CELL REPRODUCTION NOTES
8th GRADE SCIENCE

CELL GROWTH AND DIVISION

Why do cells divide?
- the number of cells in your body increases as you develop

Constant Change
- groups of cells throughout your body are growing, dividing, and dying
- worn-out cells are being constantly replaced
- muscles that are exercised are getting larger

Cell Division
- in order to make more cells, the cells you already have go through the process of division

The Cell Cycle
- Cell stages put simply: birth, growth and development, death
- Interphase - the period of time when the cell is undergoing growth and development (most of the life of the cell)
  - during interphase, cells go through periods:
    - rapid growth, growth and DNA synthesis, growth and preparation for division and then cell division
    - cell division: the nucleus divides then the cytoplasm divides to form 2 new cells
      - division happens continuously (all the time!)
      - not all of your bodies cells divide
        - ex. nerve cells, fat cells and muscle cells
          - this means they are always in interphase

Mitosis
- Mitosis - the process in which a cell divides to form two identical cells
- cells divide in 2 steps
  - nucleus – each contain the same number and type of chromosomes as the original or parent cell
  - cytoplasm
- the parent cell is the cell that undergoes division
- 4 steps to Animal Cell mitosis:
  - Prophase –
    - the chromosomes become fully visible
    - the nucleolus and nuclear membrane fade and disappear
    - centrioles move to opposite ends of cell
    - between the centrioles, threadlike spindle fibers begin to stretch across the cell
- **Metaphase**
  - double-stranded chromosomes line up at the center of the cell
  - each centromere becomes attached to a spindle fiber

- **Anaphase**
  - each centromere divides
  - the two strands of each chromosome separate
  - the separate strands begin to move away from each other toward opposite ends of the cell

- **Telophase**
  - centrioles and spindle fibers start to disappear
  - chromosomes stretch out and become harder to see
  - a nuclear membrane forms around each mass of chromosomes
  - a new nucleolus appears in each new nucleus

- 4 steps to **Plant Cell mitosis**:
  - plant cells cannot pinch apart like animal cells do
  - a structure called a *cell plate* forms between the two nuclei
  - new cell walls form along the cell plate
  - plant cells do not have centrioles, but they do have spindle fibers

**Results of Mitosis:**
- it's the division of a nucleus
- it produces two new nuclei that have the same number of chromosomes as the original nucleus

**Asexual Reproduction**
- your body has two types of cells
  - body cells – many of these
  - sex cells – few of these

- **Reproduction** - the process by which an organism produces others of the same kind
  - Two kinds:
    - *Asexual Reproduction* – new organisms are produced from one parent
      - Ex. sweet potatoes, agaves, many types of succulents, single-celled organisms,
      - Very few examples in the animal kingdom
    - *Sexual Reproduction* – we'll visit this later on in our notes

**Budding and Regeneration**
- a type of asexual reproduction where a new organism grows from the body of a parent organism
  - these organisms soon break away and live independently from the parent organism
SEXUAL REPRODUCTION AND MEIOSIS

Sexual Reproduction

- occurs when a new organism is produced from the sex cells of two parents
- sex cells
  - female - egg - usually large and contain food material
  - male - sperm - small with whip-like tails

Production of Sex Cells

- Number of chromosomes in cells
  - body cells - 46 chromosomes
  - sex cells - 23 chromosomes
- How do sex cells form?
  - through meiosis
  - meiosis - the process of nuclear division that produces sex cells
    - takes place in the reproductive organs in both plants and animals

The Importance of Sex Cells

- diploid - a cell that has two of every kind of chromosome
- haploid - a cell that has just one of every kind of chromosome
  - human sex cells are haploid
  - human body cells are diploid

Fertilization

- occurs when one sex cell joins with another and a new organism is begun
- this newly formed cell is called a zygote
  - a zygote has the diploid chromosome number for that organism

Meiosis:

- in meiosis, there are two divisions of the nucleus
  - meiosis I
  - meiosis II
- the different steps in meiosis have the same names as those in mitosis

Meiosis I -
  - Prophase I -
    - Double-stranded chromosomes and spindle fibers appear
    - nuclear membrane and nucleolus disappear
    - two of the same chromosomes come together in matching pairs
  - Metaphase I -
    - pairs of chromosomes line up in the center of the cell
    - their centromeres become attached to the spindle fibers
  - Anaphase I -
    - each double-stranded chromosome separates from its matching chromosome
    - each one is pulled to opposite ends of the cell
- **Telephase I** –
  - the cytoplasm divides and two cells form
  - each chromosome is still double-stranded

- **Meiosis II** –
  - **Prophase II** –
    - the double-stranded chromosomes and spindle fibers reappear in each new cell
  - **Metaphase II** –
    - the double-stranded chromosomes move to the center of the cell
    - the centromeres then attach to spindle fibers
  - **Anaphase II** –
    - the centromere divides
    - two strands of each chromosome separate and move to opposite ends of the cell
  - **Telephase II** –
    - the spindle fibers disappear
    - a nuclear membrane forms around the chromosomes at each end of the cell

- a cell with 46 chromosomes at the beginning of meiosis I divides to produce cells that have only 23 single-stranded chromosomes at the end of meiosis II
- when meiosis II is done, the cytoplasm divides
- the result of two nuclear divisions is four cells
- each of these is a sex cell with one half of the chromosomes of the original cell