Unit 2: Cellular Organization and Processes

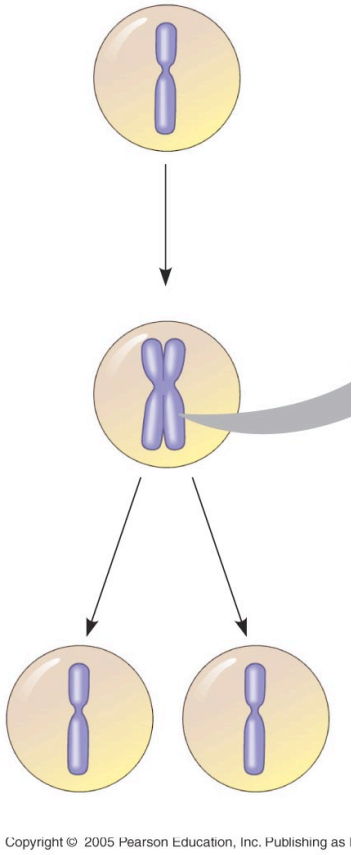
Section 2-6: The Cell Cycle
Book Reading: Chapter 12 pages 218-228

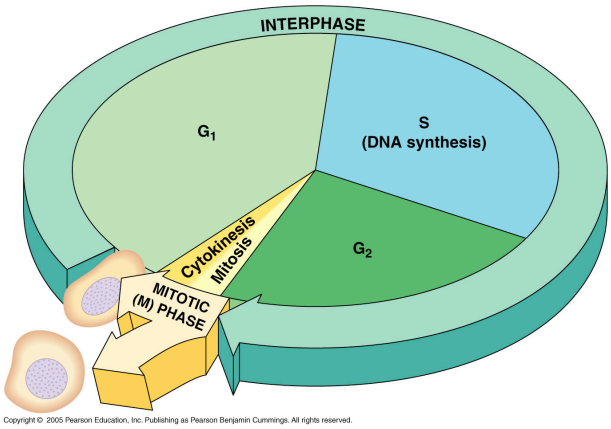
Key Aspects of Cell Division

- Three Functions of Cell Division
  - *list*
  -
  -

- The Outcome
  - *How many divisions?*
  - *How many cells? Are they different or identical?*
  - *Each cell in a human will have how many chromosomes after the division?*
  - *What kind(s) of cells undergo this process?*

- Chromosome Structure
  - Chromosome- *define*
  - Chromatin- *define*
  - Sister Chromatids- *define*
  - Centromere- *define*
  - Kinetichore- *define*





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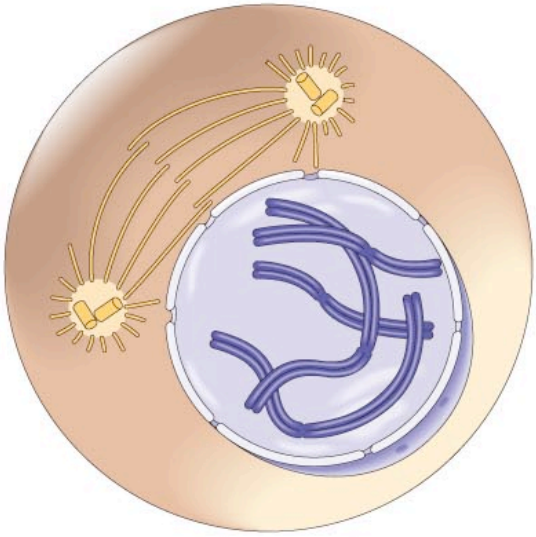
Phases of the Cell Cycle

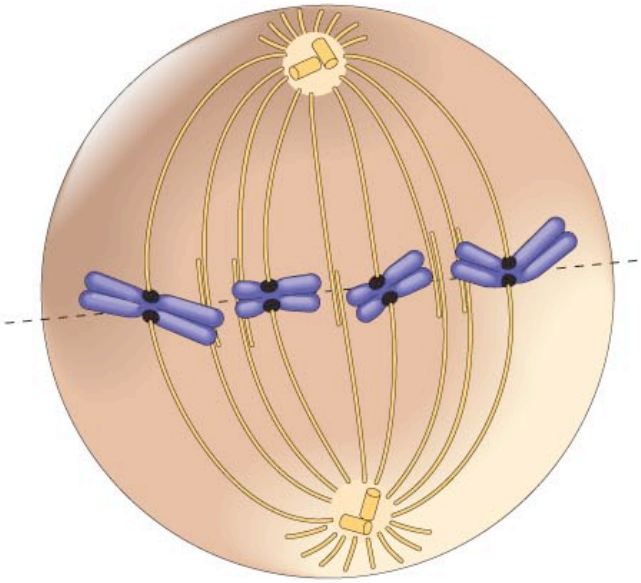
- *What is the cell cycle?*

- Interphase
  - G1 Phase
    - *What does it stand for?*
    - *What happens during this part of interphase?*
  - S Phase
    - *What does it stand for?*
    - *What happens during this part of interphase?*
  - G2 Phase
    - *What does it stand for?*
    - *What happens during this part of interphase?*
  - M Phase
    - *What does it stand for?*
    - *What happens during this part of interphase?*
    - Followed immediately by cytokenisis- *define*

