

Mitosis and the Cell Cycle

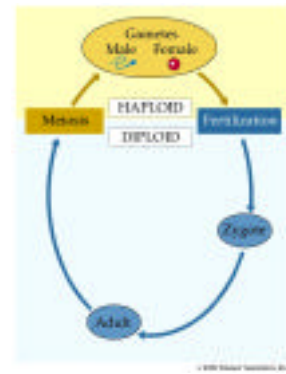
Haploid life cycle



Alternation of generations



Diploontic life cycle



Nucleus

- ✓ The length of DNA contained in one nucleus is ~2 meters or 2 million μm .
- ✓ Cell diameter is about 50 μm
- ✓ Nucleus has a diameter of 5 μm , it has a volume of $\sim 65.4 \mu\text{m}^3$.

Types of cell division

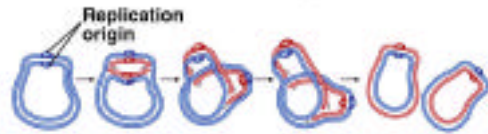
- ✓ Prokaryotes
 - Binary fission
 - Budding
 - Fragmentation
- ✓ Eukaryotes
 - Mitosis
 - Meiosis

Bacteria divide by binary fission



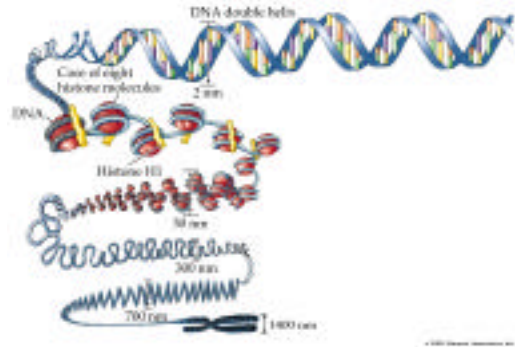
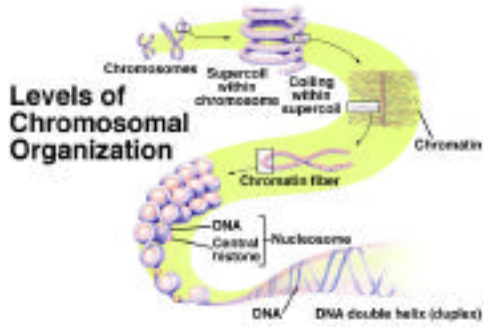
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Bacterial DNA Replication



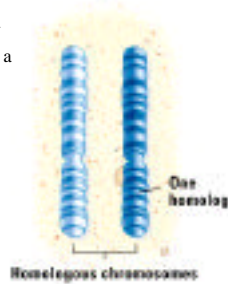
DNA is tightly wound in the nucleus

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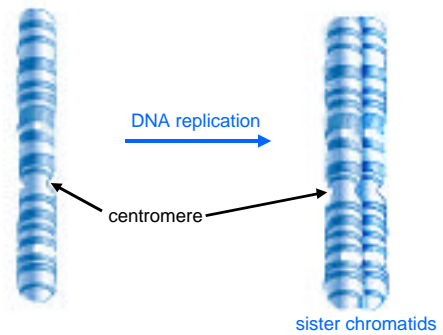
Chromosomes come in pairs

