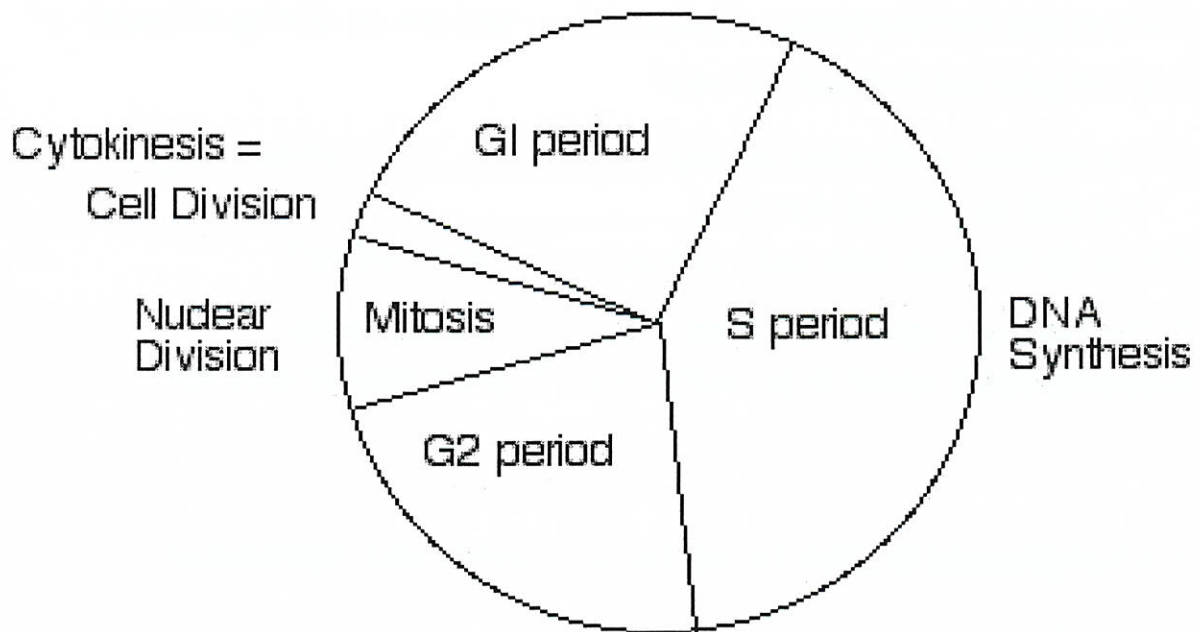


The Cell Cycle Cell Growth



MITOSIS (KARYOKINESIS) - NUCLEAR DIVISION

Mitosis is the process in which a **eukaryotic cell** (cell containing a nucleus) separates its already **duplicated chromosomes** (copied during the S phase) into **two sets** of chromosomes so there will be **two identical nuclei**. It is generally followed by **cytokinesis** which divides the cytoplasm and cell membrane. *Color the Cytokinesis stage yellow.* This results in **two identical cells** (both have an identical set of chromosomes) with an equal distribution of organelles and other cellular components. The **mitotic (M) phase** and **cytokinesis (C phase)** together are called **cell division**, the division of the **parent cell** (original) into **two daughter cells** (new cells), each with the same **genetic information (chromosomes)** as the parent cell. Mitosis does **NOT** occur in **prokaryotic cells** that do **NOT** have a nucleus. In multicellular organisms, the **somatic cells** (body cells) undergo mitosis, while **germ cells** — cells destined to become sperm in males or ova (eggs) in females — divide by a related process called

meiosis. Prokaryotic cells (bacteria), which lack a nucleus, divide by a process called binary fission.

1. When are chromosomes duplicated --- before or during mitosis?
2. What process follows mitosis?
3. The nucleus is divided during _____, while cytoplasm of the cell is divided during _____.
4. How do the two new cells compare with each other?
5. The two new cells are called _____ cells.
6. Does mitosis occur in prokaryotes? Explain why or why not.

7. What process is used by bacteria to divide and reproduce?

8. Body cells are called _____ cells, while reproductive cells are known as _____ cells.

The process of **mitosis (division of the nucleus)** is divided into **four stages (Prophase, Metaphase, Anaphase, and Telophase)**. Immediately following nuclear division (mitosis), the **cell membrane** must also divide (**cytokinesis**). Animal cells divide the cytoplasm by constricting the cell membrane in the middle to form a **cleavage furrow**. Plant cells form a **cell plate** in the center to divide the cytoplasm. At Interphase, there is only one cell, but after cytokinesis there are two identical cells.

