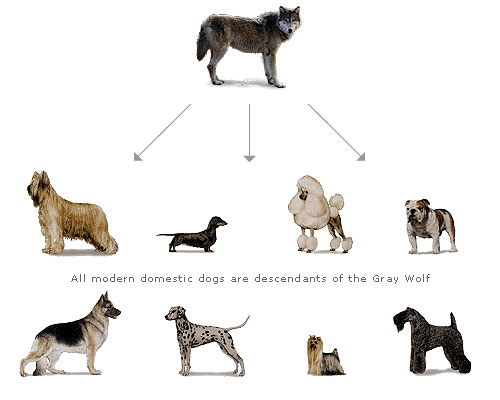
**6.1 Meiosis and Sexual Reproduction.**

**Meiosis.**

* Meiosis is an important aspect

of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Sexual reproduction, through the shuffling

of DNA, produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* This variation offspring produces individuals

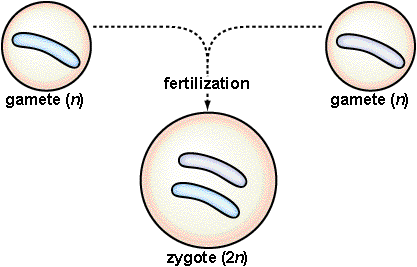
that may have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ over one another.

* “\_\_\_\_\_\_\_\_\_\_\_\_” is derived from the Greek word \_\_\_\_\_\_\_\_\_\_\_, which means to **reduce.**
* The process of meiosis results in the production of special cells called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Cell division occurs twice in meiosis: once at the end of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and again in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The process of meiosis shuffles genetic information and results in

variation in \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Role of Gametes.**

* Normal body cells have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosome

number, meaning chromosomes occur in \_\_\_\_\_\_\_\_\_\_\_\_.

* In humans, the male and female each contribute

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

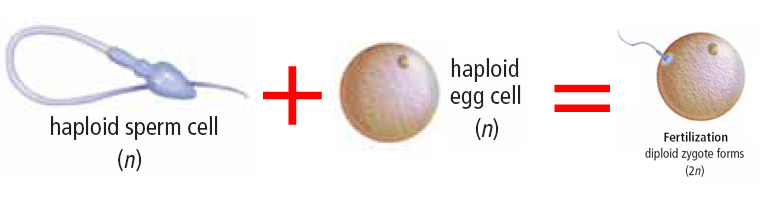
* When \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ takes place:

\_\_\_\_\_\_\_\_\_\_\_+\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

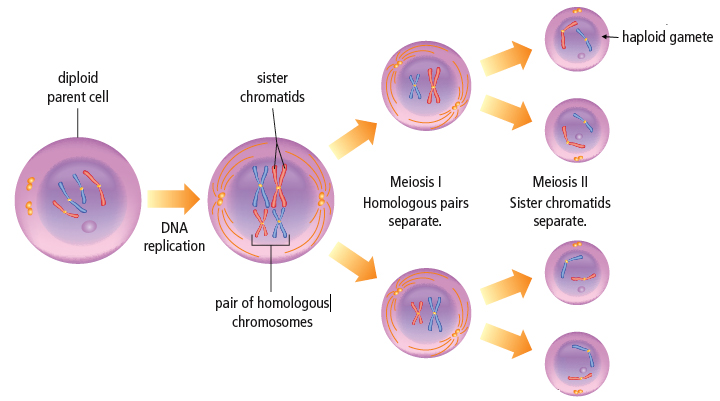
* The zygote goes on to develop into an embryo,

and on into a complete individual. When the time comes, the cycle \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Humans produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (either egg or sperm) that have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the normal number of chromosomes.

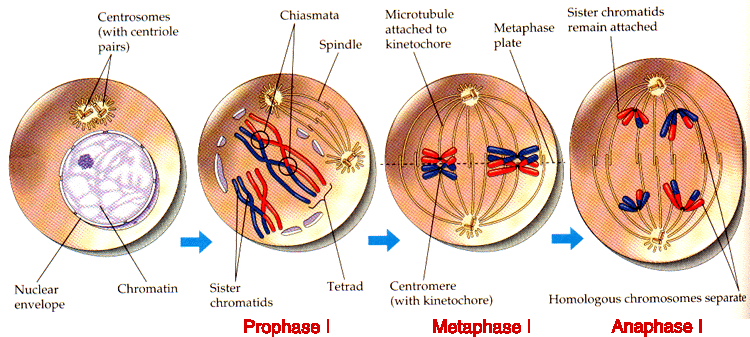


**Meiosis.**

* Meiosis produces gametes with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ compared to body cells: 