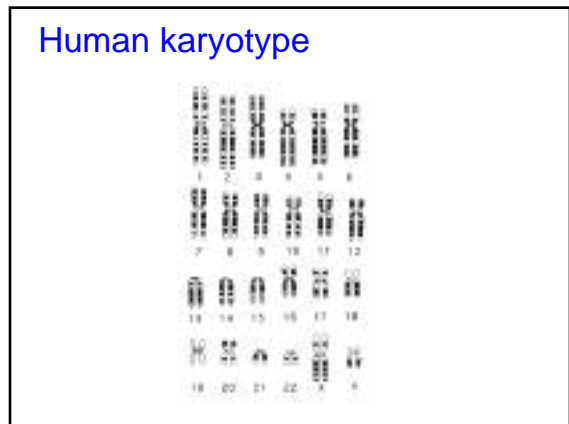
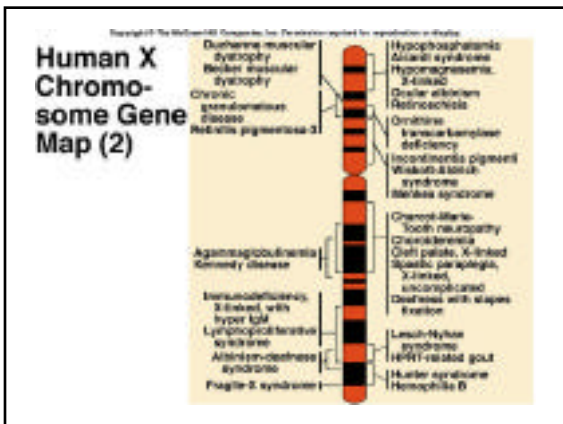
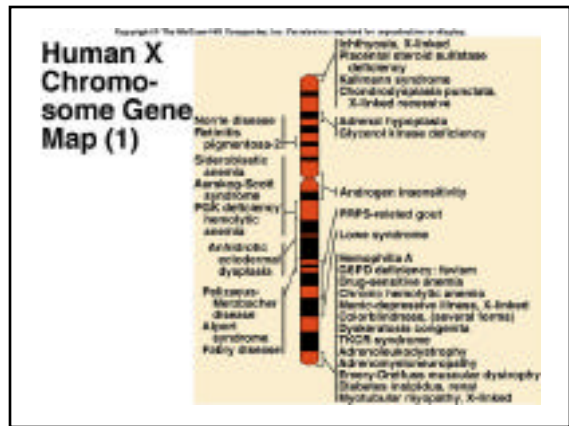
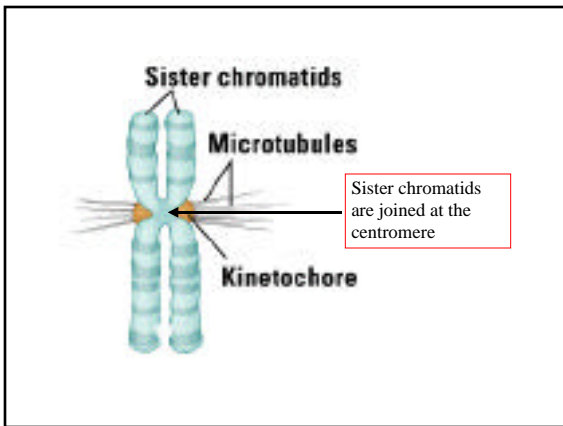
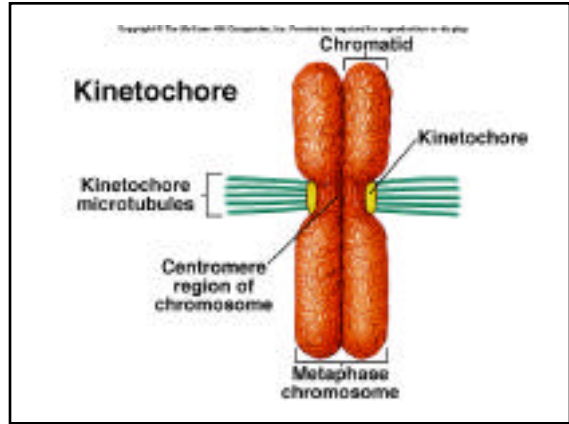
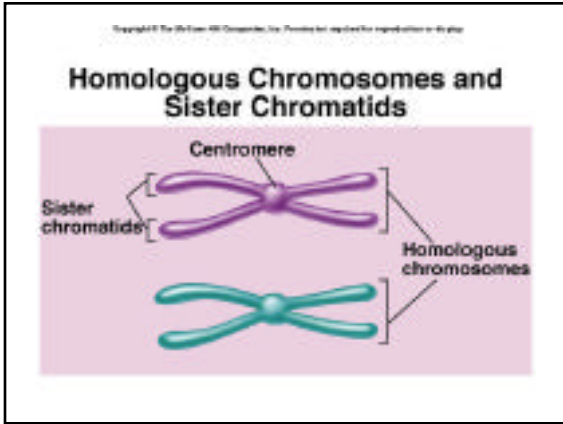
Each member of the pair is called a homolog.



