2.40: Reproductive Life Cycles

Young to old. A life cycle?

Not in the biological sense. Life cycles describe the amount of DNA present at a specific stage or time in the life of an organism. Is there a haploid or diploid amount of DNA? That is the key question.

Life Cycles

Sexual reproduction occurs in a cycle. Diploid parents produce haploid gametes that unite and develop into diploid adults, which repeat the cycle. This series of life stages and events that a sexually reproducing organism goes through is called its life cycle. Sexually reproducing organisms can have different types of life cycles. Three are represented in Figure below and described following sections.
Life cycles can vary in sexually reproducing organisms. Three types of sexual life cycles are shown here. Do you see how they differ? The letter \( n \) indicates haploid stages of the life cycles, and \( 2n \) indicates diploid stages.

### Haploid Life Cycle

The **haploid life cycle** is the simplest life cycle. It is found in many single-celled eukaryotic organisms. Organisms with a haploid life cycle spend the majority of their lives as haploid gametes. When the haploid gametes fuse, they form a diploid zygote. It quickly undergoes meiosis to produce more haploid gametes that repeat the life cycle.

### Diploid Life Cycle

Organisms with a **diploid life cycle** spend the majority of their lives as diploid adults. When they are ready to reproduce, they undergo meiosis and produce haploid gametes. Gametes then unite in fertilization and form a diploid zygote, which immediately enters G\(_1\) of the cell cycle. Next, the zygote’s DNA is replicated. Finally, the processes of **mitosis and cytokinesis** produce two genetically identical diploid cells. Through repeated rounds of growth and division, this organism becomes a diploid adult and the cycle continues. Can you think of an organism with a diploid life cycle? (Hint: What type of life cycle do humans have?)

### Alternation of Generations

Plants, algae, and some protists have a life cycle that alternates between diploid and haploid phases, known as **alternation of generations**. In plants, the life cycle alternates between the diploid sporophyte and haploid gametophyte. Spore forming cells in the diploid sporophyte undergo meiosis to produce **spores**, a haploid reproductive cell. Spores can develop into an adult without fusing with another cell. The spores give rise to a multicellular haploid **gametophyte**, which produce gametes by mitosis. The gametes fuse, producing a diploid zygote, which grow into the diploid sporophyte. These life cycles may be quite complicated. You can read about them in additional concepts.

### Summary

- A life cycle is the sequence of stages an organisms goes through from one generation to the next. Organisms that reproduce sexually can have different types of life cycles, such as haploid or diploid life cycles.
Summary of all three life cycles.

Explore More

Use this resource to answer the questions that follow.

- **Life Cycles** at [http://www.biologyreference.com/La-Ma/Life-Cycles.html](http://www.biologyreference.com/La-Ma/Life-Cycles.html).

1. What is a life cycle?
2. Describe the basic stages of the life cycles for all organisms.
3. Explain why butterflies have complex life cycles.

Review

1. What is a life cycle?
2. An adult organism produces gametes that quickly go through fertilization and form diploid zygotes. The zygotes mature into adults, which live for many years. Eventually the adults produce gametes and the cycle repeats. What type of life cycle does this organism have? Explain your answer.
3. Which life cycle is the simplest? Why?
4. Describe the alternation of generations life cycle.