Section 5: Reproduction and Development - Notes

Objectives:

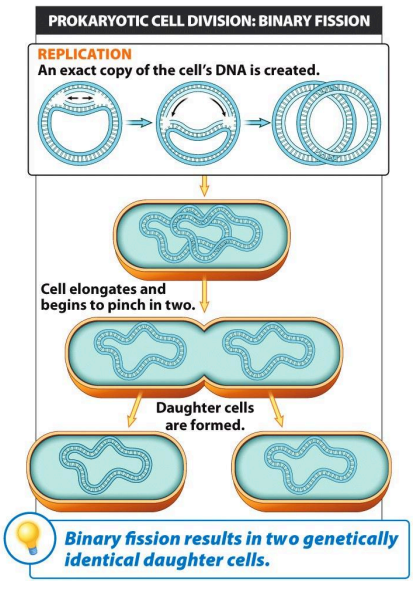
- Explain the differences between asexual and sexual reproduction.
- Describe the advantages and disadvantages of asexual and sexual reproduction.
- Describe the development of offspring.

Warm-up:

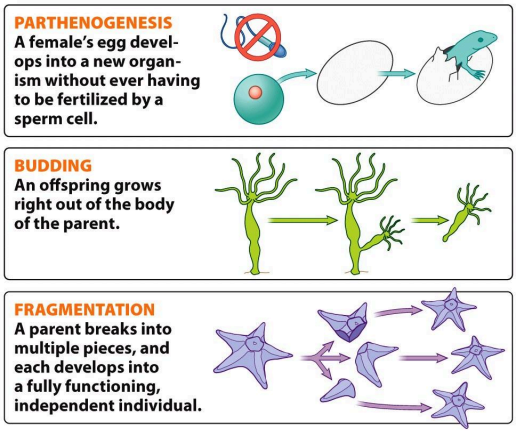
- How do humans ensure that their offspring have the correct number of chromosomes?
- What process allows a single cell to divide into many cells?

Asexual Reproduction:

- Organisms can reproduce in two ways: _____ or _____, or _____.
    - Each has advantages and disadvantages, depending on the organism's _____.
        - Some organisms, such as _____, alternate between asexual and sexual reproduction methods, depending on their current environment.
- **Asexual Reproduction:** involves the production of offspring by a _____ _____ without contribution of genetic material from another individual.
    - _____, _____, and some fungi, plant, and animal species reproduce asexually.
    - **Prokaryote:** A _____ organism that _____ a membrane-bound nucleus and specialized organelles.
- Prokaryotes reproduce through _____.
    - **Binary fission:** a type of _____ reproduction in which the DNA is _____, the cell elongates, and then separates into two genetically _____ daughter cells.
    - Some _____can undergo binary fission very quickly—often in as little as 20 minutes .



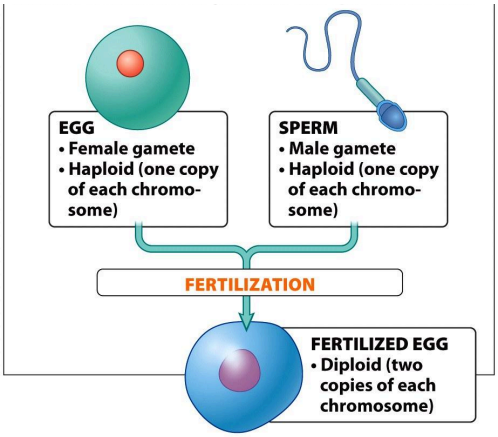
- _____ organisms can also reproduce asexually.
    - **Eukaryote:** A type of organism composed of one or _____ cells containing a membrane-bound _____, specialized _____in the cytoplasm, and a mitotic nuclear division cycle.



- Some animals can reproduce _____ through parthenogenesis, budding, or fragmentation.
- Plants can also reproduce asexually by forming new, individual plants from the established plant tissue through mitosis.
- Advantages of asexual reproduction:
    - It is energetically _____ because no energy is wasted by producing _____.
    - New individuals can be produced _____ which enhances an individual's evolutionary fitness.
    - All _____ are passed on to the offspring.
- Disadvantages of asexual reproduction:
    - If the habitat _____, individuals will be poorly suited to _____because they all have the same traits. There is no _____.

Sexual Reproduction:

- **Sexual Reproduction:** involves _____ contributing genetic material to produce offspring.
    - The genetic material is contained in _____.
    - Can occur in _____, _____, and fungi.



- Sexual reproduction creates _____ within a population, possibly creating better _____ individuals with increased fitness that will thrive.