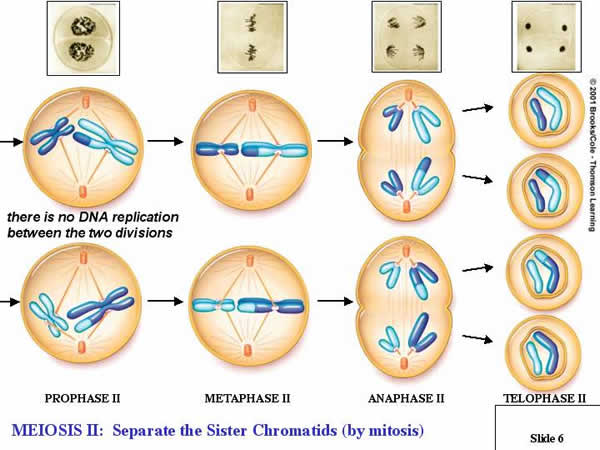
**Meiosis I.**

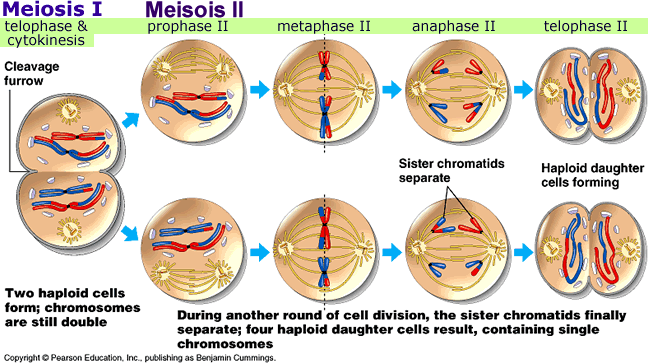
* During meiosis I, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ move to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cell.
* Meiosis I differs from mitosis because in meiosis I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lines up along the equator during metaphase.
* These matching chromosomes are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ result from meiosis I.



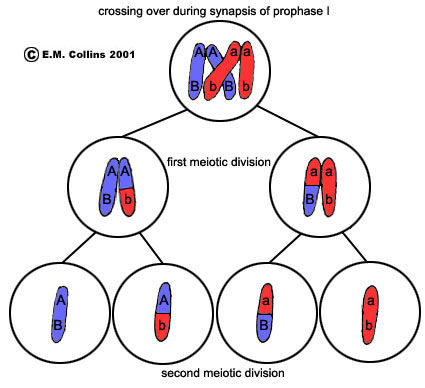
**Meiosis II.**

* DNA is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ again before meiosis II begins.
* Meiosis II is like mitosis because in both processes the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of each chromosome are pulled to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Each daughter cell inherits one chromatid from each chromosome resulting in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each with \_\_\_\_\_\_\_\_\_\_\_ the N of chromosomes.





**Crossing Over.**

* Crossing over is important for the

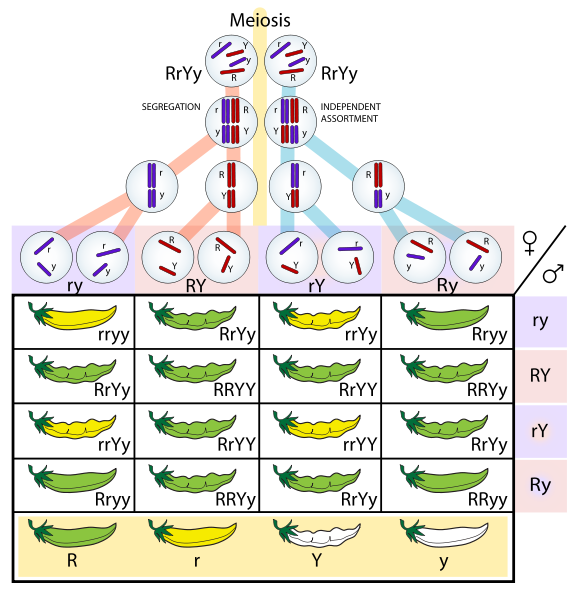
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Crossing over creates an infinite number

of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Independent Assortment.**

* During meiosis I another event called “independent assortment” occurs which also leads to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in species.
* For each of the 23 homologous pairs there are \_\_\_\_\_\_\_\_\_ possibilities for how chromosomes will sort themselves into daughter cells.
* There are more than 8 million combinations possible for the 23 pairs in any egg or sperm cell.
* 70 trillion different zygotes are possible from one sperm and one egg cell.