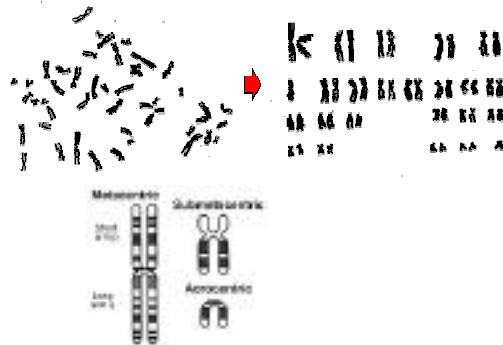
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DNA replication forms sister chromatids



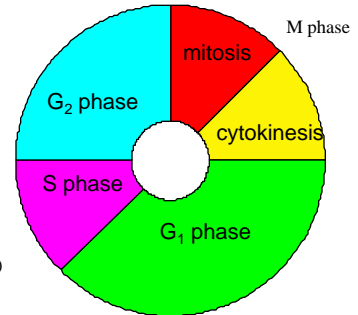


Making a karyotype

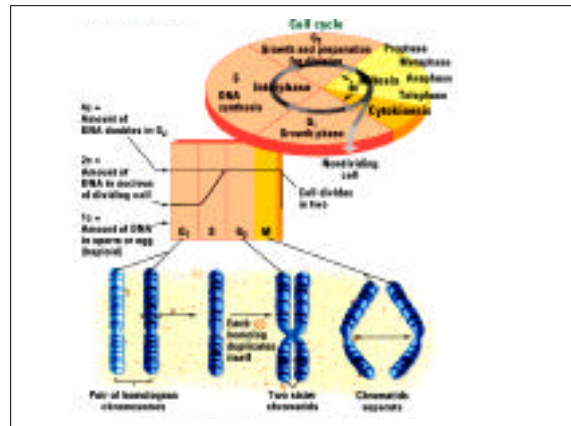
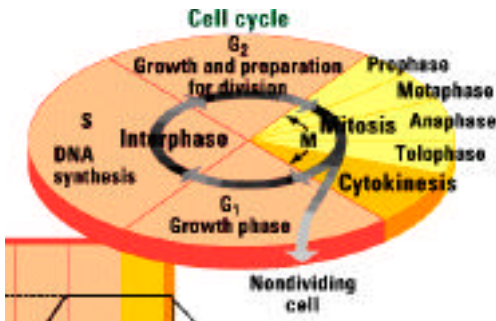


Eukaryotes: The Cell Cycle

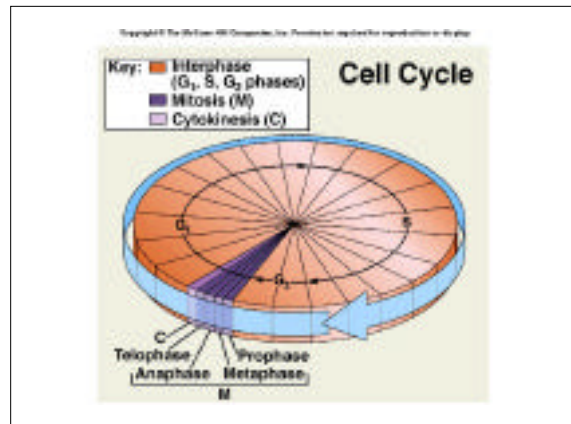
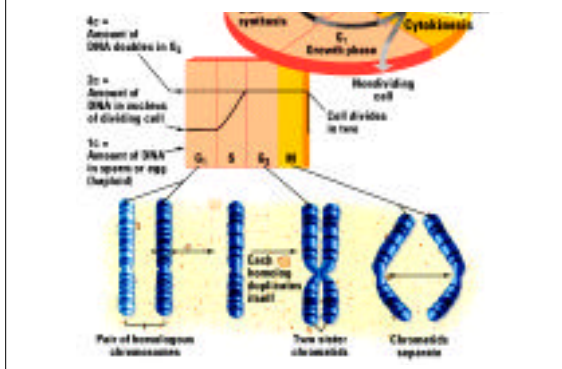
Mitosis - division of the nucleus
Cytokinesis - division of the cytoplasm and formation two separate plasma membranes
Interphase - DNA replicates and the cytoplasm is not dividing (G_1 , S, & G_2)

