Meiosis - Sexual Reproduction

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Meiosis Fundamentals

1. A process of producing sex cells (gametes)
2. **Four haploid cells are produced after one complete round**
3. Each sex cell is genetically unique

Importance to Sexual Reproduction

1. **It allows gametes to have half the original number of chromosomes of that organism.**
2. Each cell is genetically unique so no two people are exactly alike

Gametes

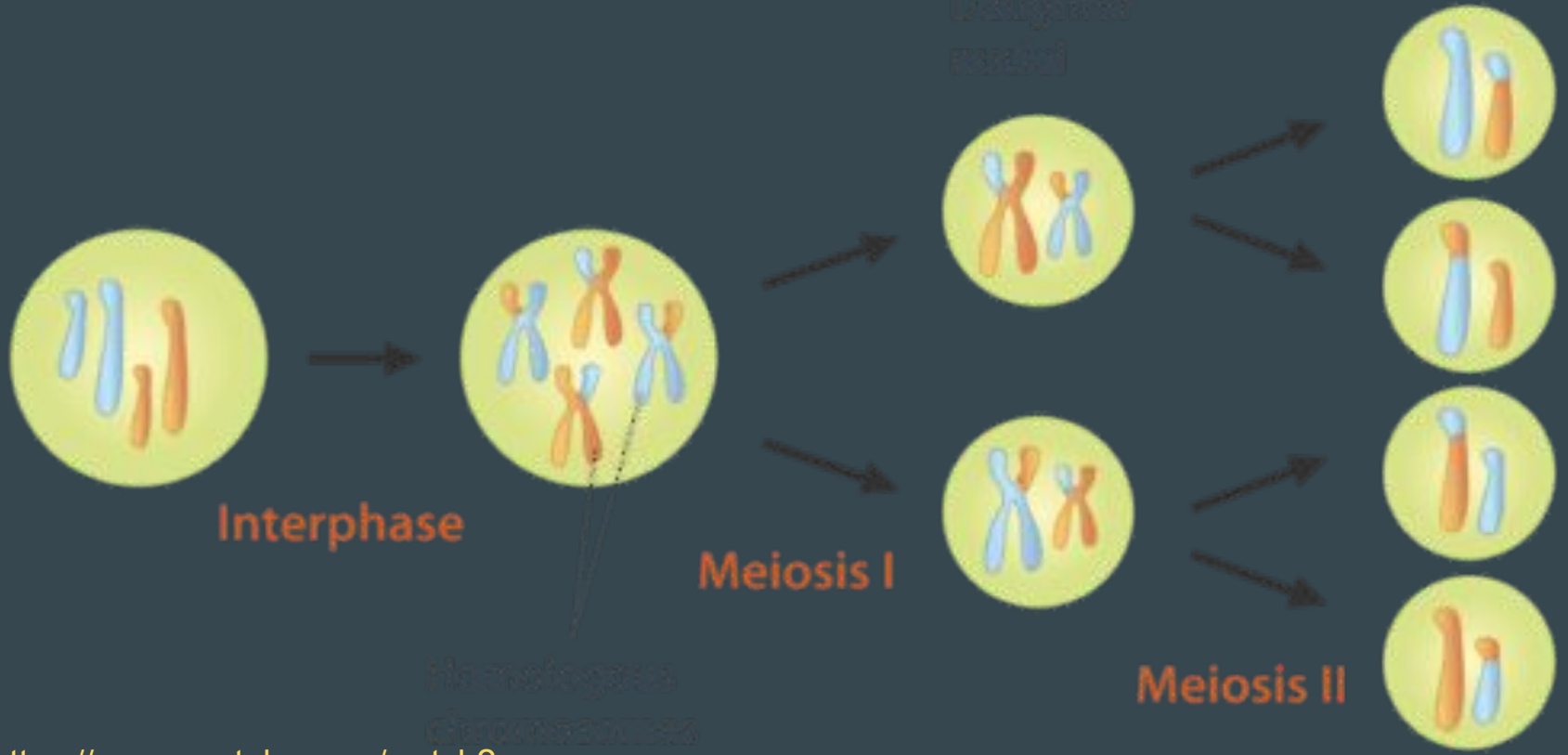
Reproductive cells produced from meiosis. Contains **half the number of chromosomes** of the organism

