UNIT 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 \( \rightarrow \) two identical, diploid (2n) cells.

D. Meiosis
   1. Makes gametes used in sexual reproduction.
   2. One cell divides twice \( \rightarrow \) 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.

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 (CO₂, 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).
**Early development** – Fertilization (A) forms a single celled zygote which then begins the process of cleavage (B) which will eventually create a layered ball of cells that will form the embryo.

**Late Development** – The fetus pictured here is nearly ready to be born. Note the umbilical cord, placenta and amniotic sac.