**Gamete Formation.**

* In males, all \_\_\_\_\_\_\_\_\_\_\_\_ resulting from meiosis develop into sperm.
* In females, \_\_\_\_\_\_\_\_\_\_\_\_\_ gets most of the cytoplasm and becomes the egg.

**Chromosome Mutations.**

* Sometimes changes in the organization of DNA and genes happen when pieces of chromosomes are \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ within the chromosome.
* They may affect the genes that are responsible for making certain proteins in the cell.
* Chromosome changes can be cause by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ such as radiation or chemicals.

**Genetic Disorders.**

* Geneticists can get a picture of individuals by

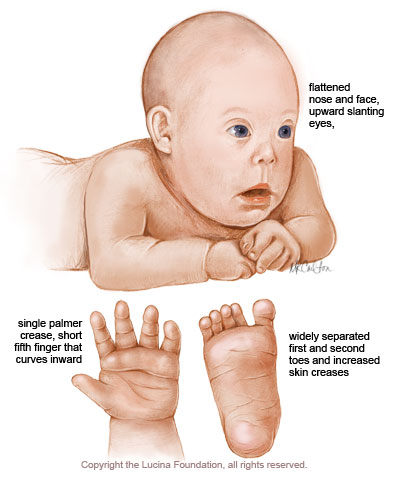
looking at a person’s chromosomes.

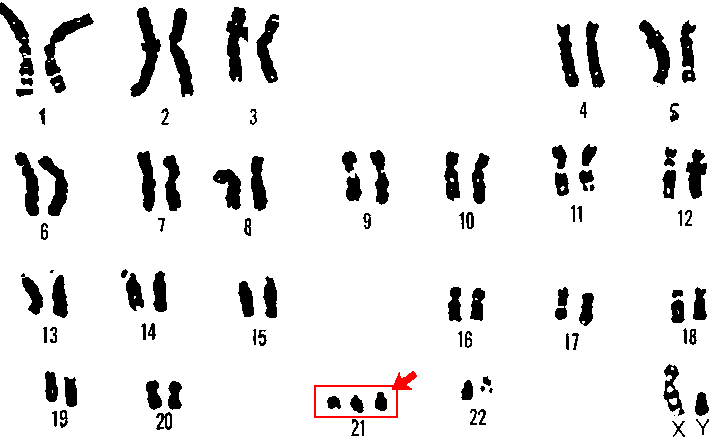
* This is called a person's “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”
* Chromosomes are identified and paired by size,

centromere location and banding patterns.

* By analyzing karyotypes, geneticists can determine

when a whole chromosome mutation has occurred.

* Treatment of these disorders or “syndromes” can then take place. A good example of this is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which occurs when a person has an extra \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**6.2** **Sexual Reproduction.**

Sexual reproduction brings non-identical gametes together to form a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - it occurs in \_\_\_\_\_\_\_\_ stages:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - the process by which gametes are brought together at same place and same time
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - process by which egg and sperm join to form a new organism
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the process by which an organism develops as an embryo

**Methods of Fertilization.**

* External or Internal Fertilization

In order for either of these methods to produce a successfully developing embryo, certain conditions must be met:

1. Embryo must have enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ must not be too cold or too hot.
3. There must be enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so that embryo does not dry out.
4. Embryo must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from predators and items in environment that can potentially harm it.

**External Fertilization**

Inexternal fertilization, sperm and egg join\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Advantages
* Very little \_\_\_\_\_\_\_\_\_\_\_\_\_\_ required to mate

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of offspring produced

* Offspring can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

in the environment - less competition between

each other and parents

* Disadvantages
* Many gametes will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Many eggs will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Offspring are often \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by parents, so many of them die

**Internal Fertilization.**

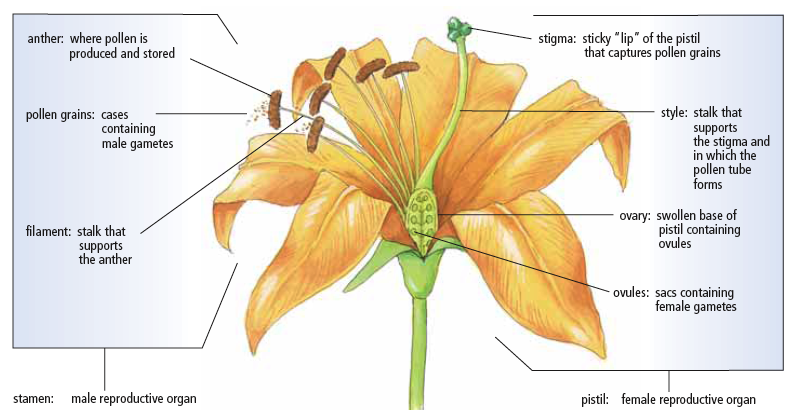
In internal fertilization, sperm and egg join \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, embryo is nourished inside mother.

