

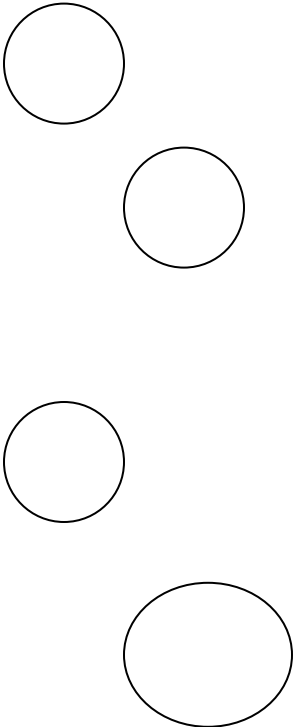
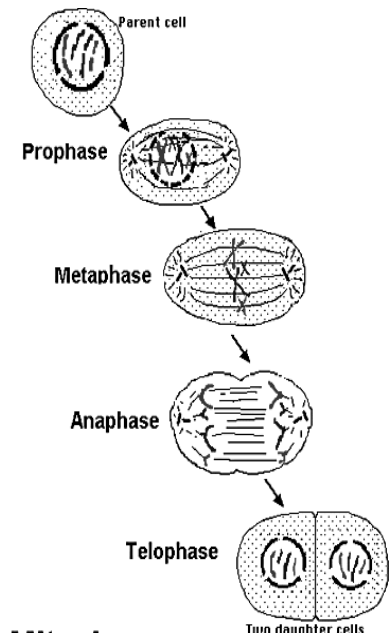
## I. Cell Growth and Division

- A. Why do cells divide
1. Life and reproduction require cell division
  2. You require constant cell reproduction to live
- B. The cell cycle
1. A cell spends most of its life in *interphase* – the phase where the normal life processes go on
  2. Mitosis – is the process of cell division
    - a. When a cell replicates itself
    - b. There are four stages of mitosis

## II. Steps of Animal Mitosis

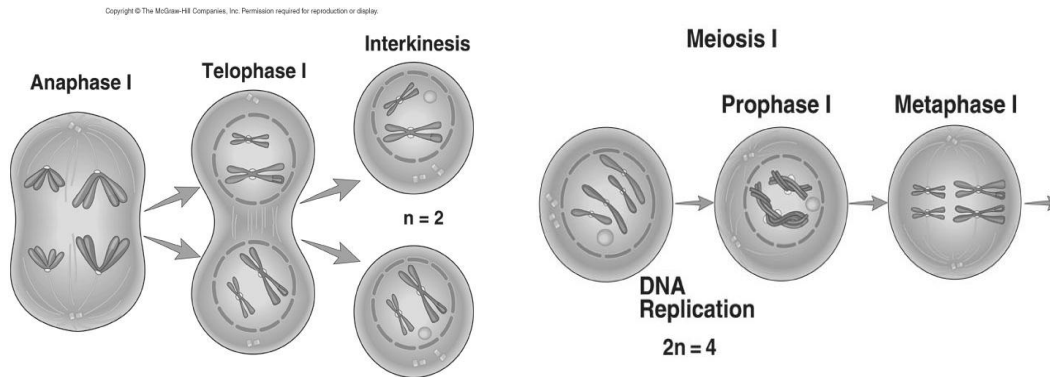
- A. Interphase is the phase between mitosis
1. All Cells Normal Activities
  2. Chromosomes replicate just before mitosis
- B. Mitosis has four phases

1. Prophase
  - a. Chromosomes become fully visible
  - b. Nuclear membrane fades
  - c. Centrioles move to opposite poles
  - d. Spindle fibers form from centrioles
2. Metaphase
  - a. Double stranded chromosomes line up in the middle
  - b. Centromere attaches to spindle fiber
3. Anaphase
  - a. Centromeres separate causing each strand of the double strand to go to opposite ends
4. Telophase
  - a. spindle fibers begin to disappear
  - b. chromosomes become harder to see
  - c. nuclear membrane reforms
  - d. nucleolus appears in each new nucleus



- C. Results of mitosis
1. Two cells identical to the original cell
  2. In human cells they start with 46 and end with 46
- D. Asexual reproduction
1. new organisms are produced from one parent
    - a. called fission
  2. Budding
    - a. When a new organism grows from the body of another organism and then drops off and grows into another organism
  3. Regeneration
    - a. When an organism grows new parts that have been cut or broken off

