THE CELL CYCLE
The Cell Cycle

Cell division occurs in three stages: interphase, mitosis, and cytokinesis.
# Cell Division Classification

<table>
<thead>
<tr>
<th>Stage</th>
<th>Name</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Interphase</strong></td>
<td>Cell doubles in size; DNA is copied</td>
</tr>
<tr>
<td>2</td>
<td><strong>Mitosis</strong></td>
<td>The process of the cell’s nucleus dividing during prophase-telophase</td>
</tr>
<tr>
<td>3</td>
<td><strong>Prophase</strong></td>
<td>Mitosis begins; nuclear membrane disappears</td>
</tr>
<tr>
<td>4</td>
<td><strong>Metaphase</strong></td>
<td>Chromosomes line up along the equator of the cell</td>
</tr>
<tr>
<td>5</td>
<td><strong>Anaphase</strong></td>
<td>Chromatids split and are pulled to each pole of cell</td>
</tr>
<tr>
<td>6</td>
<td><strong>Cytokinesis</strong></td>
<td>Nuclear membrane reforms; cell begins to pinch together. Mitosis ends</td>
</tr>
</tbody>
</table>

- **Parent cell’s cytoplasm divides, forming 2 identical daughter cells**
Stage 1: Interphase

1. The cell doubles in size
2. DNA Replicates
Interphase

Chromatin

Nuclear Membrane
Mitosis

Mitosis is subdivided into four phases.

- **Interphase**
  - Centrioles
  - Nucleus
  - Nucleolus
  - Nuclear envelope

- **Prophase**
  - Developing spindle
  - Chromatids

- **Prometaphase**
  - Nuclear envelope
  - Kinetochore microtubules

- **Metaphase**
  - Equatorial plate

- **Anaphase**
  - Chromatids

- **Telophase**
  - and Cytokinesis

1. **Mitosis begins** (cell begins to divide).

2. Centrioles appear

3. Spindle fibers form between the centrioles.

4. Chromatin coils up into Chromosomes

***Each chromosome consists of two sister chromatids attached together by a centromere by the end of this stage.

- chromatid = half of a copied chromosome
Prophase

- Centrioles
- Spindle fibers
- Nuclear Membrane
1. Nuclear membrane has disappeared.
2. Chromosomes line up along the equator of the cell.
3. Spindle fibers attach to centromeres of each chromosome.
Anaphase

1. Chromatids split
2. Spindle fibers pull chromosomes to opposite ends of the cell.

- Spindle fibers
- Centrioles
- Chromosomes
1. Two new nuclei form
   - nuclear membranes reform around chromosomes
2. Chromosomes return to chromatin form.
3. Mitosis ends.
Cytokinesis

1. Cell membrane pinches and forms identical daughter cells

- After cytokinesis, interphase begins, starting the cell cycle again.
Interphase ▲
The cell grows and replicates its DNA and centrioles.

Cytokinesis ▼
The cytoplasm pinches in half. Each daughter cell has an identical set of duplicate chromosomes.

Prophase ▲
The chromatin condenses into chromosomes. The centrioles separate, and a spindle begins to form. The nuclear envelope breaks down.

Telophase ▼
The chromosomes gather at opposite ends of the cell and lose their distinct shapes. Two new nuclear envelopes will form.

Metaphase ▼
The chromosomes line up across the center of the cell. Each chromosome is connected to spindle fibers at its centromere.

Anaphase ▼
The sister chromatids separate into individual chromosomes and are moved apart.
Mitosis Animations

1. **Basic** mitosis animation.

2. **Cells Alive**

3. **Simple Animal Cell**

4. **The Biology Project**
   (Use the QuickTime version @ bottom of site.)

5. **Cell Division Bio-Clip** (This is the best one!)

6. **Mitosis Animation & Quiz** (Self-paced)

7. **Narrated animation & quiz** (Self-paced)
Ok, now let’s review
Draw interphase.
What phase is this?
Draw cytokinesis.
What phase is this?