OUTLINE 10
1. Meiosis and Sexual Reproduction
   A. Overview of sexual reproduction
      1. germ cells and somatic cells
      2. homologous chromosomes
   B. Overview of Meiosis
   C. Stages of meiosis
      1. meiosis 1
      2. meiosis 2
      3. Differences between meiosis and mitosis
   D. How sexual reproduction promotes genetic variation
      1. fertilization
      2. crossing-over
      3. independent assortment
Patterns of control of gene expression

Negative control - an active regulatory protein turns transcription OFF

**Induction** - signal molecule turns the operon on

**Repression** - signal molecule turns the operon off

Positive control - an active regulatory protein enhances the rate of transcription

**Induction** - signal molecule makes the regulatory protein active

**Repression** - signal molecule makes the regulatory protein inactive
Patterns of Inheritance

- twins
- sisters
- brothers
- father and son
- family
- mom and offspring
Human Female Karyotype
MEIOSIS I:
Separates homologous chromosomes

INTERPHASE

Prophase I

Centrosomes (with centriole pairs)

Chiasmata

Spindle

Chromatids

Tetrad

Metaphase I

Microtubule attached to kinetochore

Metaphase plate

Sister chromatids remain attached

Anaphase I

Sister chromatids remain attached

Homologous chromosomes separate

Chromosomes duplicate

Homologous chromosomes pair and exchange segments

Tetrads line up

Pairs of homologous chromosomes split up

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Fig. 13.7

**MEIOSIS II:**
Separates sister chromatids

**TELOPHASE I AND CYTOKINESIS**

**PROPHASE II**

**METAPHASE II**

**ANAPHASE II**

**TELOPHASE II AND CYTOKINESIS**

Cleavage furrow

Two haploid cells form; chromosomes are still double

During another round of cell division, the sister chromatids finally separate; four haploid daughter cells result, containing single chromosomes

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Fig. 13.8  Differences between mitosis and meiosis
Fig. 13.10 Crossing over
Fig. 13.9 Independent Assortment

Possibility 1

Two equally probable arrangements of chromosomes at metaphase I

Possibility 2

Metaphase II

Gametes

Combination 1  Combination 2

Combination 3  Combination 4