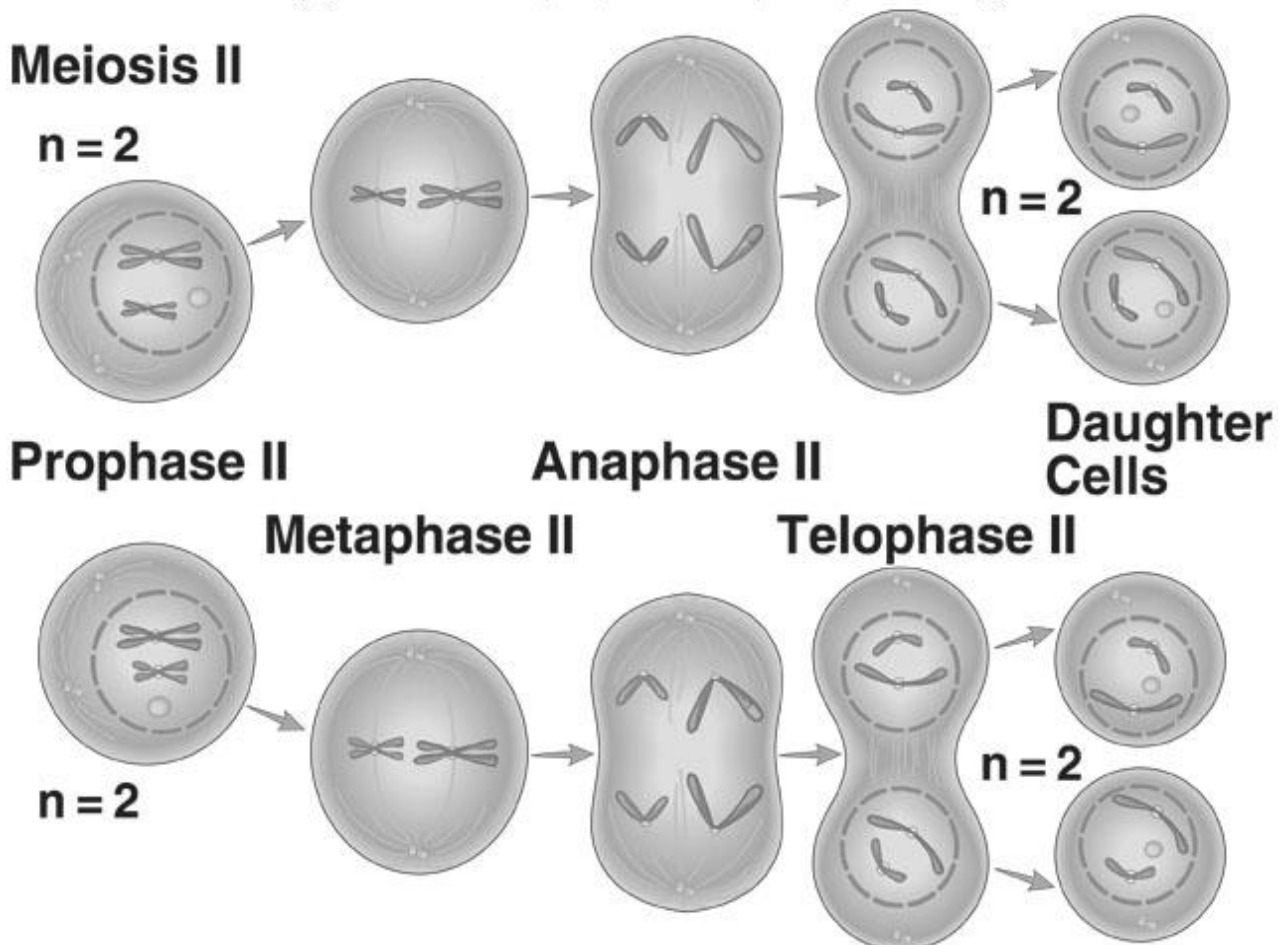
## III. Sexual reproduction and Meiosis



- A. Sexual reproduction**
1. Involves the uniting of an egg and sperm
    - a. The *egg* is the female sex cell
    - b. The *sperm* is the male sex cell
  2. Involves two separate individuals
- B. Production of sex cells**
1. Sex cells have  $\frac{1}{2}$  the number of chromosomes that other cells have
  2. In human body cells there are 46 chromosomes
  3. In *egg* or *sperm* there is 23 chromosomes
  4. The production of sex cells is called meiosis
- C. The importance of sex cells**
1. Half of your chromosomes came from mom and half from your dad
  2. A complete set of chromosomes is called the *diploid* number (in humans that is 46)
  3. The number that is found in sex cells is the *haploid* number or  $\frac{1}{2}$  as many as there are in body cells (in humans that is 23)
  4. *Fertilization* is the joining of the egg and the sperm.
  5. The cell that forms in fertilization is called a *zygote*.
- D. Meiosis is the process of getting from the diploid number of chromosome to the haploid number (how sex cells are formed)**
1. **Meiosis I**
