Crazy Traits

Student Science Background

cpo science

Heredity and Evolution

Part 1

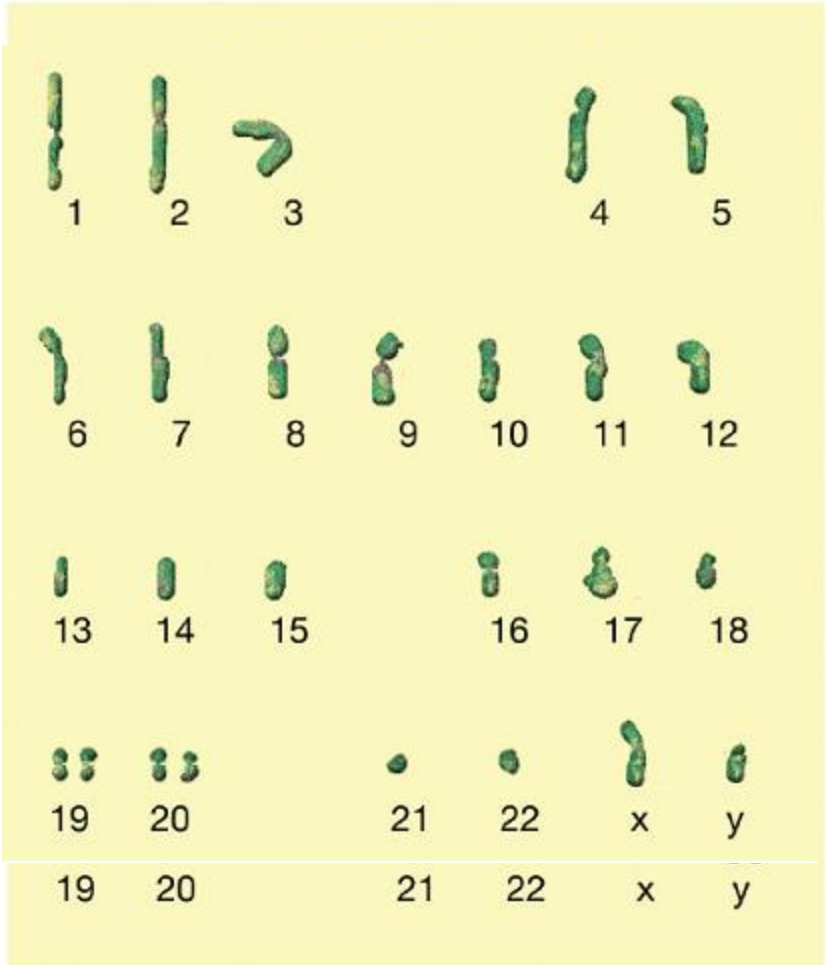
Sexual Reproduction and Meiosis

Two types of reproduction

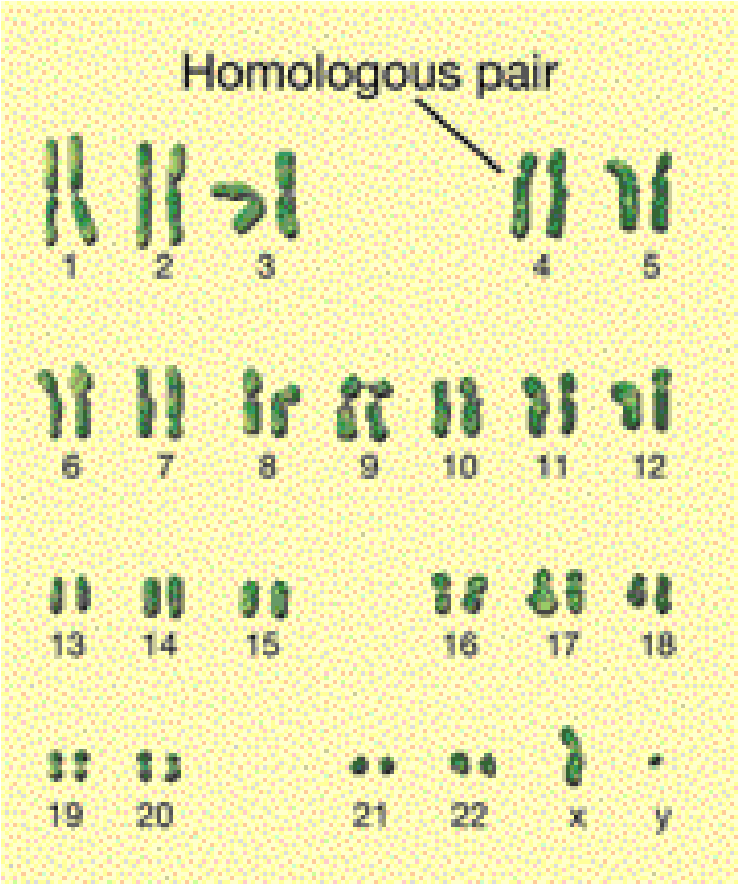
- **Asexual reproduction** is reproduction that requires only one parent.
- Most single-celled organisms like bacteria and protozoans reproduce this way.
- **Sexual reproduction** is a type of reproduction that involves special types of cells called sex cells.

