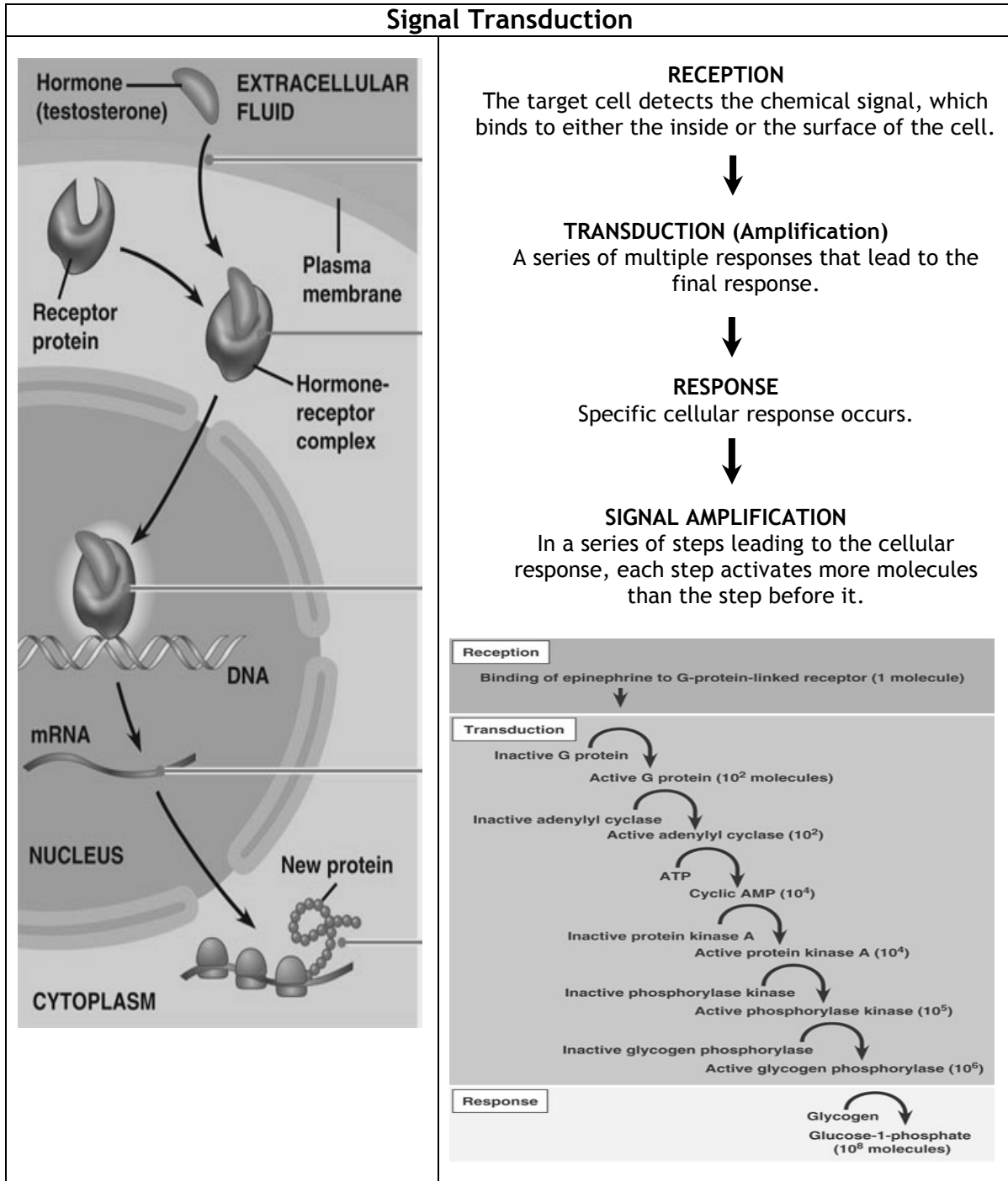


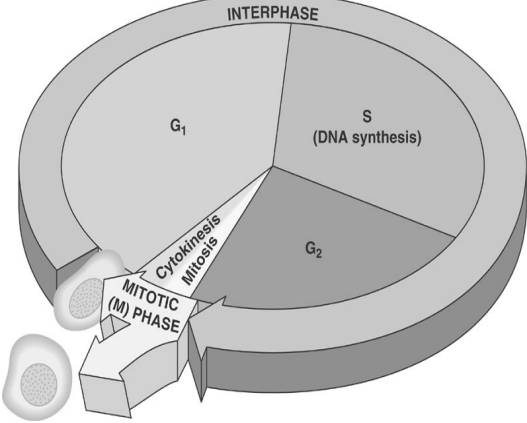
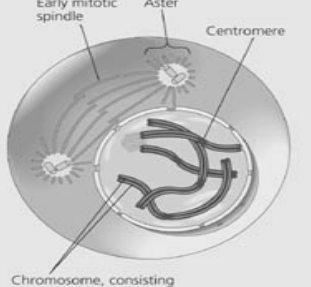
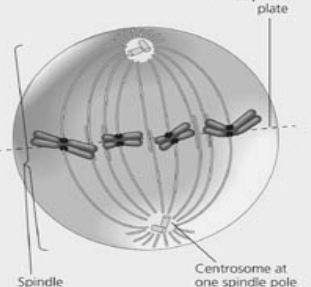
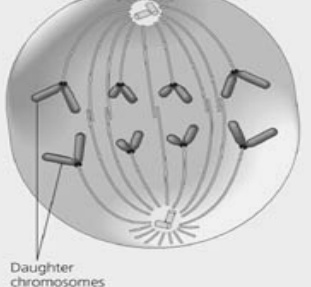
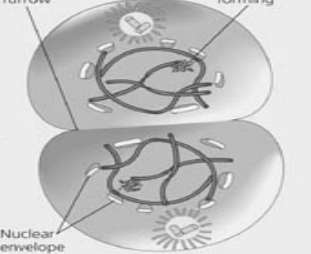
# Cell Cycle and Signal Transduction

