# Chapter 10 - Mitosis

1. Cell Division
   1. B\_\_\_\_\_
   2. All cells are derived from \_\_\_\_\_ cells
   3. New cells are produced for \_\_\_\_\_ and to \_\_\_\_\_ damaged or old cells.
2. Spontaneous Generation
   1. A\_\_\_\_\_
      1. A belief that \_\_\_\_\_ can arise from \_\_\_\_\_ materials
      2. This idea was proposed by \_\_\_\_\_. Also promoted by \_\_\_\_\_.
      3. It was taught from 800 B.C. until the 1700’s (almost 2000 years).
      4. N\_\_\_\_\_ used poor \_\_\_\_\_ and did not \_\_\_\_\_ the microbes long enough to kill them.
      5. 1668, Francesco \_\_\_\_\_ tested the meat maggot theory
      6. Louis \_\_\_\_\_ tested his idea of microorganisms.
      7. Abiogenesis was thoroughly disproven by \_\_\_\_\_ in the mid 1800’s
         1. He boiled broth in a flask killing all the \_\_\_\_\_.
         2. He bent heated the neck of the flask curving it and trapping fluid in the neck so that \_\_\_\_\_ could not get in the flask.
         3. He observed the broth for a year and microbes occurred.
         4. He broke the neck allowing air to flow into the flask and microbes appeared in a few days.
   2. S\_\_\_\_\_ \_\_\_\_
      1. Evolutionary theory suggests that \_\_\_\_\_ originated out of the primordial soup as a result of a \_\_\_\_\_ \_\_\_\_\_.
         1. Sir Fred Hoyle calculated the possibility of this happening on its own (without a creator). He said:
            1. “The previously \_\_\_\_\_ scientist Sir Fred Hoyle was driven to become a creationist of sorts when he tried to calculate the probability of such a chance assemblage. ‘*Precious little in the way of biochemical evolution could have happened on the earth. If one counts the number of trial assemblies of amino acids that are needed to give rise to the enzymes, the probability of their discovery by* \_\_\_\_\_ *shufflings turns out to be less than 1 in 1040,000.*’” (Morris, 2002)
         2. God created “\_\_\_\_\_” (out of nothing).
         3. God created all organisms “After its \_\_\_\_\_”?
         4. What about transitional fossils?
         5. Stephen Jay Gould of Harvard is perhaps the leading representative of this modern school of paleontologists. He makes the following admission: "*All paleontologists know that the fossil record contains precious little in the way of* \_\_\_\_\_ *forms; transitions between major groups are characteristically abrupt.*” (Morris, 2002)
3. Cell \_\_\_\_\_
   1. Cell Division plays many important roles in the lives of organisms
      1. The ability of organisms to reproduce their \_\_\_\_\_ is a key characteristic of life.
      2. Cell Division
         1. Is reproduction at the \_\_\_\_\_ level
         2. It produces \_\_\_\_\_ that are genetically \_\_\_\_\_ to each other and the original “parent” cell.
         3. It requires the \_\_\_\_\_, the structures that contain most of the cell’s \_\_\_\_\_
         4. It sorts new sets of \_\_\_\_\_ into the resulting pair of daughter cells.
      3. Living organisms \_\_\_\_\_ by two methods:
         1. \_\_\_\_\_ Reproduction
            1. Produces offspring that are \_\_\_\_\_ to the original cell or organism
            2. Involves inheritance of \_\_\_\_\_ genes from \_\_\_\_\_ parent
         2. \_\_\_\_\_ Reproduction
            1. Produces offspring that are \_\_\_\_\_ but show \_\_\_\_\_ in traits.
            2. It involves inheritance of unique sets of genes from \_\_\_\_\_ parents.
      4. Cell \_\_\_\_\_ is used for:
         1. Reproduction of \_\_\_\_\_ -\_\_\_\_\_ organisms
         2. Growth of multicellular organisms from a \_\_\_\_\_ into an adult.
         3. \_\_\_\_\_ and \_\_\_\_\_ of cells
         4. Production of \_\_\_\_\_
   2. Types of Cellular Reproduction
      1. Prokaryotes reproduce by \_\_\_\_\_ (dividing in half)
         1. The chromosome of a prokaryote is typically
            1. A single circular \_\_\_\_\_ associated with proteins.
            2. Much \_\_\_\_\_ than those of eukaryotes.
         2. Binary fission of a \_\_\_\_\_ occurs in three stages:
            1. \_\_\_\_\_ of the chromosome and \_\_\_\_\_ of the copies.
            2. Continued \_\_\_\_\_ of the cell and movement of the copies.
            3. \_\_\_\_\_ into two \_\_\_\_\_ cells.
      2. Eukaryotes duplicate with each cell division
         1. Eukaryotic cells
            1. Are more \_\_\_\_\_ than prokaryotic cells
            2. Have more \_\_\_\_\_
            3. Store most of their genes on \_\_\_\_\_ within the nucleus.
         2. Each eukaryotic species has a characteristic number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in each cell nucleus.
         3. Human Body cells have \_\_\_\_\_ or 23 identical pairs of chromosomes.
         4. Eukaryotic Chromosomes
            1. Each chromosome is composed of a single \_\_\_\_\_ molecule tightly coiled around \_\_\_\_\_ called \_\_\_\_\_
            2. Chromosomes cannot be seen when cells are not dividing and are called \_\_\_\_\_
            3. To prepare for division, the \_\_\_\_\_ becomes