Females: Eggs (formed at birth)

Males: Sperm (produced daily)

Male + Female = Zygote

Meiosis Stages



https://www.youtube.com/watch?v=toWK0flyFIY

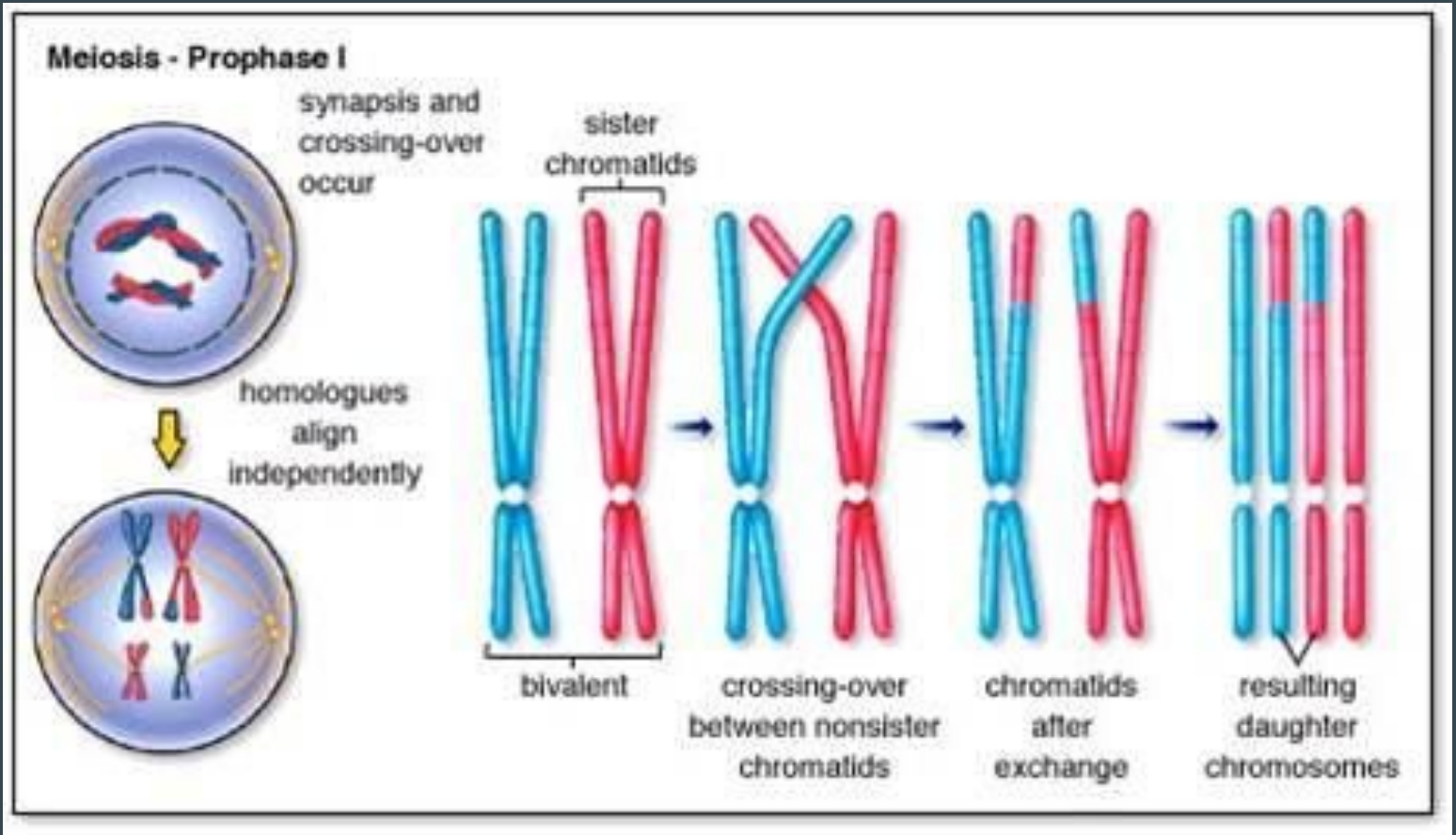
Meiosis Introduction

1. Meiosis I
    a. Produces **2 diploid cells**
2. Meiosis II
    a. Produces **4 haploid, genetically different cells**