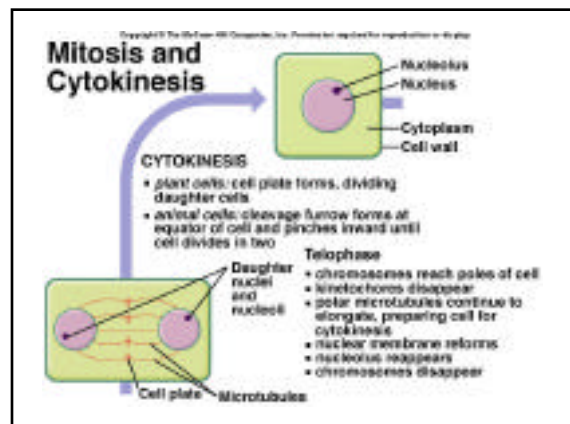
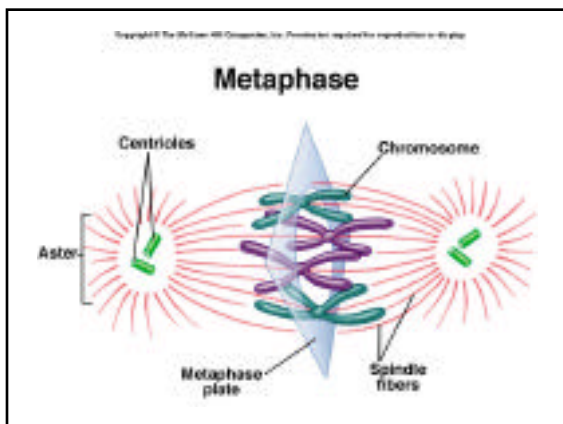
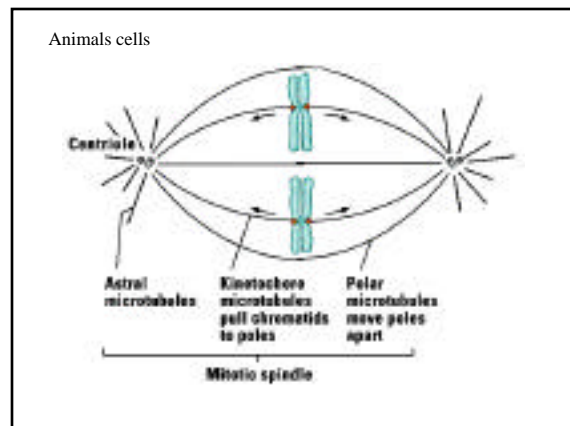
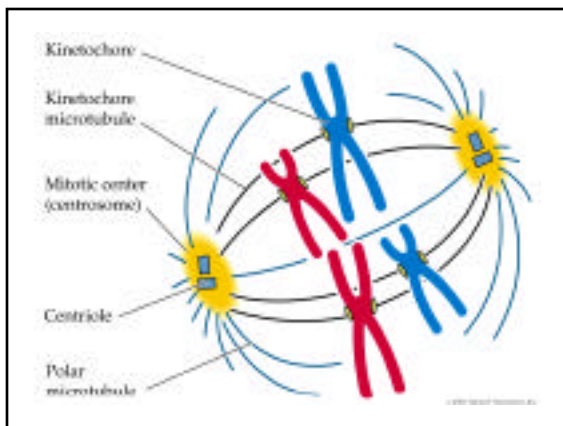
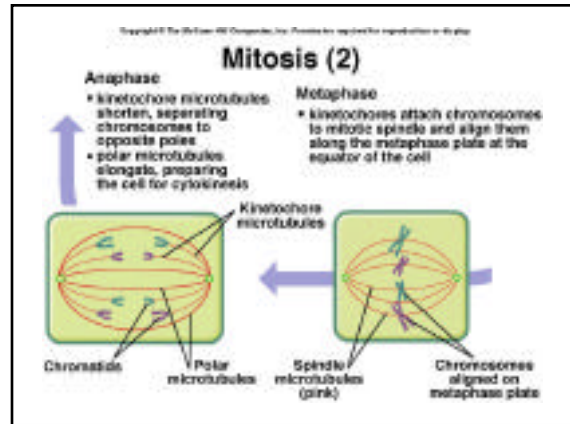
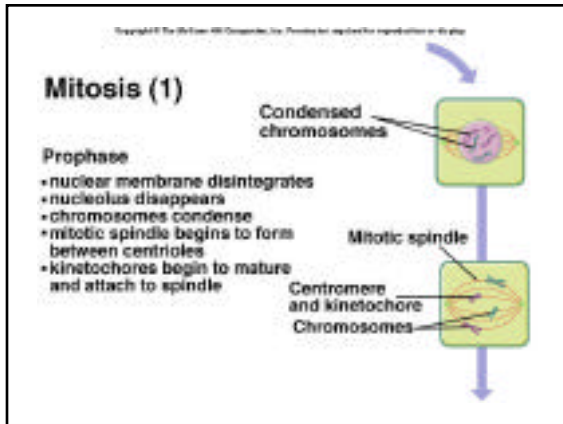