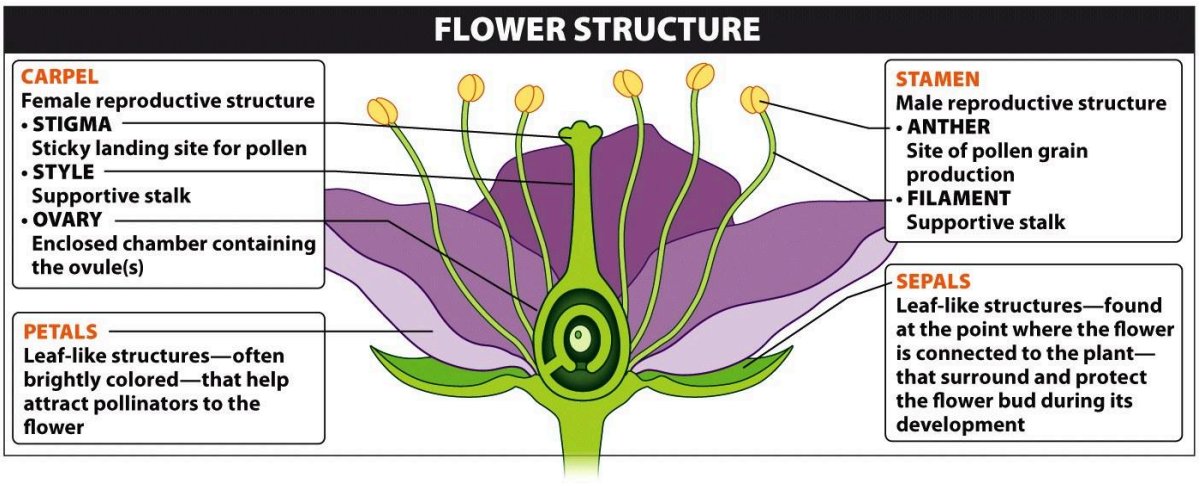
- However, finding a mate and breeding is _____ and potentially _____. Some organisms can search all their life and never meet an individual of the opposite sex!

- Advantages of sexual reproduction:
  - Offspring are genetically _____ from each other and from either _____.
  - Genetic diversity can _____ evolutionary fitness in changing environments.

- Disadvantages of sexual reproduction:
  - Finding a partner or a mate can be _____ and time consuming.
  - Only _____ of an individual's alleles are passed on to the offspring.

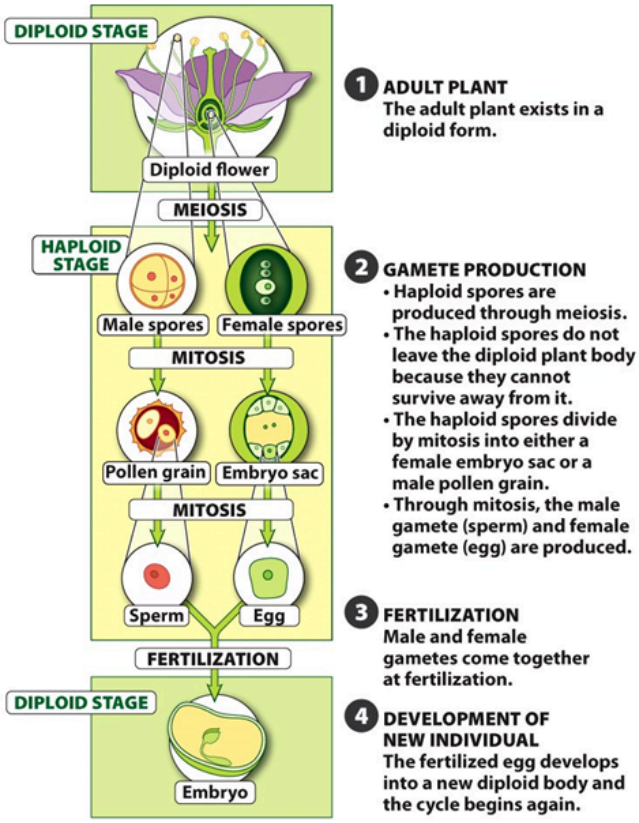
- Sexual reproduction requires _____ (the fusion of gametes) to take place.
  - In plants, the male _____ grain has to be transferred to the _____ reproductive organs.
  - In animals, fertilization requires a _____ environment and can occur either inside or outside an organism.

Sexual Reproduction - Plants:



- Pollen is created from _____ mother cells in the anther. These diploid microspores divide into _____ microspores (by meiosis), which eventually form a dual-cell, haploid pollen grain through mitosis.

