The cell cycle Notes

I. Overview of the Cell Cycle - the life of a cell
   A) 4 Stages:
      • Mitosis (M)
      • Gap 1 (G₁)
      • Synthesis (S)
      • Gap 2 (G₂)

   The cell cycle is an ordered set of events, culminating in cell growth and division into two
   • Cells are replaced via ________________.

   Mitosis in eukaryotes:
   B. Eukaryotic DNA is packaged into chromatin and then into chromosomes
      • The cell requires doubling of its (DNA) in S phase (synthesis phase) of the cell cycle;
      • And halving of that DNA during
      • DNA in eukaryotes is first condensed into a loose substance known as chromatin
      • Chromatin:
         – DNA is wound around special proteins =
         – DNA + HISTONES = NUCLEOSOME
         – The DNA Can
      • Right before cell division it is tightly packaged even more, into special structures = chromosomes

   Ordered process-
      • Histones: proteins that the DNA binds
      • Nucleosome: DNA + Histone
      • Chromatin: string of nucleosomes coiled to form a 30 nm diameter fiber
      • Chromosome =

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Chromosome number (n)
- Humans: n = 
- Chimpanzee: n = 24
- Horse: n = 32
- Sugar cane: n = 108
- Pea plant: n = 7

Haploid (n), Diploid (2n)
- Somatic cells (body cells) are
  - The cell contains
  - Homologous chromosomes
- Gametic cells (sex cells)

II. Mitosis
- Produces two______________________________

II. Mitosis
- __________________ that produces two nuclei ________________ to the parental nucleus, accompanied by cytokinesis (which produces identical elements in the cytoplasm)
- Involves the formation of_______________________, proper alignment of chromosomes and equal distribution of each copy into a new daughter cell
- Divided into 5 phases:
  - Prophase, prometaphase, metaphase,
- 2 centriole pairs form an axis of microtubules (__________ fibers) between them
- Centrioles migrate to opposite ends of the cell (the __________) forming the spindle apparatus, aster appears
- Microtubules grow from the poles toward the centromeres, connecting to ______________________

the mitotic spindle apparatus: microtubules that attach to chromosomes in order to properly

prophase
- chromatin condenses into ______________________
- polar microtubules extend from each spindle & overlap

prometaphase
- nucleoli disappear
- sister chromatids ______________________
- kinetochore microtubules attach to the chromosome
3) __________________________
• chromosomes _______________________________
__________________________________________
• the centromeres are aligned, and the sister chromatids of each chromosome straddle the metaphase plate

4) _____________________
• paired centromeres of each chromosome _________________
• each chromatid is now a chromosome and they begin to move to opposite poles of the cell
• poles of the cell move farther apart

telophase
• daughter nuclei form at the two poles of the cell
• chromosomes become less coiled and return to _________________ state
• _______________ occurs, pinching the cell in two…results into _________________________
III. How is the cell cycle regulated?

Cell cycle rate impacted by factors & changing conditions

- It is highly regulated by a molecular control system
- ______ in cell cycle act as critical control points where stop and go-ahead signals regulate the cycle
- Stop signal can be overcome by a go-ahead signal (make sure the cell is ready to go forward in the cycle)

signals responsible for cell cycle control:

External factors (size, nutrient availability, social signals)

Molecular controls
MPF
Protein kinases
Cyclins
enzymes that activate/inactivate other proteins by phosphorylating them are involved at these checkpoints.

Molecular control of Cell Cycle involve both “accelerator proteins” and “brake proteins”

cyclin combines w/ Cdk molecules to produce F’s at the checkpoints.
Cancer: out of control cell division due to:

IV. Binary Fission: Prokaryotes, Yeast & Amoeba