Eukaryotes: the cell cycle



The amount of DNA increases during the cell cycle



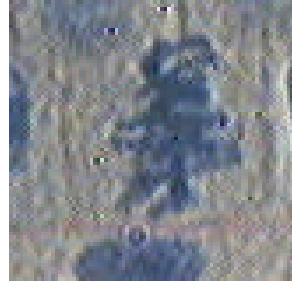


Prophase



Chromosomes form
Two chromatids
Mitotic spindle develops

Metaphase



Chromosomes align in
a single plane

Anaphase

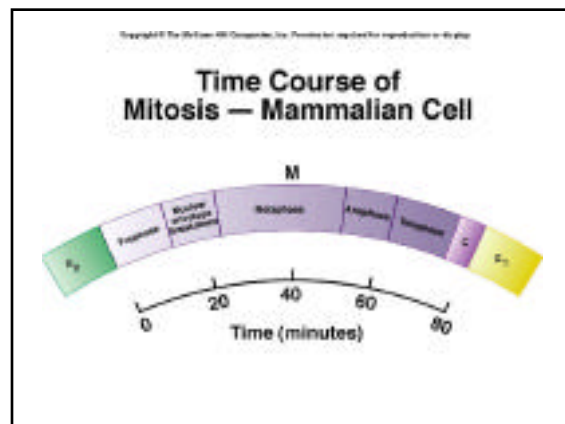
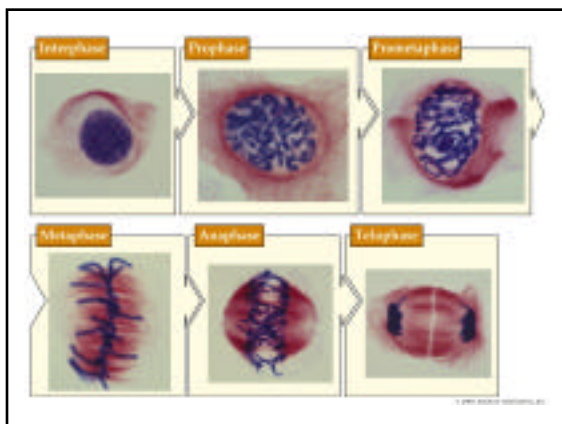