Meiosis I -

1. Prophase I
    a. DNA condenses into **homologous chromosomes**
    b. Crossing over occurs
        i. Genetic material is **exchanged** between **homologous** chromosomes

Prophase I -


Meiosis - Prophase I
synapsis and crossing-over occur
homologues align independently
sister chromatids
bivalent
crossing-over between nonsister chromatids
chromatids after exchange
resulting daughter chromosomes

Meiosis I -

1. Metaphase I
   a. Homologous **chromosomes line up** at the middle of the cell
2. Anaphase I
   a. Homologous chromosomes **(sister chromatid still attached)** move away

Meiosis I -

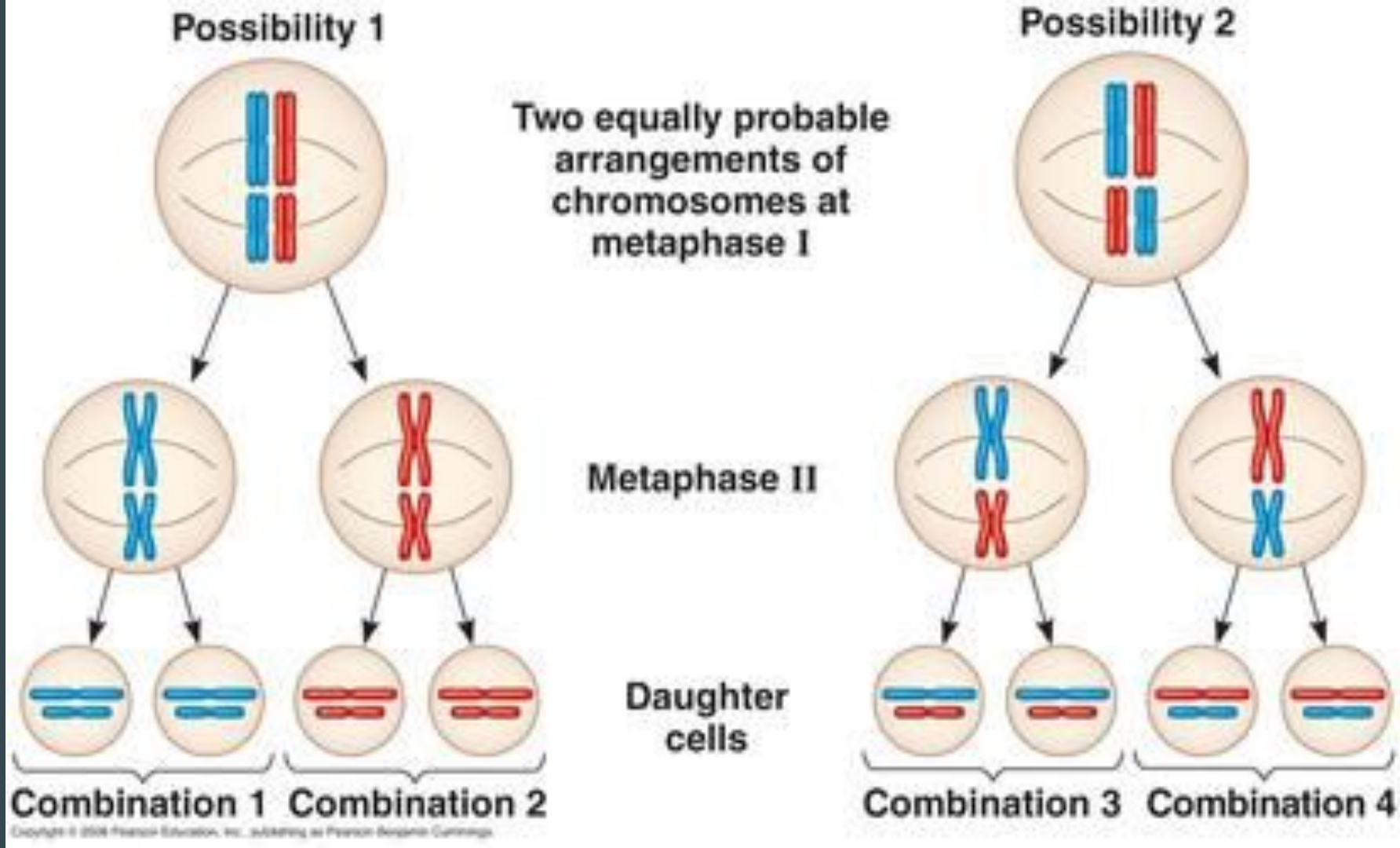
1. Telophase I & Cytokinesis
    a. Cell membrane forms around **two** cells
    b. Cells split
    c. Two cells:
        i. Genetically **different**
        ii. Contain **chromosomes** not chromatids