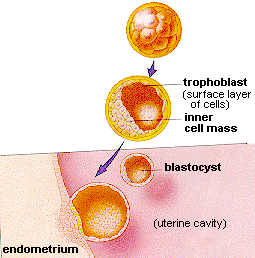
* Advantages
* Embryo \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from predators
* Offspring more likely to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, as

many species will protect their young while they mature

* Disadvantages
* Much \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ required to find mate
* Fewer zygotes produced, resulting in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* More energy required to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for offspring

**Pollination.**

* Most plants transfer male gametes as \_\_\_\_\_\_\_\_\_\_\_\_. Pollen can be carried by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**The Human Reproductive System.**

* Fertilization
  + Occurs in the top one third of the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* + Once ovulated, the egg is only viable for about

\_\_\_\_\_\_\_\_\_ hours if not fertilized.

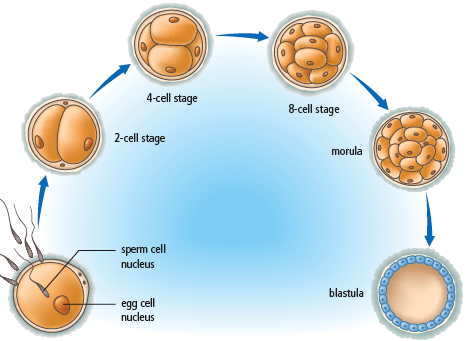
* Implantation and Pregnancy
  + After fertilization, the zygote continues to move

down the fallopian tube.

* + As it does, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ begins.
  + It takes the embryo \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ days to

get to the uterus and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the endometrium.

**Embryonic Development.**

* ****Embryonic development is the early development of an organism - in humans, it is the first \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ after fertilization.
* **Stages**
  + End of the first week - ball of cells

called **\_\_\_\_\_\_\_\_\_\_\_\_\_.**

* + By end of second week it is a hollow

ball called a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

* + Cells at this stage are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

and have the ability to develop into

any kind of cell.

* + In the next stage the embryo is known as a

**\_\_\_\_\_\_\_\_\_\_\_\_\_** and develops 3 layers:

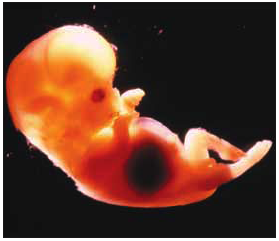
1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (skin, nerves)
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (muscles, bones)
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (lungs, liver, digestive system lining)

* Period of the Embryo
  + For the first three months, organogenesis

occurs and it is termed an embryo.

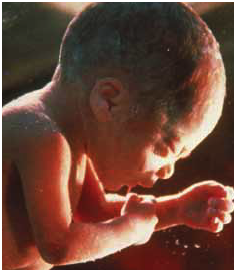
* + This is a 6 week embryo.

**Fetal Development.**

* ****The cell layers now differentiate into the organs and tissues of a baby - this is divided into 3 trimesters:

**First Trimester (0-12 weeks)**

* Organ systems begin to develop  
  and form. Bone cells form.

 **Second Trimester (12-24 weeks)**

* Rapid growth from 12-16 weeks.

**Third Trimester (24+ weeks)**

* Continued growth, especially of brain.
* Fat begins to deposit at 32 weeks to keep baby warm.
* Period of the Fetus
  + During the second trimester, \_\_\_\_\_\_\_\_\_ declines and the

placenta secretes its own \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* + This is the period of the fetus marked

by growth of all the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* + This is a 4 month fetus.
* Period of the Baby
  + The third trimester, period of the baby,