Chromatid separation

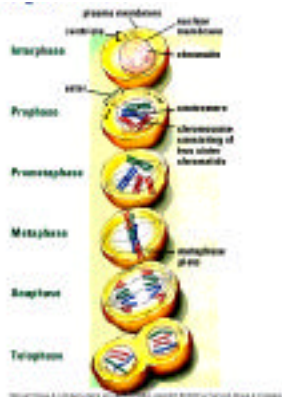
Telophase



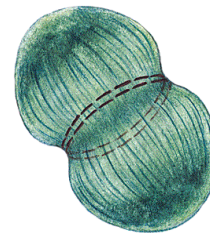
The mitotic apparatus disappears - includes kinetochore,
polar and astral microtubules



The stages of mitosis

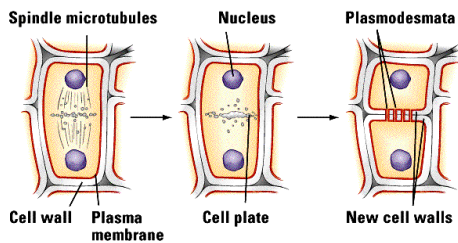


A contractile ring is formed in animal cells

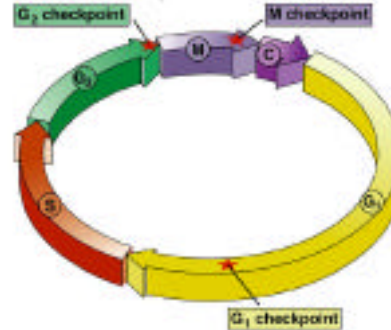


A bundle of actin filaments

A cell plate is formed in plant cells



Cell Cycle Control

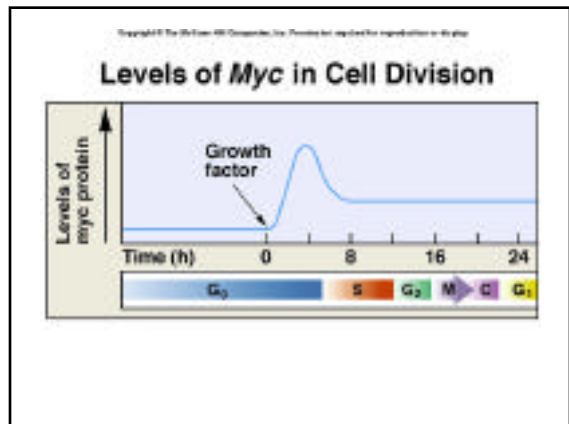
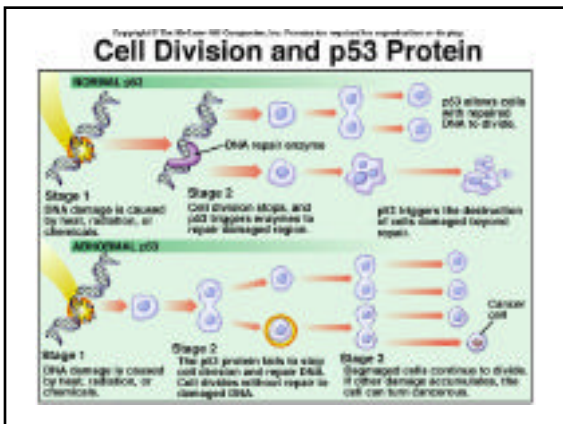
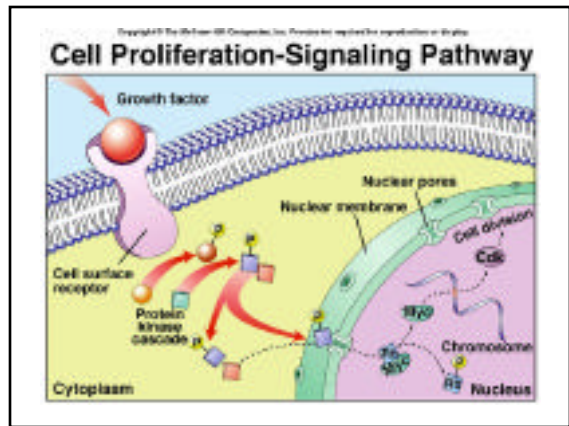
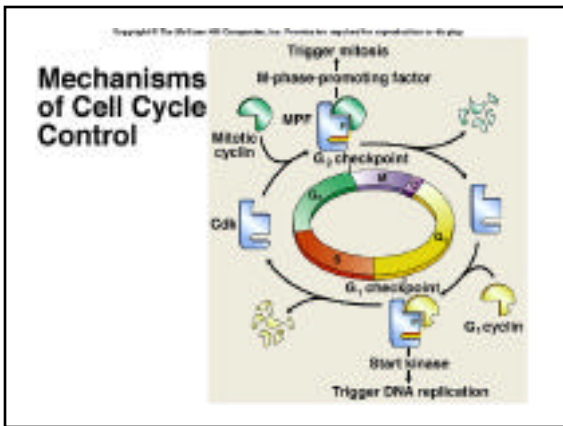