Chromosomes

- **Sex cells** contain half the number of chromosomes as *body cells* (all of the other cells in a multicellular organism).
- Human body cells have 46 chromosomes. (diploid)
- Human sex cells have 23 chromosomes. (haploid)



- **In body cells, the chromosomes occur in pairs**.
- The chromosomes in each pair are called *homologous* (equivalent) pairs.

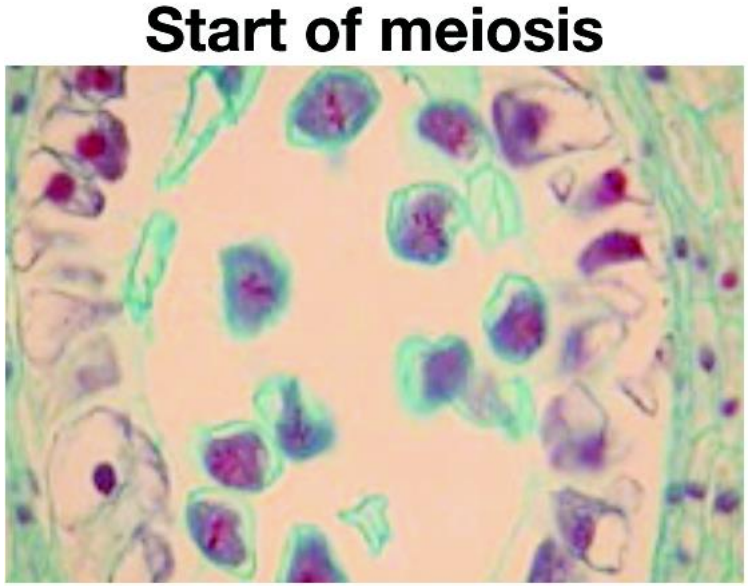


Gametes

- **gametes** - special cells that contain half the number of chromosomes as body cells.
- **Each gamete has only one of the chromosomes from each homologous pair**.

