

## TOPIC FOUR: Reproduction

### A. Asexual reproduction

1. Advantages: faster, easier
2. Disadvantage: no variety; offspring are the same as parent

### B. Sexual reproduction

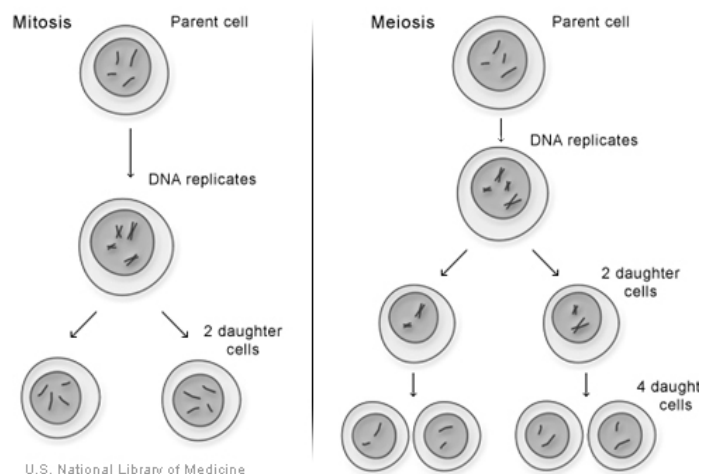
1. Advantage: variety due to recombination of genes
2. Disadvantage: more time, effort and risk

### C. Mitosis

1. Used in all forms of asexual reproduction.
2. The number and types of chromosomes in the daughter cells are **the same** as in the parent cell.
3. Large organisms use mitosis for growth and healing. Simple organisms use it to reproduce.
4. One division of a cell into two identical, diploid ( $2n$ ) cells.

### D. Meiosis

1. Makes gametes used in sexual reproduction.
2. One cell divides twice to make four DIFFERENT haploid ( $1n$ ) cells.
  - a. Separates pairs of **homologous chromosomes** so that offspring get one chromosome of each pair from a different parent.
  - b. Each daughter cell (gamete) gets only **one half** of the chromosomes of the *parent* cell.



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#### Mitosis vs. Meiosis

Notice the number of chromosomes stays the same in mitosis, and is halved in meiosis.

### E. Male Reproductive System

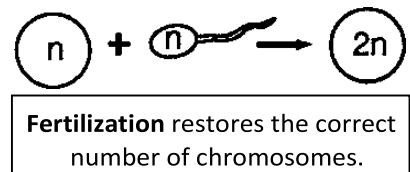
1. Testes produce and store sperm.
2. **Testosterone** is the male sex hormone and is made in the testes.

## F. Female Reproductive System

1. **Ovaries** produce eggs.
2. **The menstrual cycle** lasts 28 days (on average).
  - a. **Ovulation** – release of an egg (typically 1 per cycle).
  - b. **Menstruation** – shedding of the uterine wall.
  - c. If pregnancy occurs, the menstrual cycle will temporarily stop.
3. **The fallopian tube** carries the egg to the **uterus**.
4. The **uterus** is the womb where the baby will develop.
5. The **vagina** is the birth canal where the baby will leave the body.

## G. Fertilization occurs in the fallopian tube (oviduct).

1. A fertilized egg is called a **zygote**.
2. Fertilization restores the complete set of chromosomes, so the zygote is diploid (1n from the egg + 1n from the sperm = 2n).