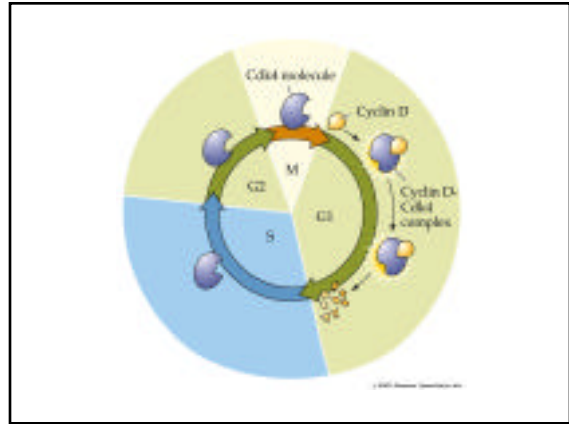
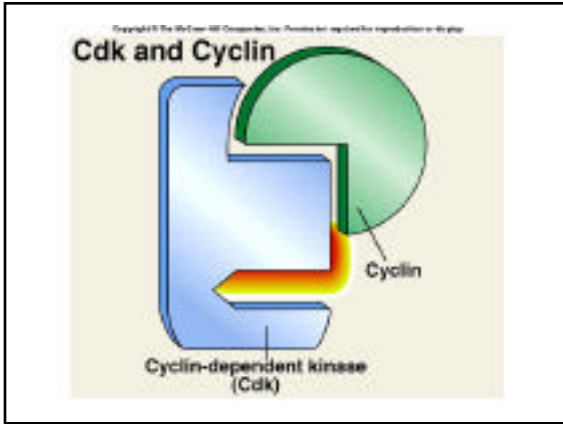


Cell Growth Checkpoint



Levels of specific proteins in the cell control mitosis

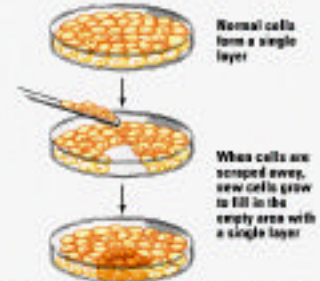
- ✓ M-phase Promoting Factor (MPF) triggers mitosis.
- ✓ Changing levels of cyclin and cyclin dependent kinase proteins determines cell division.



Regulation of the cell cycle

- ✓ Cell senescence
 - Limits the number of time the cell can divide
- ✓ Growth control
 - Contact inhibition

Cells regulate their division by means of contact inhibition



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Mutations and Cancer

