Learning Objectives (1 of 4)

2.1 Distinguish between genotype and phenotype and identify the different forms of genetic inheritance.

2.2 Describe the sex chromosomes and identify what makes them different from other chromosomes.

2.3 Explain how behavior geneticists use heritability estimates and concordance rates in their research.

2.4 Describe how the concept of epigenesis frames gene–environment interactions, and connect epigenesis to the concept of reaction range.
Learning Objectives (2 of 4)

2.5 Explain how the theory of genotype environment effects casts new light on the old nature–nurture debate.

2.6 Outline the process of meiosis in the formation of reproductive cells.

2.7 Describe the process of fertilization and conception.

2.8 List the major causes and treatments for infertility, and describe how infertility is viewed in different cultures.
2.9 Describe the structures that form during the germinal period.

2.10 Outline the major milestones of the embryonic period.

2.11 Describe the major milestones of the fetal period and identify when viability occurs.

2.12 Compare and contrast prenatal care in traditional cultures and developed countries.

2.13 Identify the major teratogens in developing countries and developed countries.
Learning Objectives (4 of 4)

2.14 Explain how chromosomal disorders occur.

2.15 Describe causes and symptoms of some common genetic disorders.

2.16 Describe the three main techniques of prenatal diagnosis.

2.17 Explain who is likely to seek genetic counseling and for what purpose.
Genetic Influences on Development
Chromosomes- There are 23 pairs of chromosomes with a total of 46.

DNA- The chromosomes are composed of complex molecules called DNA.

Gene- The DNA in the chromosome is organized into segments called GENES. These genes include hereditary information.

Genome- There are 23,000 genes in our 46 chromosomes which makes the total human genome.
Genetic Basics: Expression of Traits (2 of 3)

- **Genotype** – the totality of an individual’s genes (who we are)

- **Phenotype** – actual characteristics
  - This is what is seen or observed and can include a wide range of things
Genetic Basics: Expression of Traits (3 of 3)

- Dominant genes – Is a gene that is dominant.
- Recessive genes – Is a gene that is not common. It’s only evident when matched with another recessive gene.
- Allele – Several forms of a gene, usually arising through mutation, that are responsible for hereditary variations.
- Dominant–recessive inheritance – The dominant gene inherited by your parents influences the phenotype.
Table 2.1 Traits with Single-Gene Dominant–Recessive Inheritance

<table>
<thead>
<tr>
<th>Dominant</th>
<th>Recessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curly hair</td>
<td>Straight hair</td>
</tr>
<tr>
<td>Dark hair</td>
<td>Blonde hair</td>
</tr>
<tr>
<td>Facial dimples</td>
<td>No dimples</td>
</tr>
<tr>
<td>Normal hearing</td>
<td>Deafness (some forms)</td>
</tr>
<tr>
<td>Normal vision</td>
<td>Nearsighted vision</td>
</tr>
<tr>
<td>Freckles</td>
<td>No freckles</td>
</tr>
<tr>
<td>Unattached ear lobe</td>
<td>Attached ear lobe</td>
</tr>
<tr>
<td>Can roll tongue in U-shape</td>
<td>Cannot roll tongue in U-shape</td>
</tr>
</tbody>
</table>
Conception

• For conception to occur there must be a released ovum and a sperm

• Ovulation releases the ovum, and if sperm is available, fertilization can occur

• Ovulation occurs about 14 days into a woman’s cycle.
The two ovaries alternate ovulation in each monthly cycle.
Infertility Causes

• For men three main causes
  – Too few sperm
  – Quality of sperm
  – Low motility

• For women many causes
  – One is ovulation
Why does fertility decline after the mid-20s?
Infertility Treatments

• Many treatments utilize assisted reproductive technologies (ART)
  – Artificial insemination
    ▪ Injects sperm into woman’s uterus
  – Fertility drugs
    ▪ Mimic hormones involved in ovulation
  – In-vitro fertilization
    ▪ Ova removed and fertilized outside the womb then placed into uterus
Infertility Worldwide

• Cultural differences exist on how infertility is viewed

• In the West there may be a sense of sadness or loss as well as marital strain
  – About half of all couples say it has made marriage stronger

• Outside of the West, can be deeply stigmatizing, especially for women
Figure 2.7 Milestones of Prenatal Development
The Germinal Period (First 2 Weeks)

During the travel from the fallopian tube to the uterus cell division is taking place

- Blastocyst – ball of about 100 cells formed by 1 week after conception. It implants itself to the uterine wall.

- Trophoblast – outer layer of cell that will form structures that nourish and protect embryo
  - Amnion – fluid-filled membrane in the womb

- Embryonic disk – inner layer of cells which will form embryo

- Placenta- Is between the uterine wall and the disk.

- Umbilical cord- Is the cord that connects the embryo to the placenta. This is how the embryo receives nutrients.
The Embryonic Period: Weeks 3 to 8 (1 of 2)

• Key Developments
  – Embryonic layers
    ▪ Ectoderm – becomes skin, hair, nails, sensory organs, and the nervous system
    ▪ Mesoderm – becomes the muscles, bones, reproductive system, and the circulatory system
    ▪ Endoderm – becomes the digestive system and respiratory system
Key organs and structures are forming, including:

- Neural tube develops by week 3
- Eyes, nose, mouth, and heartbeat by week 4
- Buds that will be arms and legs start to develop in week 5
- Liver, digestive system, and heart’s separate chambers by week 8
The Fetal Period (Week 9 to Birth)

• The longest period of prenatal development
  – Genitals develop by month 3
  – Movement can be felt by month 4
  – Breathes, hiccups, and responds to sound by the end of month 6
  – Main impediment to viability is lung development