9. Name the 4 mitotic stages.

10. How does cytokinesis occur in an animal cell?

11. How does cytokinesis occur in a plant cell?

During interphase, the genetic material is called **chromatin** and can NOT be clearly seen because it isn't tightly coiled. When **prophase begins**, the DNA molecules are progressively shortened and condensed by coiling, to form visible **chromosomes**. **Enzymes** during prophase break down the **nuclear membrane and nucleolus** so they are no longer visible. Spindle fibers also form in prophase which will attach to the chromosomes. At **metaphase**, the spindle fibers attach themselves to the **centromeres** of the chromosomes and align the chromosomes at the **equator** (middle of the cell). **Anaphase** is the next stage. The spindle fibers shorten and the centromere splits separating the two sister chromatids. During **telophase**, the chromosomes pairs (chromatids are pulled to opposite poles of the cell. The **nuclear envelope and nucleolus reform** before the **chromosomes uncoil**. The **spindle fibers disintegrate**.

12. Genetic material is called _____ during interphase and **IS / IS NOT** clearly visible.

13. What makes the chromosomes become visible during prophase?

14. What is used to help break down the nuclear membrane?

15. Besides the nucleus, what else is broken down during prophase?

16. What forms during prophase to **LATER** attach and move chromosomes?

17. Doubled chromosomes are held together by the _____.

18. Where do chromosomes line up during metaphase?

19. During what stage are sister chromatids separated and moved to opposite ends of the cell?

20. Name 4 things that happen during telophase.

a.

b.

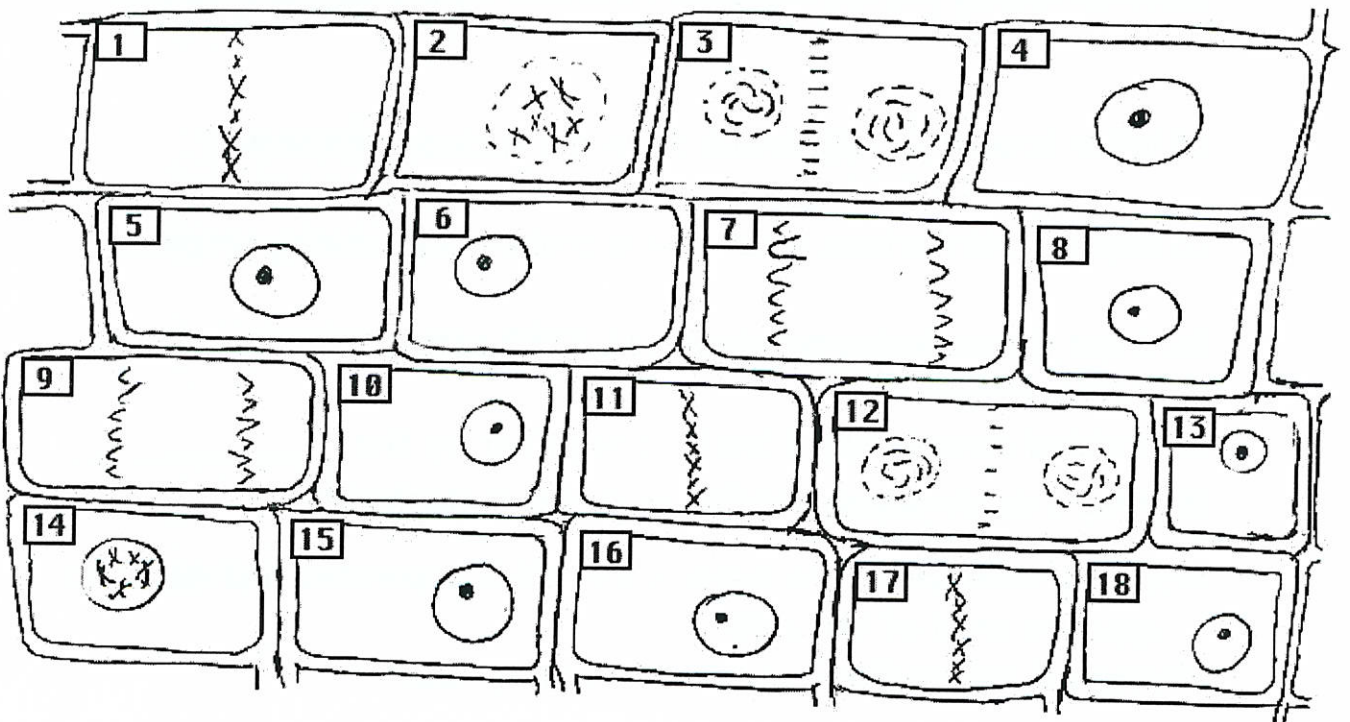
c.

d.

*Name each numbered stage in the plant cell cycle diagram:
(interphase, prophase, metaphase, anaphase, or telophase)*

- | | | |
|----|-----|-----|
| 1. | 7. | 13. |
| 2. | 8. | 14. |
| 3. | 9. | 15. |
| 4. | 10. | 16. |
| 5. | 11. | 17. |
| 6. | 12. | 18. |

Plant Cells in Mitosis



Label the stages of the cell cycle & mitosis. LABEL and COLOR the stages in the plant cell and animal cell. The stages should be colored as follows --- interphase-pink, prophase-light green, metaphase-red, anaphase-light blue, and telophase-yellow. Also label the CENTRIOLES, SPINDLE FIBERS, CENTROMERE, and CHROMOSOMES.

Mitosis of an Animal Cell