## H. A zygote develops into an **embryo** and then into a **fetus**.

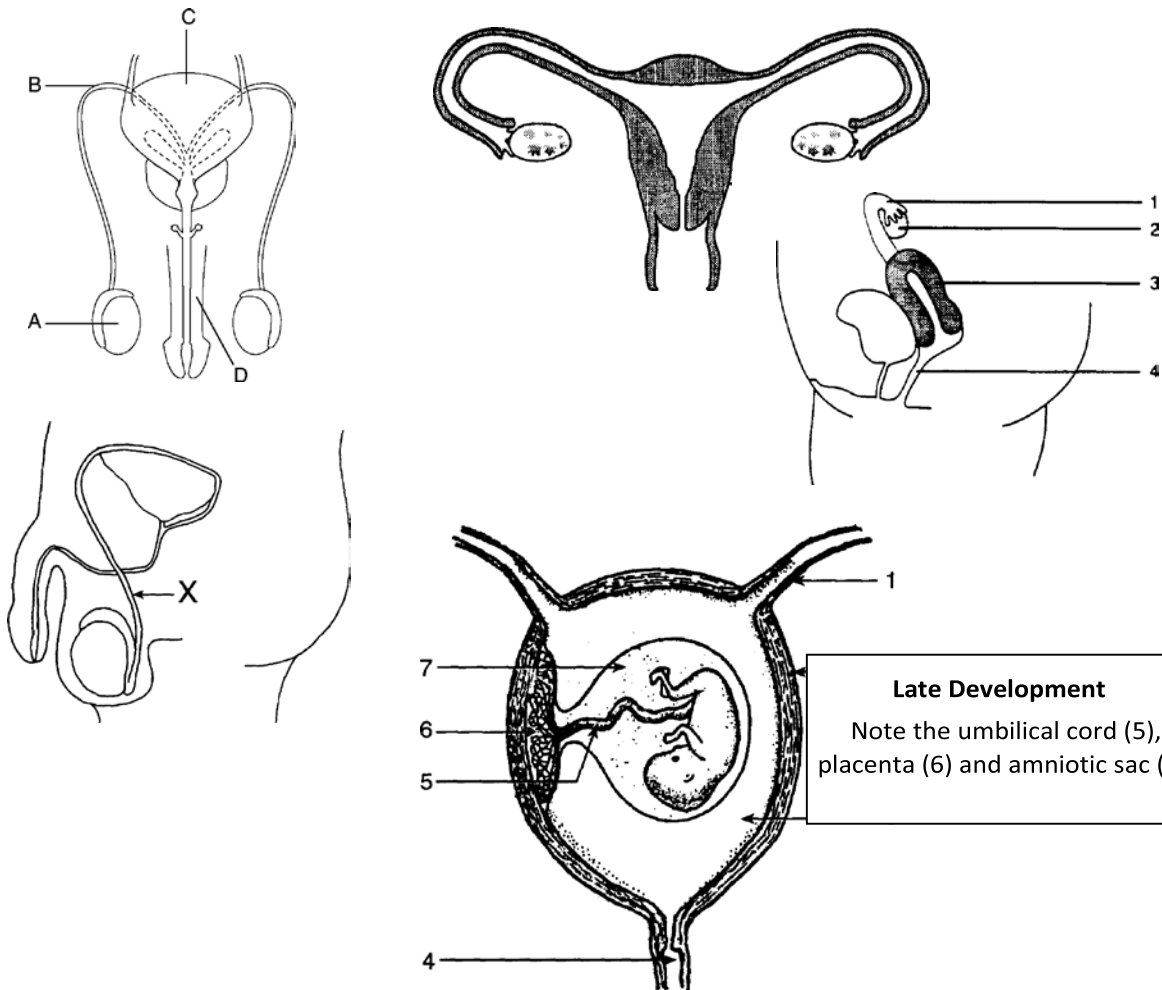
### I. The **placenta** transfers nutrients and oxygen from the mother's blood into the blood of the fetus through the process of diffusion. **The blood of the mother and fetus do not mix.**

1. The fetus is attached to the placenta by the umbilical cord.
2. Waste produced by the fetus is also removed by the placenta.
  - a. Waste ( $\text{CO}_2$ , urea, salts) *diffuse* from placenta into mother's blood.
  - b. Since the fetus does not eat solid food, it does not have to eliminate feces.

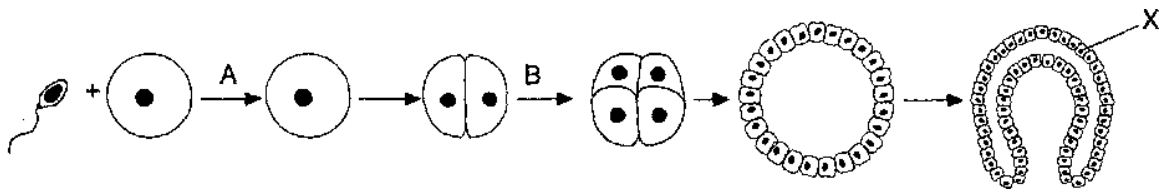
### J. The embryo and fetus develop in the **uterus**.

1. Cells divide without becoming larger (cleavage).
2. After a few days, cells begin to **differentiate** – that is they start to form different types of cells (nerve, skin, bone, etc.).
3. The embryo is very vulnerable to alcohol, drugs, etc. because the important organs and systems are just starting to develop.
4. **Common mistake:** *The fetus develops in the placenta (or vagina, stomach, etc.).* The fetus develops in the uterus (or womb).

Front and side views of the male and female reproductive organs



**Late Development**  
 Note the umbilical cord (5),  
 placenta (6) and amniotic sac (7).



**Early development** – Fertilization forms a single celled **zygote (A)** which then begins the process of **cleavage (B)** which will eventually create a layered ball of cells that will form the embryo.

Adapted from *What You Absolutely Must Know to Pass the NYS Living Environment/Biology Regents*  
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