highly compact

visible with a microscope

* + - 1. Human K\_\_\_\_\_
         1. A picture of the \_\_\_\_\_ from a human cell arranged in pairs by size.
      2. A large, complex chromosomes of eukaryotes duplicate with each cell division.
         1. Before a eukaryotic cell begins to divide, it duplicates all of its \_\_\_\_\_, resulting in two copies called \_\_\_\_\_.
         2. The sister chromatids are joined together along their lengths and are cinched especially tightly at a narrowed “waist” called the \_\_\_\_\_.
         3. When a \_\_\_\_\_, the Sister Chromatids:

separate from each other and

sort into separate \_\_\_\_\_ cells.

* + - 1. A cell cycle includes \_\_\_\_\_ and \_\_\_\_\_ phases
         1. The \_\_\_\_\_ is an ordered sequence of events that extends from the time a cell is first formed from a dividing parent cell until \_\_\_\_\_.
         2. The \_\_\_\_\_ consists of two stages, characterized as follows:

I\_\_\_\_\_: \_\_\_\_\_ of cell contents

G1 — growth, increase in \_\_\_\_\_

S — \_\_\_\_\_ of chromosomes

G2 — growth, preparation for \_\_\_\_\_

M\_\_\_\_\_ Phase: division

Mitosis — division of the \_\_\_\_\_

Cytokinesis—division of \_\_\_\_\_

* + - 1. Cell Division is a continuum of dynamic changes
         1. Mitosis progresses through a series of stages.

P\_\_\_\_\_

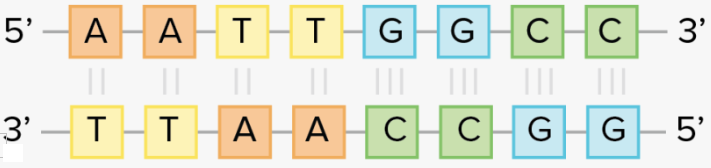
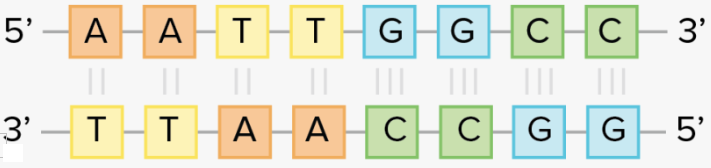
Prometaphase

M\_\_\_\_\_

A\_\_\_\_\_

T\_\_\_\_\_

* + - * 1. C\_\_\_\_\_
  1. Stages of Mitosis
     1. I\_\_\_\_\_
        1. The \_\_\_\_\_ contents double
        2. \_\_\_\_\_appear
        3. Chromosomes duplicate in the nucleus during the \_\_\_\_\_.
        4. Accounts for \_\_\_\_\_ of the cell cycle.
        5. DNA Replication occurs during the \_\_\_\_\_of the cell cycle
        6. \_\_\_\_\_becomes condensed by wrapping around \_\_\_\_\_.
        7. DNA is \_\_\_\_\_or \_\_\_\_\_before cell division.
        8. Each new cell will then have an \_\_\_\_\_of the DNA
        9. DNA Replication happens right before the actual division of the cell occurs (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
        10. Enzyme \_\_\_\_\_binds to the DNA at the replication origin and begins to \_\_\_\_\_it by \_\_\_\_\_the hydrogen bonds between the complementary bases of DNA.
        11. \_\_\_\_\_binds to the unzipped DNA and begins linking \_\_\_\_\_ across from the parent strand, forming a complementary \_\_\_\_\_.
        12. The parent strand is separated into the \_\_\_\_\_ strand, and the \_\_\_\_\_ .
        13. Parent strand serves as a \_\_\_\_\_for the daughter strand to be made.
        14. This process occurs simultaneously on both parent strands, but in \_\_\_\_\_directions.
        15. Each replicated copy of DNA is composed of one parent strand and one daughter strand.
        16. The \_\_\_\_\_ bases of DNA always align the same.
            1. A\_\_\_\_\_ with T\_\_\_\_\_
            2. G\_\_\_\_\_ with C\_\_\_\_\_



