2 ways to count chromosomes

1. Karyotype
2. Amniocentesis

Wrapping of a chromosome

1. Histone
2. Nucleosome
3. Double helix

Mitosis checks

1. G1

**Also called the “restriction point” in mammalian cells.**

**Places cells in a non-dividing phase called the Go phase.**

**Most important checkpoint according to some.**

1. G2
   1. **Uses protein kinases to signal “go-ahead” for the G2 phase.**
   2. **Activated by a protein complex whose concentration changes over the cell cycle.**
2. G2
   1. **M-phase Promoting Factor.**
   2. **Protein complex required for a cell to progress from G2 to Mitosis.**
   3. **Role of MPF - to trigger a chain of protein kinase activations.**
3. MFP
   1. CDK
   2. **Protein Kinase.**
   3. **Amount remains constant during cycle.**
   4. **Inactive unless bound with cyclin.**
   5. Cyclin
      1. **Protein whose concentration builds up over G1, S and G2.**
      2. **When enough cyclin is present, active MPF is formed.**

Cancer

1. Uncontrolled growth when checks don’t work
2. Apoptosis- when cell gets too old or something goes wrong
3. Density dependent inhibition
   1. **The number of cells in an area force competition for nutrients, space, and growth factors .**

6 stages of mitosis

1. Prophase
   1. **Nucleoli disappear.**
   2. **Chromatin condenses into the chromosomes.**
   3. **Centrioles separate to opposite ends of the cell.**
   4. **Mitotic spindle begins to form.**
2. Prometaphase
   1. **Nuclear envelope dissolves.**
   2. **Spindle fibers join with the kinetochore of the centromeres.**
3. Metaphase
   1. **Centrioles now at opposite ends of the cell.**
   2. **Chromosomes line up on the metaphase plate.**
   3. **Spindle apparatus fully developed.**
4. Anaphase
   1. **Centromeres break and the duplicate chromosomes are pulled away from each other toward opposite ends of the cell.**
   2. **Cell elongates; poles move slightly further apart.**
   3. **Specialized regions of the centromeres where spindle microtubules attach.**
   4. **Structure on the chromosome**
   5. **Appear to “ratchet” the chromosome down the spindle fiber microtubule with a motor protein.**
   6. **Microtubules dissolve behind the kinetochore.**
   7. If interrupted, can prevent the cell from dividing with proper numbers of chromosomes
5. Telophase
   1. **Chromosomes uncoil back to chromatin.**
   2. **Nuclear envelope reforms.**
   3. **Nucleoli reappear.**
   4. **Spindle fibers disappear.**
   5. **Cytokinesis usually starts.**