Meiosis II -

1. Similar to Mitosis EXCEPT:
    a. **Four** cells are created
    b. All cells **genetically** different
    c. **Haploid** cells called **GAMETES**

Meiosis II -

1. Independent Assortment:
   a. The **randomized order** of which chromatids are selected for each **haploid** cell
   b. This allows for **greater genetic diversity** of individuals

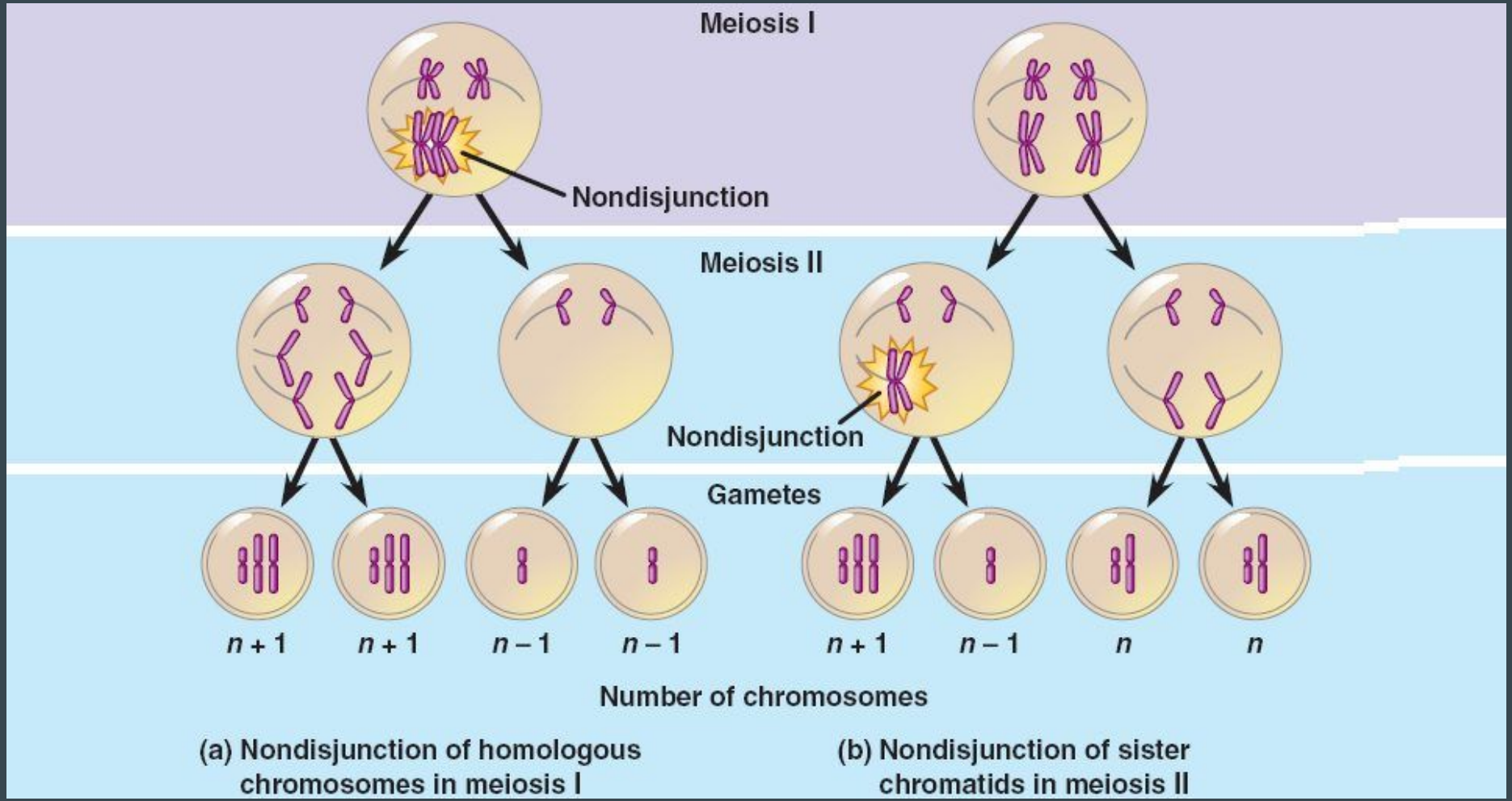

Possibility 1
Possibility 2
Two equally probable arrangements of chromosomes at metaphase I
Metaphase II
Daughter cells
Combination 1
Combination 2
Combination 3
