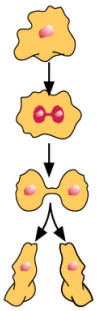
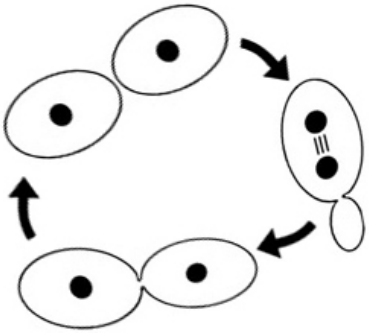
Cell Division

Vocabulary: anaphase, asexual reproduction, binary fission, budding, cell cycle, chromatids, chromatin, chromosomes, clones, cloning, cytokinesis, DNA, DNA replication, heredity, interphase, metaphase, mitosis, prophase, replication, sporulation, synthesis**,** telophase

Asexual Reproduction

Species are maintained in existence through the life spans process of reproduction. **Asexual reproduction** produces genetically identical offspring from a single parent cell. The process of **mitosis** is associated with asexual reproduction and the growth and repair of cells in sexually reproducing organisms.

Reproduction and development are necessary for the continuation of any species. **Asexual reproduction** is a method of reproduction with all the genetic information coming from one parent.

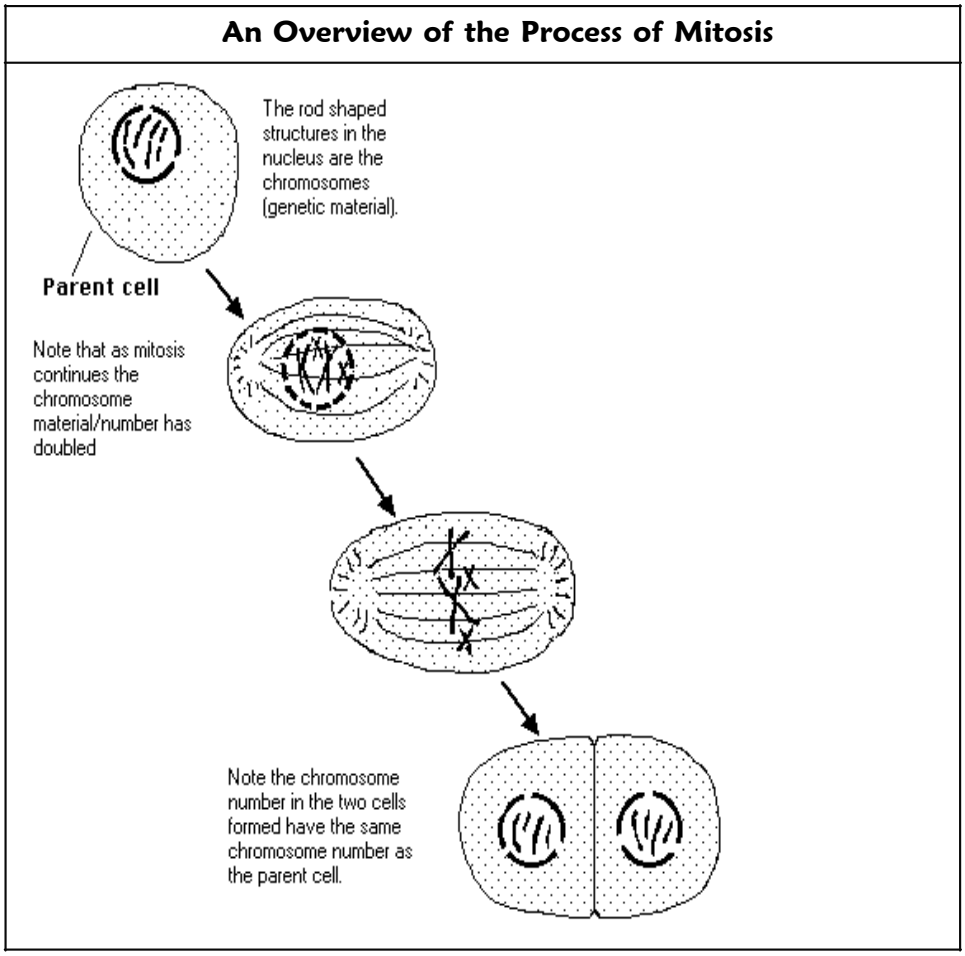
Some Methods of Asexual Reproduction	
1. **binary fission** -- involves an equal division of both the organism cytoplasm and nucleus to form two identical organisms -- the diagram of the protist at the right is example of this	
2. **budding** -- involves one parent dividing its nucleus (genetic material) equally, but cytoplasm unequally -- the diagram of a yeast at the right is an example of this	
3. **sporulation** (spore formation) -- is reproduction involving specialized single cells coming from one parent -- the diagram of mold spores being formed at the right is an example of this	

Asexual reproduction is sometimes called cloning. **Cloning** is the production of identical genetic copies. All forms of asexual reproduction are variations of the cell division process of mitosis. **Mitosis** is associated with asexual reproduction, as well as growth and repair in sexually reproducing organisms.