    - a. **Prophase I** double stranded chromosomes and spindle fibers appear
      1. chromosomes come together in matching pairs (find their mate)
    - b. **metaphase I**
      1. paired chromosomes line up in the center and attach to spindle fibers
      2. The *centromere* of each double stranded chromosome is attached to the spindle fiber
    - c. **anaphase I**
      1. Each double stranded chromosomes separates
    - d. **telephase I**
      1. cytoplasm divides to form two cells
      2. each cell has a haploid number of double stranded chromosomes

2. Meiosis II is the second division of mitosis
  - a. *prophase II*
    1. Double stranded chromosome and spindle fibers present
  - b. *metaphase II*
    1. Double stranded chromosomes line up in the middle of the cell
  - c. *anaphase II*
    1. *Centromere* divides and a single stranded chromosome moves to each end of the cell
  - d. *telepahase II*
    1. chromosomes disappear
    2. nuclear membrane
3. The result of meiosis is two sex cells with one half the number of chromosomes as the original cell

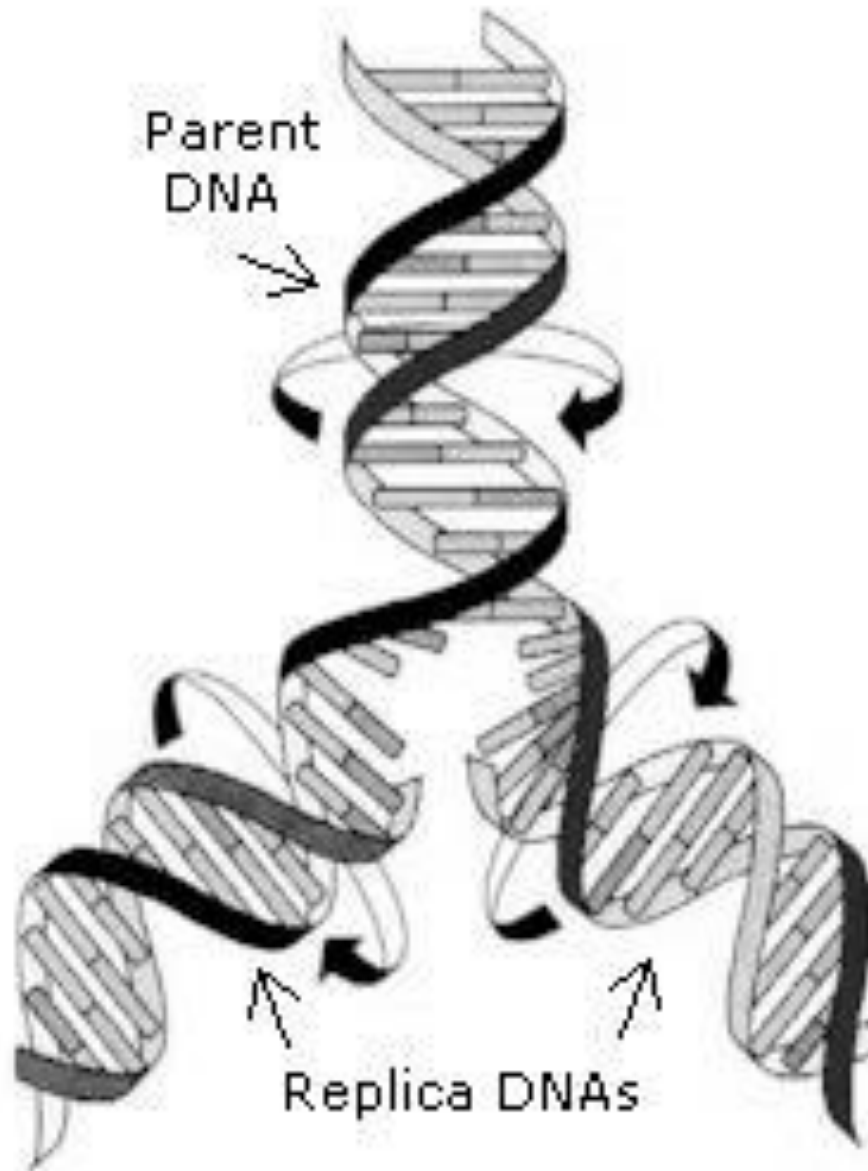
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#### IV. DNA (Deoxyribonucleic acid)