Combination 4

Errors-

1. Nondisjunction:

When chromosomes **do not split apart properly** leading to **too few or too many** chromosomes in a cell

Application in life = Down Syndrome


Meiosis I
Nondisjunction
Meiosis II
Nondisjunction
Gametes
n + 1
n + 1
n – 1
n – 1
n + 1
n – 1
n
n
Number of chromosomes
(a) Nondisjunction of homologous chromosomes in meiosis I
(b) Nondisjunction of sister chromatids in meiosis II

Analogies

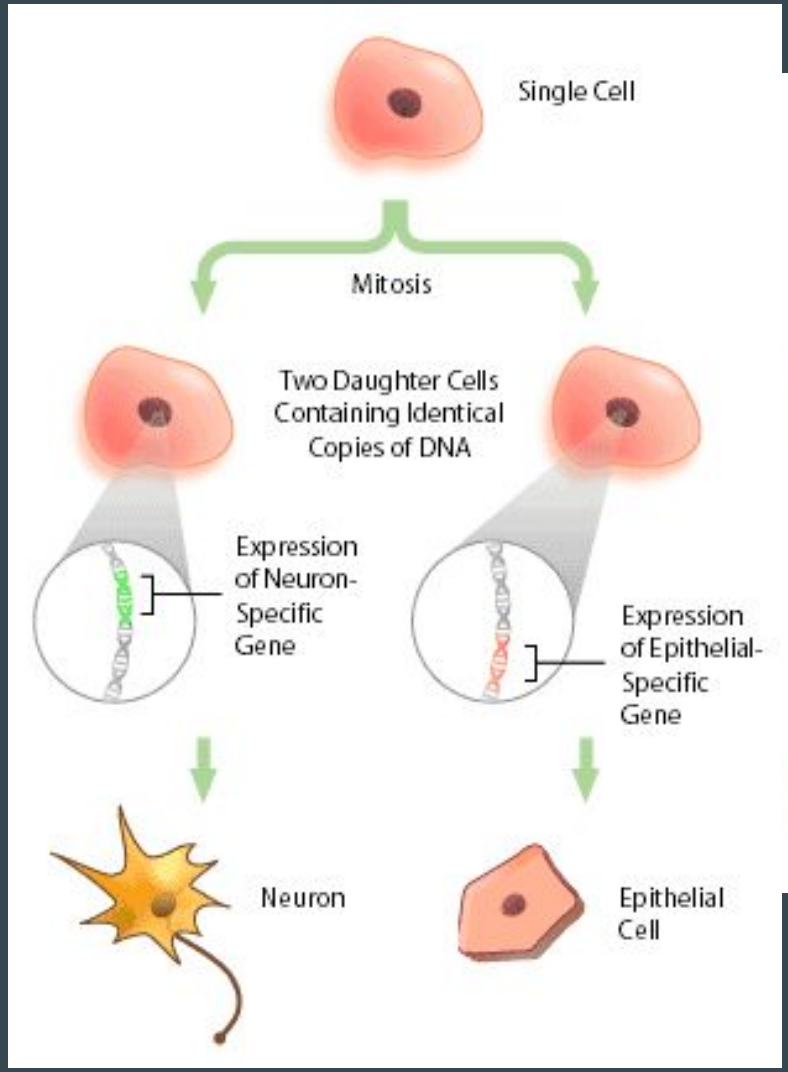
With your group on a whiteboard, come up with analogies for all of the following processes:

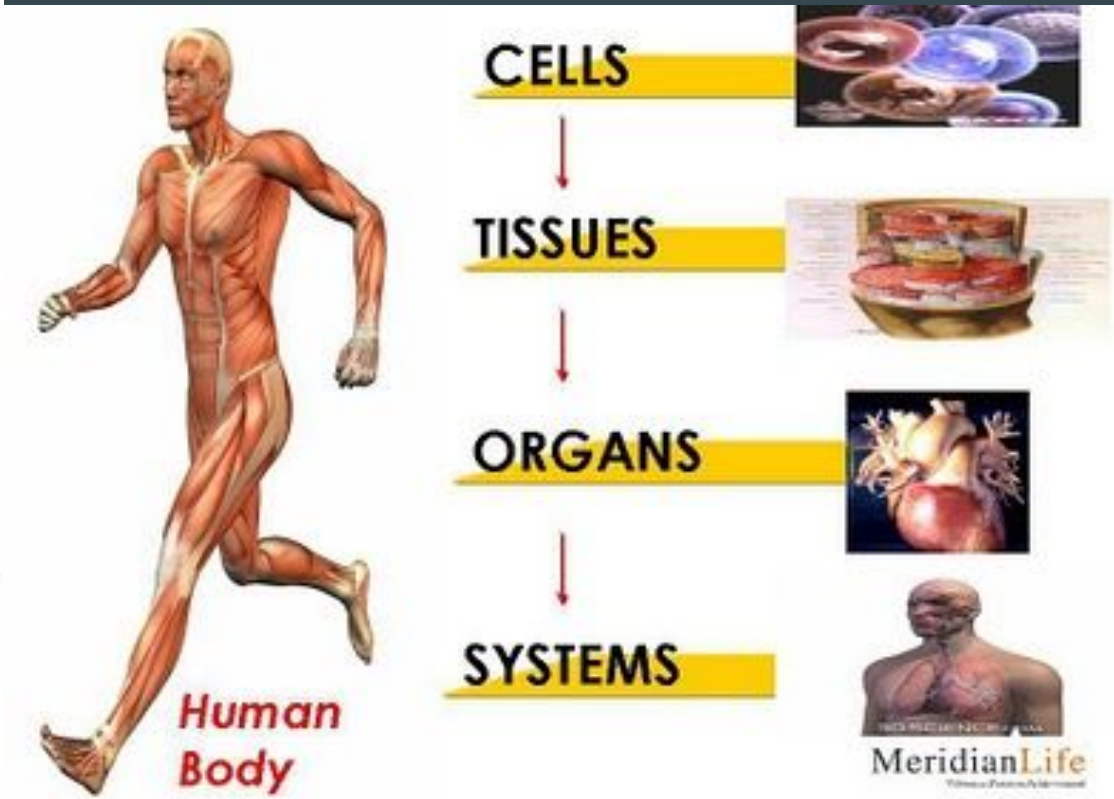
1. Crossing Over
2. Independent Assortment
3. Nondisjunction

When done display around the around the room for others to see. Pick the best ones and write them in your notes

Differentiation

1. Stem Cells (Body Cells as an Embryo)
    a. Each has the same DNA
    b. Specialized cells:
        i. **Different functions** due to **different genes** are activated.





https://www.youtube.com/watch?v=t3g26p9Mh_k

Differentiation

1. Specialized cells vary:
    a. **In shape**
    b. **Their role**
    c. **Time it takes to regrow**

Cell Complexity Game

Based on the game you just played as a class answer the following questions:

1. How do stem cells differ from specialized cells?
2. Why were brain cells further ahead than any other type of cell?
3. Summarize how complexity of the body works.