Mitosis

Mitosis is the method used for cell division and reproduction in cells not involved in sexual reproduction. This process starts with one **replication** (copying of the chromosome material) and one division of the chromosome material. This results in the chromosome numbers in the two cells produced being the same as in the parent cell. This process is represented in the graphic which follows.

An Overview of the Process of Mitosis



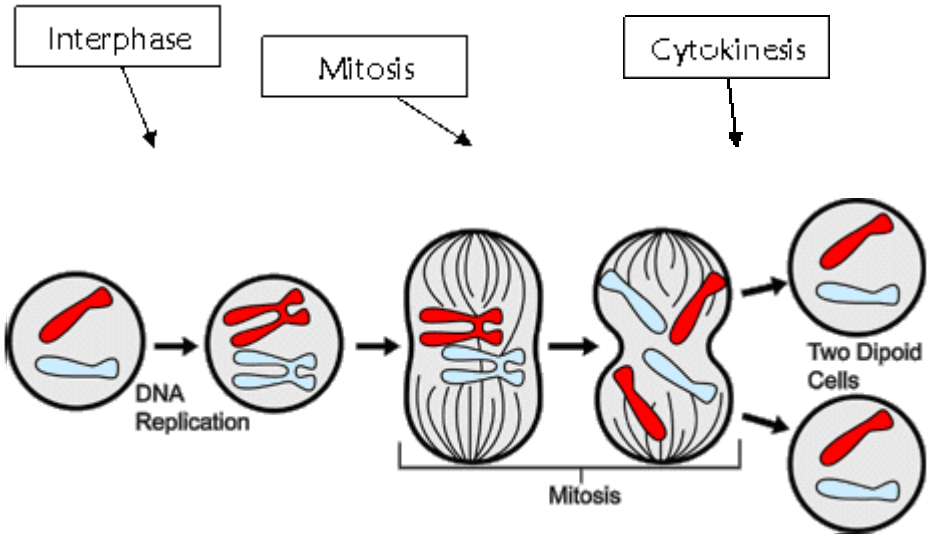
The Cell Cycle

The **cell cycle** is the lifespan of a cell. It is divided into three parts: Interphase, Mitosis, and Cytokinesis. **Interphase** is divided into three parts. G1 - or the first growth phase, is the stage in a cells life when normal cell functioning is occurring. A cell will remain in this stage unless it receives a signal to reproduce. Cells can receive signals from neighboring cells during development of a multi-cellular organism, or it may receive a signal for

repair of neighboring cells or a cell may receive a signal to divide if the cell becomes too large for intracellular transport to occur effectively. When a cell receives the signal to divide, it moves into the second stage of interphase called **synthesis**. Synthesis is the longest part of the cell cycle because this is the stage when a cells DNA replicates. **DNA replication** involves separating the double helix, complimentary nucleotides finding their match (Adenine joins with Thymine, Cytosine joins with Guanine) and two identical strands of DNA forming. Once this is accomplished, and proteins have confirmed its success, a cell moves into the third phase of interphase called G2, or the second growth phase. Here, organelles replicate and the cell grows in anticipation of dividing into two smaller cells.

If everything goes according to plan, a cell is ready to move into the mitotic stage of the cell cycle. **Mitosis** is the division of the nucleus stage. It is a choreographed mechanism to efficiently and accurately divide the two identical copies of DNA into the newly forming cells and it is done the same way in every living cell. The four parts of this cycle are prophase, metaphase, anaphase and telophase (PMAT). In **prophase**, the DNA which is in long, stringy **chromatin** form condenses and coils up into **chromosomes**. The identical pieces of DNA are joined together with a centromere. During this phase, the nuclear membrane in eukaryotes begins to disintegrate. In **metaphase**, the paired **chromatids** line up (chromosomes) single file down the equator of the cell. In **anaphase**, the sister chromatids separate and identical chromatids each move to opposite poles. **Telophase** is when the chromosomes begin to uncoil again back into chromatin and new nuclear membranes begin to form in eukaryotes.

The final stage of the cell cycle begins in telophase when the cells cytoplasm begins to divide. In animal cells, the cell membrane pinches in during this stage called **cytokinesis**. In plant cells, a cell plate forms between the newly forming nuclei as the cell wall can't pinch in. This continues until two new cells are formed with identical DNA.



Two Key Results of **Mitosis**

1. The same chromosome number is retained from generation to generation.
2. Each daughter cell receives an exact copy of the chromosomes of the parent cell. (**clones**)

Asexual Heredity

Every organism requires a set of coded instructions for specifying its traits. For offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next. **Heredity** is the passage of these instructions from one generation to another. The **DNA** molecule provides the mechanism for transferring these instructions.

In **asexually** reproducing organisms, all the genes come from a single parent. As asexually produced offspring are produced by the cell division process of **mitosis**, all offspring are normally genetically identical to the parent.