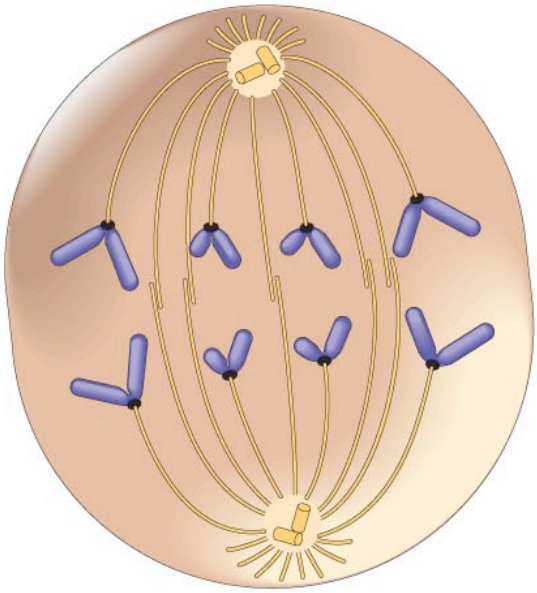
Mitosis- *define*



- ❖ Prophase
  - Chromatin condenses
  - Nuclear envelope begins to break down
  - Mitotic spindle begins to form
  - Centrosomes
    - *define*
    - *what happens to them?*
  - Microtubules attach to kinetichore or connect to microtubules from the other side

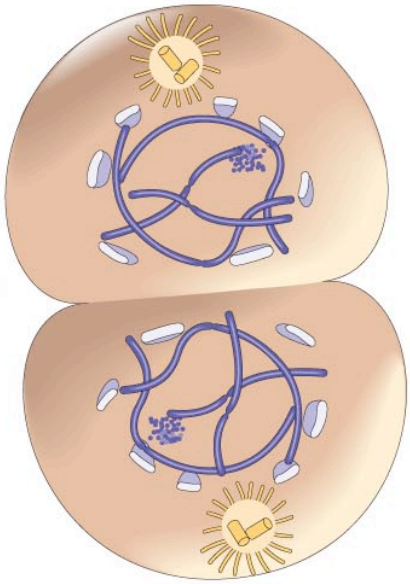


- ❖ Metaphase
  - Longest stage of mitosis
  - Centrosomes at opposite end of cell
  - Chromosomes line up on metaphase plate
  - Spindle- the whole microtubule apparatus



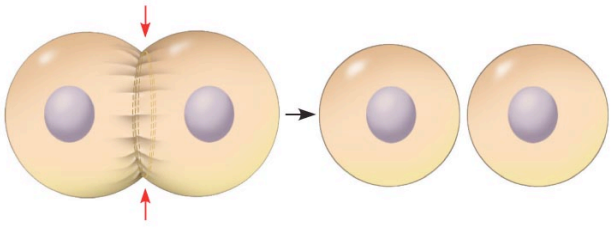
- ❖ Anaphase
  - Shortest phase of mitosis
  - Sister chromatids separate
    - Each sister chromatid is now an individual chromosome
    - Two chromosomes begin to move toward opposite ends of the cell
  - Cell elongates as nonkinetichore microtubules lengthen
    - by the end the two ends of the cell have equivalent and complete collections of chromosomes

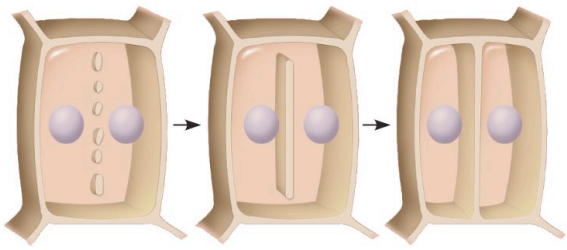
- Telophase
  - Nuclear envelope reforms
  - Chromosomes begin to condense
  - Marks the end of mitosis
  - Cytokenisis begins simultaneously with telophase



Cytokenisis- division of the cytoplasm

- Animal Cells
  - Cleavage- the process of the pinching in of the plasma membrane
  - Cleavage furrow- a shallow groove in the cell surface near the metaphase plate starts the process
  - Assisted by contractile proteins just inside the cell membrane
- Plant Cells
  - Vesicles from the golgi move toward the center of the cell carrying pieces for the building of a new cell wall
  - The vesicles eventually fuse, forming a cell plate
  - The membrane components of the vesicles become the new plasma membrane of the plant cell and the cell plate becomes the new cell wall