1. A mitotic \_\_\_\_\_

Is required to divide the chromosomes

Guides the \_\_\_\_\_ of the two sets of daughter chromosomes, and

* + - * 1. Is composed of \_\_\_\_\_ and associated proteins.
        2. Spindle Microtubules emerge from two \_\_\_\_\_.
    1. P\_\_\_\_\_
       1. In the \_\_\_\_\_, \_\_\_\_\_ become more tightly coiled and folded.
       2. In the \_\_\_\_\_, the \_\_\_\_\_ begins to form as microtubules rapidly grow out from the \_\_\_\_\_.
    2. M\_\_\_\_\_
       1. The \_\_\_\_\_ is fully formed.
       2. Chromosomes \_\_\_\_\_ at the cell equator.
       3. \_\_\_\_\_ are facing the opposite poles of the spindle.
    3. A\_\_\_\_\_
       1. Sister chromatids separate at the \_\_\_\_\_ …
       2. …and are moved to \_\_\_\_\_ of the cell along the spindle microtubules.
       3. At the end of anaphase, the two ends of the cell have \_\_\_\_\_ collections of \_\_\_\_\_.
    4. T\_\_\_\_\_
       1. The cell continues to \_\_\_\_\_.
       2. The \_\_\_\_\_ forms around chromosomes at each pole, establishing \_\_\_\_\_ nuclei.
       3. \_\_\_\_\_ uncoils.
       4. The \_\_\_\_\_ disappears.
  1. C\_\_\_\_\_
     1. During cytokinesis, the \_\_\_\_\_ is divided into separate cells.
     2. Cytokinesis usually occurs simultaneously with \_\_\_\_\_.
     3. In \_\_\_\_\_ cells, cytokinesis occurs as
        1. A \_\_\_\_\_ furrow forms from a \_\_\_\_\_ of microfilaments.
        2. The cleavage furrow deepens to \_\_\_\_\_ the contents into two cells.
     4. In \_\_\_\_\_ cells, \_\_\_\_\_ occurs as
        1. A \_\_\_\_\_ forms in the middle
        2. The cell plate grows outward to reach the edges, dividing the contents into two cells.
        3. Each cell now possesses a \_\_\_\_\_ and cell \_\_\_\_\_.
  2. G\_\_\_\_\_ factors signal the cell cycle control system.
     1. The cell cycle control system is a \_\_\_\_\_ in the cell that triggers and coordinates key events in the cell cycle.
     2. \_\_\_\_\_ in the cell cycle can
        1. \_\_\_\_\_ an event or
        2. Signal an event to \_\_\_\_\_.
     3. There are three major checkpoints in the cell cycle:
        1. \_\_1 Checkpoint: allows entry into the \_\_\_\_\_ or causes the cell to \_\_\_\_\_, entering a non-dividing G0 phase.
        2. \_\_2 Checkpoint 🡪 Is the \_\_\_\_\_ replicated? Is the \_\_\_\_\_ favorable? Is the cell big enough?
        3. \_\_\_ Checkpoint 🡪 are all \_\_\_\_\_ aligned on spindle?
     4. Research on the control of the cell cycle is one of the hottest areas in biology today
  3. Growing out of control, \_\_\_\_\_ cells produce malignant tumors
     1. Unregulated \_\_\_\_\_.
     2. C\_\_\_\_\_ currently claims the lives of 20% of the people in the United States.
     3. Cancer cells \_\_\_\_\_ on the cell cycle.
     4. Cancer cells \_\_\_\_\_ and invade other tissues of the body.
     5. A \_\_\_\_\_ is a mass of abnormally growing cells within otherwise normal tissue.
        1. \_\_\_\_\_ Tumors remain at the \_\_\_\_\_ site but may disrupt certain organs if they grow in size.
        2. \_\_\_\_\_ Tumors can \_\_\_\_\_ to other locations in a process called \_\_\_\_\_.
        3. An individual with a malignant tumor is said to have \_\_\_\_\_.
     6. Localized Tumors can be
        1. removed \_\_\_\_\_ and/or
        2. treated with concentrated beams of high-energy \_\_\_\_\_.
     7. Metastatic Tumors are treated with \_\_\_\_\_.