- The embryo sac is created from _____ mother cells in the carpel. These diploid megaspores divide into _____ megaspores (by meiosis), in which one eventually forms the haploid embryo sac containing the egg cell through mitosis.
- Once fertilization happens in plants, a _____ is formed and the ovary develops into a _____ to protect the seed.



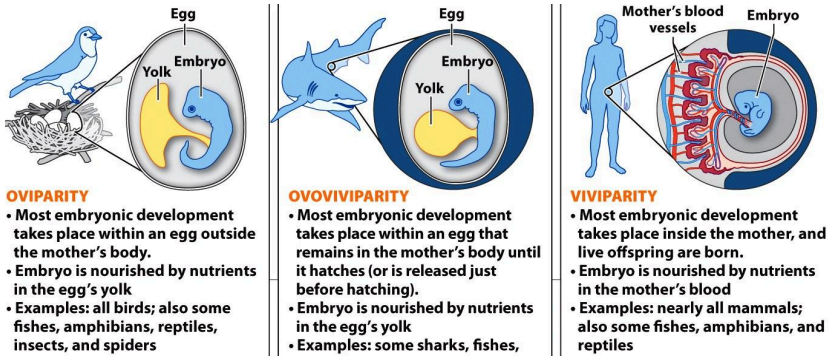
Sexual Reproduction - Animals:

- Many aquatic invertebrates and vertebrates practice _____ fertilization, where sperm and egg meet _____ of the parents' bodies.
    - Fertilization in this situation takes _____ and _____, as the gametes have no mechanical method of moving toward each other.
- _____ poses different problems for fertilization—gametes cannot move without their own power, and they risk _____.
- These problems are solved by _____ fertilization, where males deposit their motile sperm directly into the moist reproductive tract of the female.

EXTERNAL FERTILIZATION
The sperm and egg unite outside of the male's and the female's body.

INTERNAL FERTILIZATION
Sperm are deposited directly in the female's reproductive tract and unite with the eggs inside the female's body.

- Upon fertilization, the sperm and egg nuclei will unite within the single cell called a _____. This single cell then begins to divide and form an _____.
    - As the embryo continues to divide, it needs a source of _____ to grow larger and produce _____ cells.
    - This can be accomplished _____ or _____of the body of the mother.
- _____: embryo is nourished by _____ inside an egg that is laid soon after fertilization.
- _____: embryo is nourished by _____ inside an egg that remains _____ the mother's body until/close to hatching.
- _____: embryo develops _____ the mother, nourished by nutrients carried in her _____, and live offspring are born.

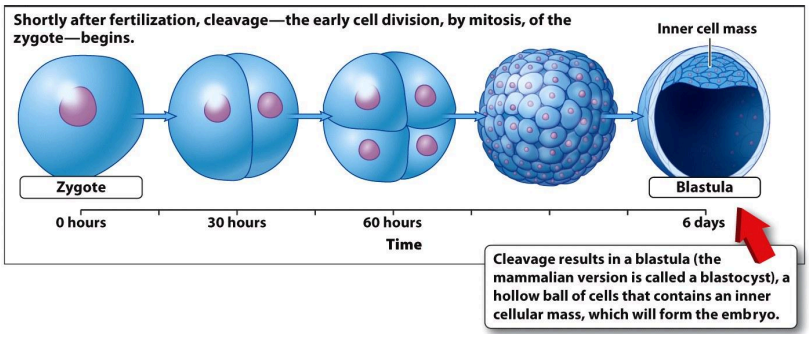


- Oviparity, ovoviviparity, and viviparity are all strategies for providing:
    - a _____ environment for embryonic development
    - a _____ for embryonic development
    - a source of _____ for embryonic development
    - the environment necessary for fertilization to occur

Development:

- Once fertilization occurs, a _____ is formed.
    - After about 30 hours, the zygote will have its first cell division through _____

- The cells continue to divide in a process called _____.



- As the embryo continues to develop, the cells will start to _____.
  - At this point in development, all of the cells have the _____ to eventually become any type of cell. These cells are called _____ _____.
- After _____ weeks of development, the embryo becomes a _____ and is considered a fetus until _____.
  - Most organs begin to develop after _____.
  - During the second trimester the _____ system forms, _____ becomes stronger, and hair starts to form.
  - During the third trimester the fetus _____ in size and prepares for birth.
- Although a human female usually only releases _____ egg cell at a time that can be fertilized, occasionally _____ or more eggs can be released.
  - Both eggs could be fertilized by _____ to produce _____, genetically different _____.
    - These are also known as _____ twins, or non-identical twins.
- There is a chance that a single embryo can divide into _____ or _____ separate embryos after fertilization already occurred.
  - The embryos are produced from the _____ sperm and egg, and would be genetically _____.
  - These are called _____, or _____ twins.