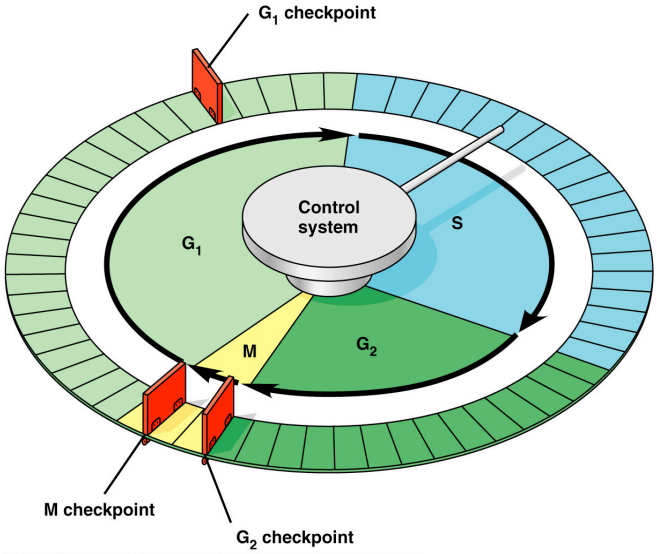




Regulation of the Cell Cycle

- ❖ Cell Cycle Control System
  - Cell Cycle Control System- *define*

  - Cyclin Dependent Kinases (Cdks)
    - Protein kinases that drive the cell cycle are present at a constant concentration but are mostly found in their inactive form
    - To be active, Cdks must be *in association with what?*
    - The concentration of cyclin inside the cell fluctuates, *what effect does this have on the activity of Cdks?*
  - MPF
    - M-phase promoting factor
    - *what two components does it consist of?*
    - When formed, the process moves forward



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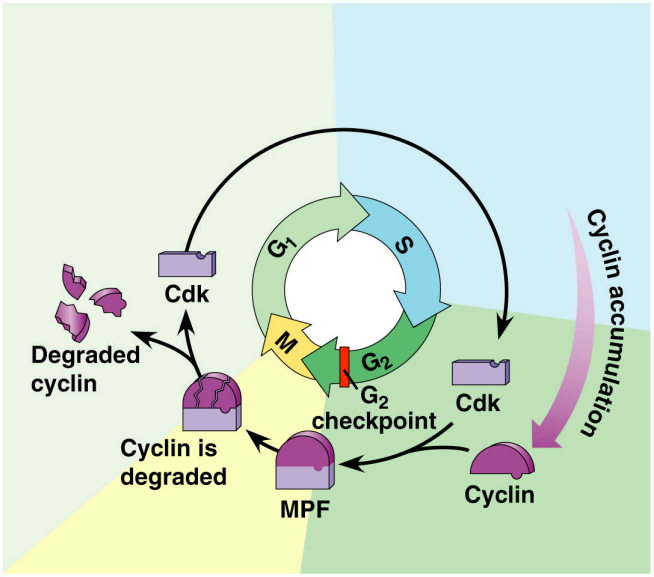

(b) Molecular mechanisms that help regulate the cell cycle

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- ❖ Checkpoints
  - *define*
  - May be *where do they come from? Are they internal external or both?*
  - Usually the cells stop at each checkpoint until a go signal is introduced
  - G1 Checkpoint in Mammals
    - Most important
    - If no go signal is received the cell will move into the G0 phase
      - The G0 phase is a *what is occurring during this phase?*
      - Cells in this phase include *what kinds of cells in our bodies are in this phase?*

  - Go Signals= growth factors- *define*

- Stop Signals
    - Density-dependent inhibition- *define*
    - Anchorage dependence- *define*

<u>Cancer</u>

- Characteristics of cancer cells
    - Do not respond normally to the control mechanisms
    - Divide excessively and invade other tissues
    - Do not stop dividing when growth factors are depleted
    - When they do stop dividing *do they do so at regular places?*

- Formation of Cancer Cells
    - Transformation- *define*
    - Transformed cells *are capable of doing what?*
    - The transformed cells then grow and produce a tumor- *define*

- Types of Tumors
    - Benign Tumor- *define*
    - Malignant Tumor
        - *define*
        - Metastasis- the spread of a malignant tumor from its original site
- Treatments
    - High-energy radiation
        - Used to treat *what kinds of tumors*
        - The radiation damages the tumor cells more than the damaged cells
    - Chemotherapy
        - Drugs that are toxic to *what cells and how are they administered?*

        - Has several side effects due to its interference with normally dividing cells