

- Genetic Engineering
 - Human Genome Project
 - The Human Genome Project is an international effort to map the entire human genome.
 - It has already revealed a great deal about the nature of genes and genetic variations.
 - Inheritance of harmful recessive genes and abnormalities of the chromosomes are major causes of serious developmental problems
 - Genetic Counseling
 - Results are an estimate of risk, not a guarantee that a disorder will or won't occur.
 - Genetic counseling and prenatal diagnosis help people at risk for transmitting hereditary disorders
 - Assess their chances of giving birth to a healthy baby
 - Provides facts. Recommended for :
 - Individuals with a close relative with a genetic condition
 - Women over 30 and men over 40
 - Couples with a history of infertility
 - Genetic Counseling Decision Tree for High-Risk Couples
 - Doesn't tell you what to do, but it takes you through the decision tree and helps you make the best decision for you
- Creation Connections: Main characters: Ovum and Sperm
 - Main characters:
 - 1. Ovum from ovaries travel into fallopian tubes.
 - 2. Sperm (produced in a male's testes).
 - 3. Intercourse → sperm travel through the cervix → fallopian tube.
 - 4. Possible results → fertilization
 - FYI: Sperm can remain viable for up to 6 days.
- Prenatal development
 - Divided into 3 periods

Period	Length	Key Events
Zygote (AKA Germinal)	2 weeks	Fertilization, cell differentiation, blastocyst (exo- and endoderm), implantation, start of placenta
Embryo (Embryonic)	6 weeks	Specialized layer of cells (endoderm), organs begin to develop, heart beats, primitive streak, neurogenesis, development of arms, legs, face, organs, and muscles
Fetus (Fetal)	30 weeks	"Growth and Finishing", brain development (neurons and CNS), learning

- Periods of Prenatal Development
 - The Germinal Period (0-2 weeks)
 - Overview: The Period of the Zygote

- From conception to attachment
 - Conception occurs in fallopian tubes
 - Cell differentiation and multiplication
 - After fertilization, cell mass drifts out of the fallopian tubes
 - Implantation:
 - it takes about 7-10 days for the zygote to imbed itself into the uterine wall (endometrium)
 - The process begins at the end of the first week and is completed by the end of the second week
 - ****Highly canalized****
 - 30% don't survive
 - 42% successfully implant in uterus
- Around the 4th-5th day, 60 to 70 cells exist, forming a hollow, fluid-filled ball called a blastocyst.
- At the end of 1st week --- differentiation
 - Occurs in the original stem cells
 - Embryo's cells have formed specialized layers
- Conception and Implantation
 - Outer layer cells will become support system:
 - Will become structures that enable the embryo to survive:
 - Ex- placenta
 - Placenta via umbilical cord
 - Provides nutrients and oxygen
 - Carries waste products away
- Blastocyst
 - Inner Cell_Mass/ Embryonic Disk will become embryo
 - With 3 specialized layers formed between 7-16 days
 - Outer layer: Ectoderm becomes external coverings
 - E.g., Skin, hair, sense organs, nervous system, epidermis, tooth enamel
 - Inner layer: Endoderm becomes digestive system, respiratory system and lungs, and glands
 - Middle layer: Mesoderm develops into muscles and bones, connective tissues, and circulatory system
 - Develops around 16 days
 - As development continues
 - Tiny finger like villi (blood vessels) form & burrow into uterine wall
 - Independent before, now gets nutrients
 - Allows developing organism to receive nutrients more efficiently
 - Placenta starts to develop connected to the developing organism by the umbilical cord
- The Embryonic Period (3-8 weeks)
 - Major organs develop & begin to function
 - Rate of cell differentiation intensifies
 - Support systems for cells form & organs appear

- Each organ system has its own program for development (Heart first, Lungs last)
 - Each system's development follows a particular sequence. Different parts develop on different days...
 - Day 31 shoulders, arms, and hands develop
 - Day 33 fingers develop
 - Day 34-36 thumb is complete
 - Primitive streak appears
 - Thin line down the center of the embryo which becomes the central nervous system (CNS)
 - Heart is first organ to function
 - Circulates blood to the placenta & throughout body by end of 3rd week
 - By end of 1st month
 - Ears, nose, & mouth begin to form
 - Arms & legs make appearance as buds
 - Fingers & toes become defined
 - Internal organs rapidly developing
 - Stomach produces digestive juices
 - Kidneys filter blood
 - During this time of extremely rapid growth, organism is most vulnerable to environmental insult
 - Neurogenesis: the production of nerve cells (neurons) begins.
 - Almost all of the neurons in the brain are generated prenatally.
 - By the end-between 1-2" long
 - All major organ systems have formed
- The Fetal Period (9 weeks-birth)
- Sex organs develop
 - Brain development is significant
 - Age of viability occurs around 22 weeks
 - Age of viability is the age at which a preterm newborn might survive
 - Weight plays a crucial role
 - Only 20% under 1.5 pounds survive
 - By 28 weeks, survival rate is 95%
 - The Fetus: Week Eight to Birth
 - Size of fetus increases twentyfold
 - Brain development
 - Some neurons die off as others make new connections
 - CNS becomes active and responsive in mid pregnancy
 - Fetal activity random at first (spontaneous movements) begin at about 4 months
 - Prenatal behavior/activity shapes further brain development
 - Fetus' brain sending signals to muscles and muscles are responding.
 - Ex- 6 month breathing amniotic fluid, sleep/wake cycles, crying when distressed
 - Learning (around 7-8 months)
 - Fetuses recognize repeated, familiar sounds
 - 37 weeks heart rate slowed—(↑ attention) when read to