- A. history**
- 1. Rosalind Franklin discovered that DNA was a strand of molecules in a two spiral form**
  - 2. James Watson and Francis Crick made a model of the DNA molecule in 1953**
- B. The DNA model**
- 1. made up of two twisted strands of sugar and phosphate molecules.**
  - 2. the rungs are made up of molecules called nitrogen bases**
  - 3. There are four kinds of bases**
    - a. Adenine**
    - b. Guanine**
    - c. Cytosine**
    - d. Thymine**
    - e. These bases are represented by the letters A, G, C, & T**
  - 4. Guanine always combines with cytosine and thymine always combines with adenine (Figure 4-13, page 104 & 105)**
- C. How DNA copies itself**
- 1. DNA replicates just before mitosis**
  - 2. DNA molecule unwinds**
  - 3. An enzyme breaks apart the nitrogen bases, causing the DNA to unzip and expose the bases**
  - 4. The bases attached to each strand pair up with new bases found in the nucleus**
  - 5. Sugar and phosphate groups form the side of the new DNA strand.**
  - 6. Each new DNA strand has the exact information and is exactly like the original DNA strand.**



- D. Genes is a certain part on the DNA that tells how to make a certain protein**
- 1. We are made up of different types of proteins, so DNA directs the way we are made up**
  - 2. Proteins are made up of amino acids and DNA tells the order of amino acids.**
  - 3. RNA is involved in the making or proteins.**
    - a. RNA is a transfer agent of the information on the DNA to making the protein.**
    - b. Two types of RNA**
      - 1. Messenger RNA gets its message from the DNA and moves out of the nucleus to the ribosomes**
      - 2. Transfer RNA**

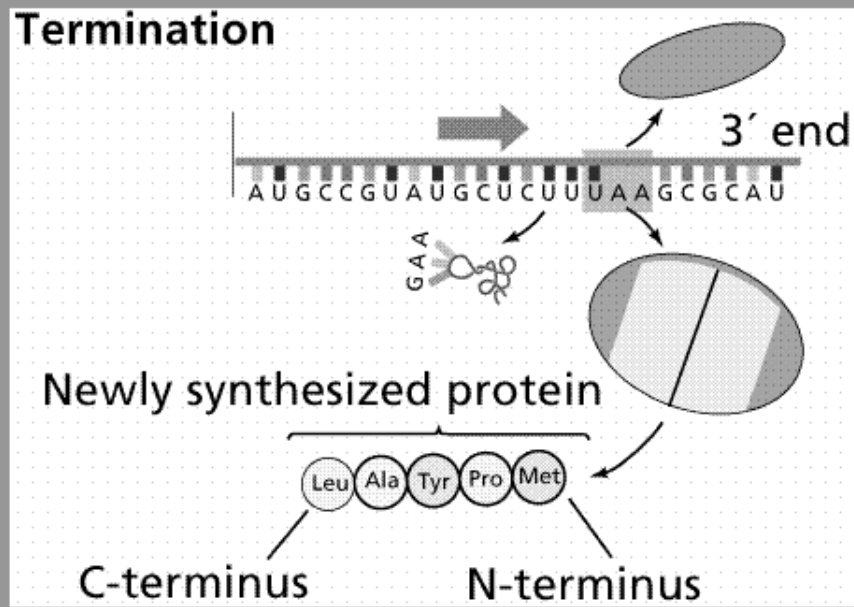


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