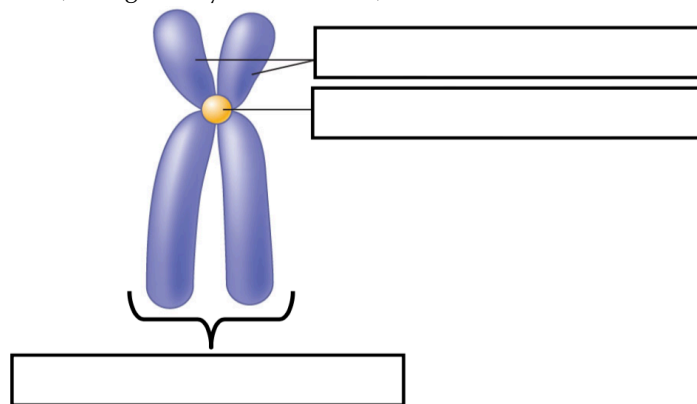
d. Name the **two types of gametes that humans can produce**.

1. \_\_\_\_\_

2. \_\_\_\_\_

e. What is the **total number of chromosomes found in a HUMAN gametic cell (or gamete)**?

5. You are going to have to learn the difference between a number of similar-sounding terms. The sketch below, that looks like an X, **represents a replicated (duplicated) chromosome**, the original DNA molecule (chromosome) having been copied in preparation for cell division. **By duplicating each chromosome in the parent cell's nucleus, the parent cell will be ready to provide each of the two new daughter cells with a copy of every single one of the parent cell's chromosomes so each of the two daughter cells will be not only identical to each other, but also identical to the parent cell that made them.** A duplicated chromosome is made up of **two sister chromatids**. The narrow "waist" represents the location of the **centromere** on the chromosome.
- Remember, **one** chromosome is **one** DNA molecule (*wrapped around histone proteins in eukaryotes*) that itself is made up of **two** strands of nucleotides. So then what are **Sister Chromatids**?
  - Every unduplicated chromosome has a centromere. Every sister chromatid, therefore, also has a centromere. What is a **centromere**?
  - Though unduplicated chromosomes are made of chromatin, which is made up of DNA wrapped around histone proteins, once this DNA is copied into a duplicated chromosome, additional proteins, like cohesins, associate with the chromatin (and, thus, the sister chromatids) that makes up the duplicated chromosome. What is the function of these **cohesin proteins**?
  - Study Figure 12.5 well. Then, using what you've learned, label the illustration below.



6. *Think:* Take a look at one of the two sister chromatids in the duplicated chromosome to the right. If the colored stripes, in the chromatid you selected, represent different genes along a molecule of DNA (*remember, a **gene** is a sequence of DNA nucleotides that encodes information the cell uses to make RNA or protein molecules with*), is this picture of a duplicated chromosome **biologically sound (correct)**? Explain exactly why or why not.



7. Cell division involves mitosis, followed immediately by cytokinesis.
- What does the term **mitosis** refer to?
  - What does the term **cytokinesis** refer to?

8. **When an unduplicated chromosome has been duplicated (and is thus made up of two sister chromatids), it is still considered one chromosome.** Only when sister chromatids are separated from one another, are each of the two double-helix DNA molecules, which made up the duplicated chromosome, now considered individual unduplicated chromosomes in their own right.

Study Figure 12.5. How many chromosomes are illustrated in steps 1, 2, & 3 of the figure? *Check your answer by going to the [Ch.12.1 Concept Check Question #1](#) answer in Appendix A)*

# of chromosomes in step 1 =

# of chromosomes in step 2 =

# of chromosomes in step 3 =

Remember, this illustration shows what happens to only one chromosome. **Eukaryotic organisms have multiple chromosomes in their nuclei though.** This process happens to each one of them independently.

9. a. What types of cells are produced by **meiosis** versus **mitosis** (followed in both cases by cytokinesis)?

Type of cells made by mitosis:

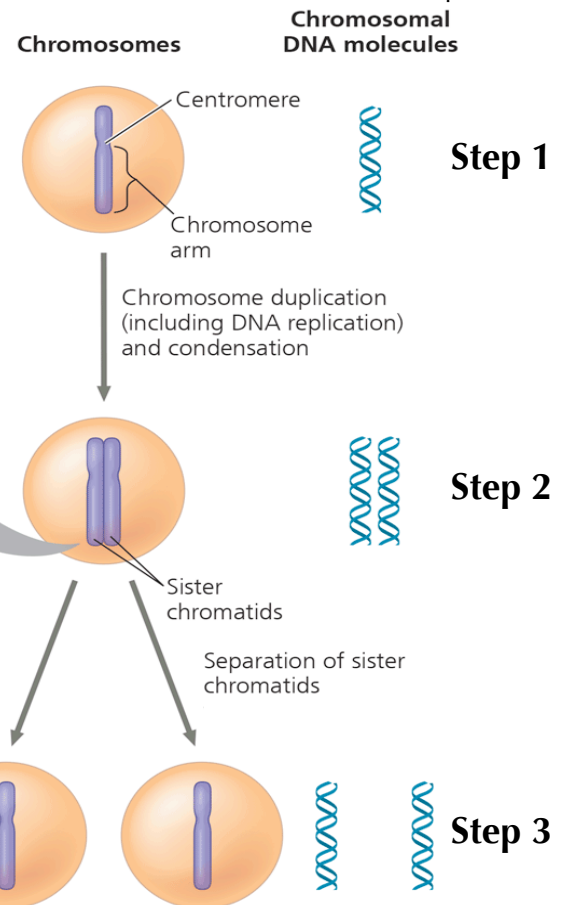
Type of cells made by meiosis:

- b. In **multicellular eukaryotic animals**, in what organ(s) do we find the **cells that can and do undergo meiosis**?

- c. Relevant to the parent cells, how are the **chromosome numbers of daughter cells different after a somatic cell undergoes meiosis** (and cytokinesis) **compared when a somatic cell undergoes mitosis** (and cytokinesis)?

10. Eukaryotic species vary in their number of chromosomes. What if a chicken has 78 chromosomes in its somatic cells.

- How many chromosomes did the chicken inherit from each of its two parents?
- How many chromosomes will be in each of the chicken's gametes (reproductive cells)?
- How many chromosomes will there be in each somatic cells in the offspring of this chicken (chickens being sexually reproducing organisms)?



Check your answers by going to the [Ch.12.1 Concept Check Question #2](#) answers in Appendix A)