~Biology AP~



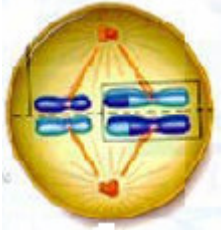



A Meridian® Study Guide by David Guan and Jennifer Zheng



# Cell Cycle

|   |  |
|---|--|
|    | <h2>INTERPHASE</h2> <ul style="list-style-type: none"> <li>• In the G1 phase, the cell carries out its regular processes such as protein synthesis and cellular respiration.</li> <li>• In the S phase, cellular processes continue to take place, with the addition of copying DNA.</li> <li>• The G2 phase is a continuation of the G1 phase.</li> <li>• The cell spends most of its cycle in Interphase.</li> </ul> |
| <h2>MITOSIS (M PHASE)</h2>  |  |
|   | <h2>PROPHASE</h2> <ul style="list-style-type: none"> <li>• Duplicated chromosomes become sister chromatids.</li> <li>• Mitotic spindle forms.</li> <li>• Centromeres move away from each other.</li> </ul>   |
|  | <h2>METAPHASE</h2> <ul style="list-style-type: none"> <li>• The longest stage of mitosis - lasting about 20 minutes.</li> <li>• Chromosomes line up at the metaphase plate, which is equidistant from each spindle pole.</li> </ul>  |
|  | <h2>ANAPHASE</h2> <ul style="list-style-type: none"> <li>• The shortest stage of mitosis - lasting only a few minutes.</li> <li>• Sister chromatids are pulled apart, as each becomes a separate chromosome.</li> <li>• Equal numbers of chromosomes gather at opposite ends of the cell.</li> </ul>   |
|  | <h2>TELOPHASE/CYTOKINESIS</h2> <ul style="list-style-type: none"> <li>• Two daughter cells being to form in the cell.</li> <li>• A cleavage furrow forms in animal cells, separating the two daughter cells.</li> </ul>  |

**Meiosis**  
process of forming haploid cells (gametes) from diploid cells

| Meiosis I   |             |  | Meiosis II   |              |   |
|---|-------------|--|--|--------------|---|
|    | Prophase I  | Each chromosome pairs with its homolog, cross over occurs, nuclear envelope breaks apart and spindle apparatus forms |    | Prophase II  | Nuclear envelope breaks apart and spindle apparatus begins to form.         |
|   | Metaphase I | Chromosomes line along metaphase plate, matching their homologous partner, and separation of homologous pairs start  |   | Metaphase II | Sister chromatids line up in the middle of the cell.                        |
|  | Anaphase I  | Separated homologous pairs move to opposite poles of cell.   |  | Anaphase II  | Sister chromatids split apart, becoming chromosomes, and pull toward poles. |

|  |                                     |  |  |                                      |  |
|--|-------------------------------------|--|--|--------------------------------------|--|
|  | <p>Telophase I,<br/>Cytokinesis</p> | <p>Nuclear membrane reforms, resulting in two new haploid cells.</p> |  | <p>Telephase II,<br/>Cytokinesis</p> | <p>Nuclei and nucleoli return. New daughter cells are divided.</p> |
|--|-------------------------------------|--|--|--------------------------------------|--|

- ❖ Recombination Concepts
  - If the genes are close to each other, the possibility of separating them is small
  - High combination frequency is the high possibility of separating two genes by crossing over
- ❖ Linkage Maps
  - A diagram that shows the order of genes given recombination possibilities
    1. Start by determining which genes are close together
    2. Determine position of genes close to the first gene
    3. Use information gathered in step 2 to find positions of other genes
  - think of it as a number line where the percentages are numbers on the number line

| Meiosis Problems  |   |  |  |
|---|---|--|--|
| <p style="text-align: center;">Nondisjunction</p> <p style="text-align: right;">gametes</p> | <p>Nondisjunction is when meiotic spindle causes tetrad chromosomes to not separate correctly during anaphase I or II</p> |  |  |
|   | Polyploidy  | <p>cells with more than two complete sets of chromosomes, which happens when a normal gamete fertilizes a gamete that has nondisjunction in all of its chromosomes</p> |  |
|   | Aneuploidy  | <p>abnormal chromosome number as a result of nondisjunction</p>  |  |
|   |   | Monosomic  | <p>cells that have one copy of a particular chromosome type; <math>2n-1</math></p> |
| Trisomic  | <p>cells that have three copies of a particular chromosome type; <math>2n+1</math></p>                                    |  |  |