

# Types of Reproduction

## Why do cells divide?

- Stimuli to start a cell division:
  - To replace dead or dying cells,
  - To produce more cells to enlarge the organism (growth and development)
  - Reproduction, i.e. to increase the number of unicellular organisms.

## Different Types of Reproduction

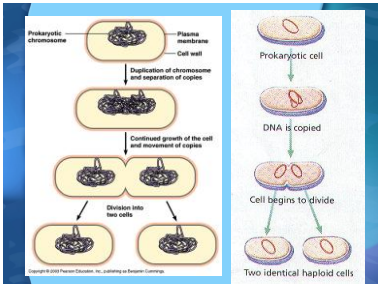
- Asexual**
  - one parent
  - simple
- Types:**
  - Binary Fission
  - Budding
  - Vegetative Reproduction
- Sexual**
  - With parents
  - More complicated
  - Cell Cycle - Meiosis

## Asexual

- Binary Fission**
  - cell division → get an identical copy of the original cell
  - prokaryotic cells
  - they don't need anything else to help it reproduce


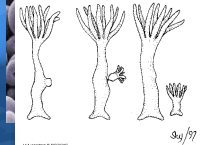



DNA → START






## Asexual

- Budding**
  - creating new cells from portions of their bodies
  - prokaryotic and eukaryotic cells
  - prokaryotic-genetically identical from the parent
  - beneficial for survival

## Asexual

- Vegetative Reproduction**
  - Use parts of plants to create new plants
  - eukaryotic
  - types: division, stem cutting, grafting
  - don't need any parts to reproduce

division, Stem Cutting, grafting

## Asexual

- Mitosis**
  - genetically equal somatic (body) cells
  - results in copying & equal duplication of parental cell's DNA and the equal division of chromosomes into two daughter cells
  - (rates = liver cells 1x/yr - epithelial cells 1x/day)


## Asexual repro review -



(a) Reproduction: An amoeba, a single-celled organism, is dividing into two cells. Each new cell will be an individual organism (2x). (b) Growth and development: The tiny yeast buds a small daughter cell shortly after the mother cell divides, forming two cells (2x). (c) These zooids, these sliding boxes, form cells (animal cells) that give rise to new blood cells (2x).

### Sexual Reproduction

- **Eukaryotic cells**
  - Many different chromosomes, sometimes thousands
  - All located in the nucleus of the cell.
- **Meiosis – sexually produces sperm and egg with half the number of chromosomes and new gene combos**



### Chromosome

- **Found in nucleus**
- **Made of DNA**
  - A very LONG DNA molecule
  - Coiled and condensed around proteins
- **Contains a few thousand genes**
  - Genes → code for proteins

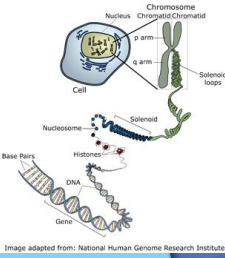
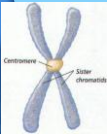


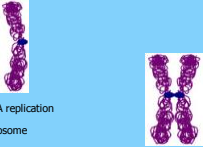
Image adapted from: National Human Genome Research Institute.

### Chromosomes

- **When preparing for cell division, chromosomes copy themselves**
  - Each half of the chromosome is called a **chromatid** or **sister chromatid**
    - Chromatids form as DNA makes copies of itself



- constricted area of each chromatid is called a **centromere**
- **centromere = hold sister chromatids together**



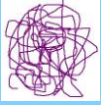
Before DNA replication  
- Chromosome

After DNA replication  
- Sister Chromatids

Held together by centromere


### More "C" words

- **Between Cell Division, DNA is NOT tightly wound in Chromosomes**
  - It is in less tightly coiled DNA strands called **Chromatin**




### Types of Chromosomes

- **Autosomes**
  - All of the "regular" chromosomes that determine our traits
  - In humans, we have **46 chromosomes: 22 pairs of autosomes + one pair of sex chromosomes**




- **Sex chromosomes**
  - The chromosomes that determine the sex or gender of the organism
  - In humans, we have one pair of X and Y sex chromosomes
  - XX = female
  - XY = male



### Homologous chromosomes

- 46 chromosomes = 23 pairs
  - 1 pair was originally from mom
  - 1 pair was originally from dad
- A match set of chromosomes are called = **homologous pairs**
- Both chromosomes in a homologous pair contain information that code the same trait (ex. eye color)



### Number of Chromosomes

- Cells are either **haploid** or **diploid**.
  - **Haploid** (think "half") cells, like sex cells, such as sperm and eggs, contain **only one** copy of each chromosome. In humans, haploid = 23. Haploid =  $n$
  - **Diploid** (think "double") cells, like all the rest of your body's cells, contain **two** copies of each chromosome. In humans, diploid = 46. Diploid =  $2n$ .

### Chromosomes

- Every time our body cells divide, each **NEW** cell must also end up with the same 46 (23 pairs of) chromosomes
- Preparing for cell division → cells **MUST** copy all its chromosomes through DNA replication

- somatic (body) cells –
  - Diploid = 46 chromosomes



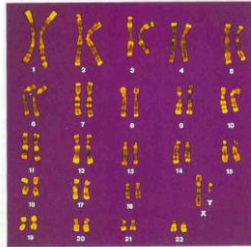
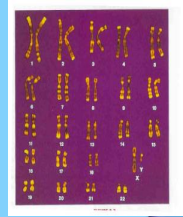
DNA replication

mitosis

2 diploid cells

### Karyotypes

- A karyotype is a picture of an organisms chromosomes.
- When the chromosomes are most visible, the cell is squashed and a picture is taken using an electron microscope.
- Each individual chromosome picture is cut out and matched up in pairs.



### To Cell Cycle!

- There is **only one way** to make cells
  - From other cells!
- What is the goal of the cell cycle?
  - To produce two genetically identical cells from one original cell

**Now to Mitosis!**