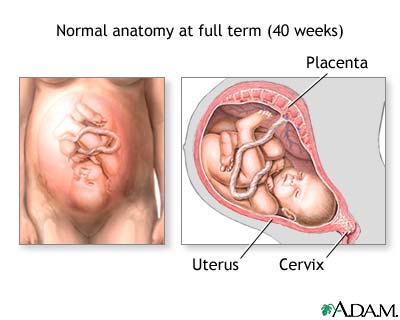
is marked by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of all \_\_\_\_\_\_\_\_\_\_\_\_

and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

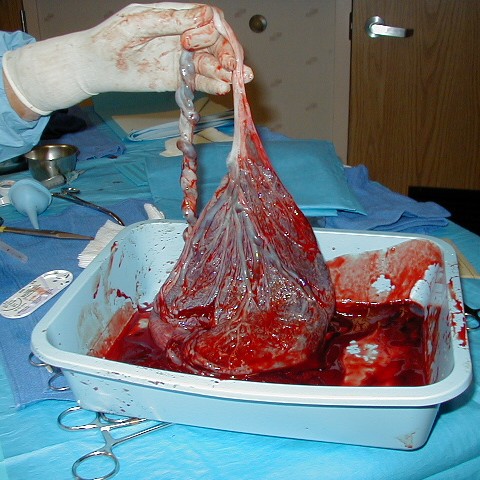
* + The baby is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

outside the womb during this period.

* Labor
  + Secretions of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from

the posterior pituitary cause the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to contract and open.

* + When dilated to \_\_\_\_\_\_\_\_, the next phase begins.
* Birth of the Baby
  + Typically delivered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Delivery of the Afterbirth
  + About half hour after the baby is born,

the uterus contracts again to expel

the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and membranes.

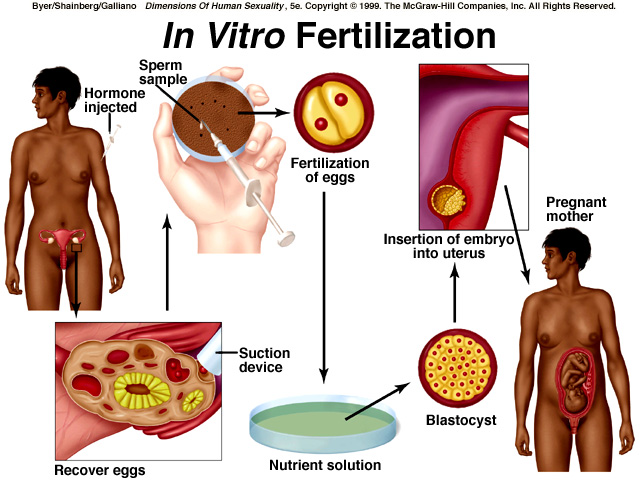
* + The uterus then contracts tightly to

seal off all the broken capillaries.

**6.3 Assisted Reproduction Technologies.**

* Many couples can be infertile due to complications related to the reproductive system. It could be a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (chemical imbalance).
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the inability of a couple to have a baby.
* Assisted reproductive technologies involve removing eggs from the woman, fertilizing them, and returning them to the uterus.
* Reproductive technologies help childless couples, but carry a higher risk of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Also creates the problem of “\_\_\_\_\_\_\_\_\_\_\_\_\_\_” \_\_\_\_\_\_\_\_\_\_\_\_\_\_. What should be done with them?

**Types of Assisted Reproductive Technologies.**

* Artificial Insemination.
* Donor sperm is collected and placed in the female.
* First developed for animals more than 200 years ago.
* Used with much success in humans when there are not enough sperm produced by males and sperm can be concentrated.
* Many couples may receive donated sperm from sperm banks.
* In Vitro Fertilization (IVF).
* Egg and sperm are collected and fertilization takes place in a dish. Embryo(s) then placed in female’s uterus.
* “In vitro” means “in glass” referring to technology using petri dishes.
* Used with females with blocked fallopian tubes.
* Eggs and sperm are combined and after about 4 days the developing embryo is implanted into the female.
* Gamete Intrafallopian Transfer (GIFT)
* Eggs and sperm are collected, mixed, then injected into the woman’s fallopian tubes.
* The mixture of sperm and eggs are immediately injected into the woman’s fallopian tubes so fertilization takes place inside the woman.
* Intracytoplasmic Sperm Injection (ICSI)
* A single sperm is injected directly into an egg.
* This is done using very high tech equipment and is used when a male has a severe fertility problem with a very low sperm count.

**Impact of Reproductive Technologies.**

* Positive Impact
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ who would not otherwise be able to have children
* Improves \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Frozen embryos can be used in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Elimination of embryos that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is possible
* Negative Impact
* Data shows \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ due to IVF
* Many more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Question of who \_\_\_\_\_\_\_\_\_ these embryos
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of information
* Surrogate mothers may \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Embryos getting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_