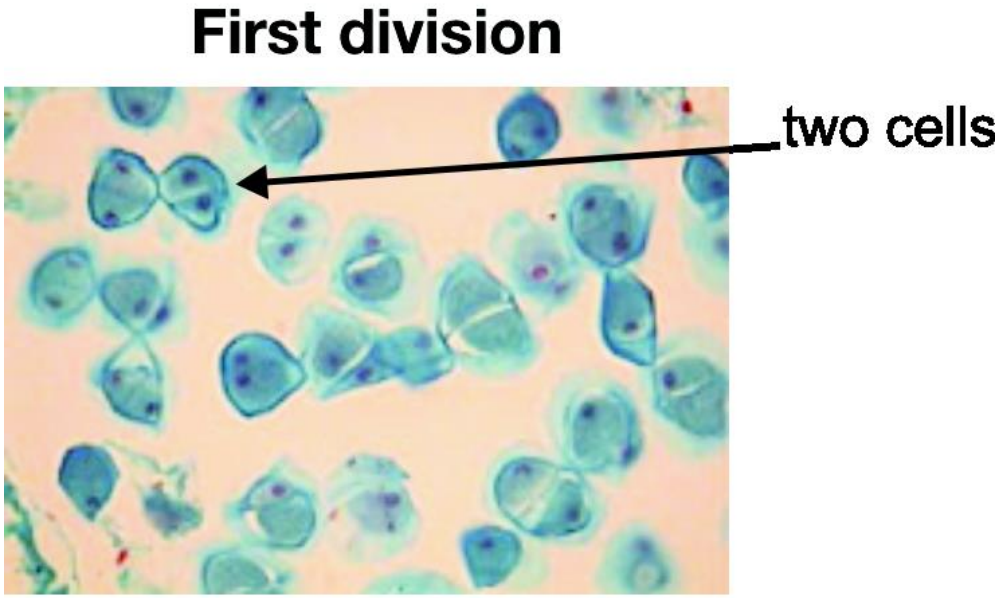
Meiosis

- Meiosis is cell division that produces sex cells with half the number of chromosomes.
- During meiosis, a cell undergoes two divisions to produce four gametes, each with half the number of chromosomes of the parent cell.



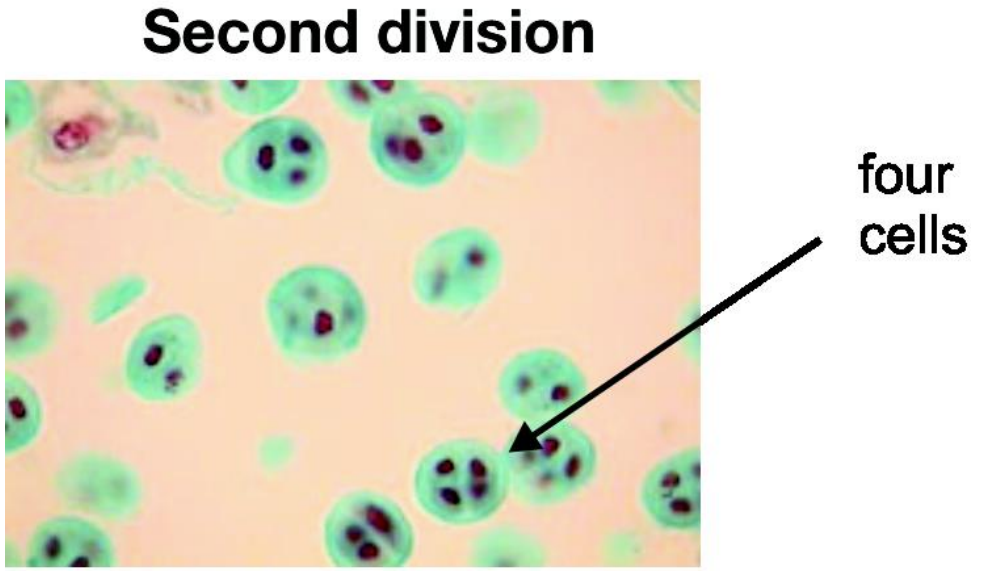
Meiosis – First division

- In the first division of meiosis, the homologous pairs of chromosomes separate.
- Remember, just before a cell divides, the chromosomes double.
- The doubled chromosome pairs line up along the center of the cell. Spindle fibers attach and pull the pairs apart. Two cells form. Each cell contains one doubled chromosome from each homologous pair.



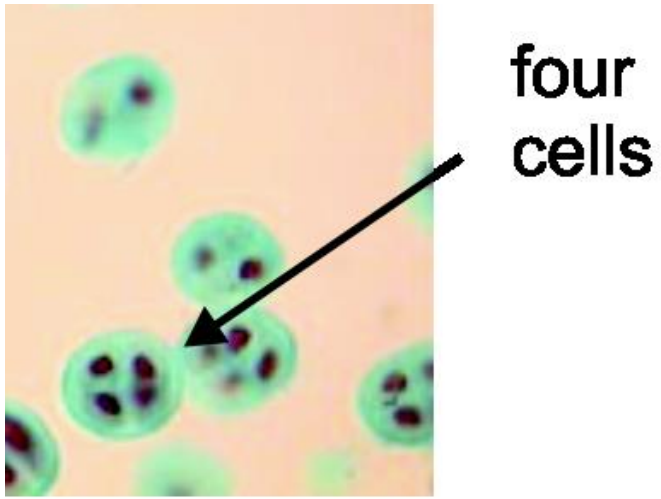
Meiosis – Second division

- In the second division of meiosis, the doubled chromosomes are split apart.
- The doubled chromosomes line up in the center of the cell. Spindle fibers pull the chromosomes apart at the center.
- The two halves move to opposite ends of the cell.

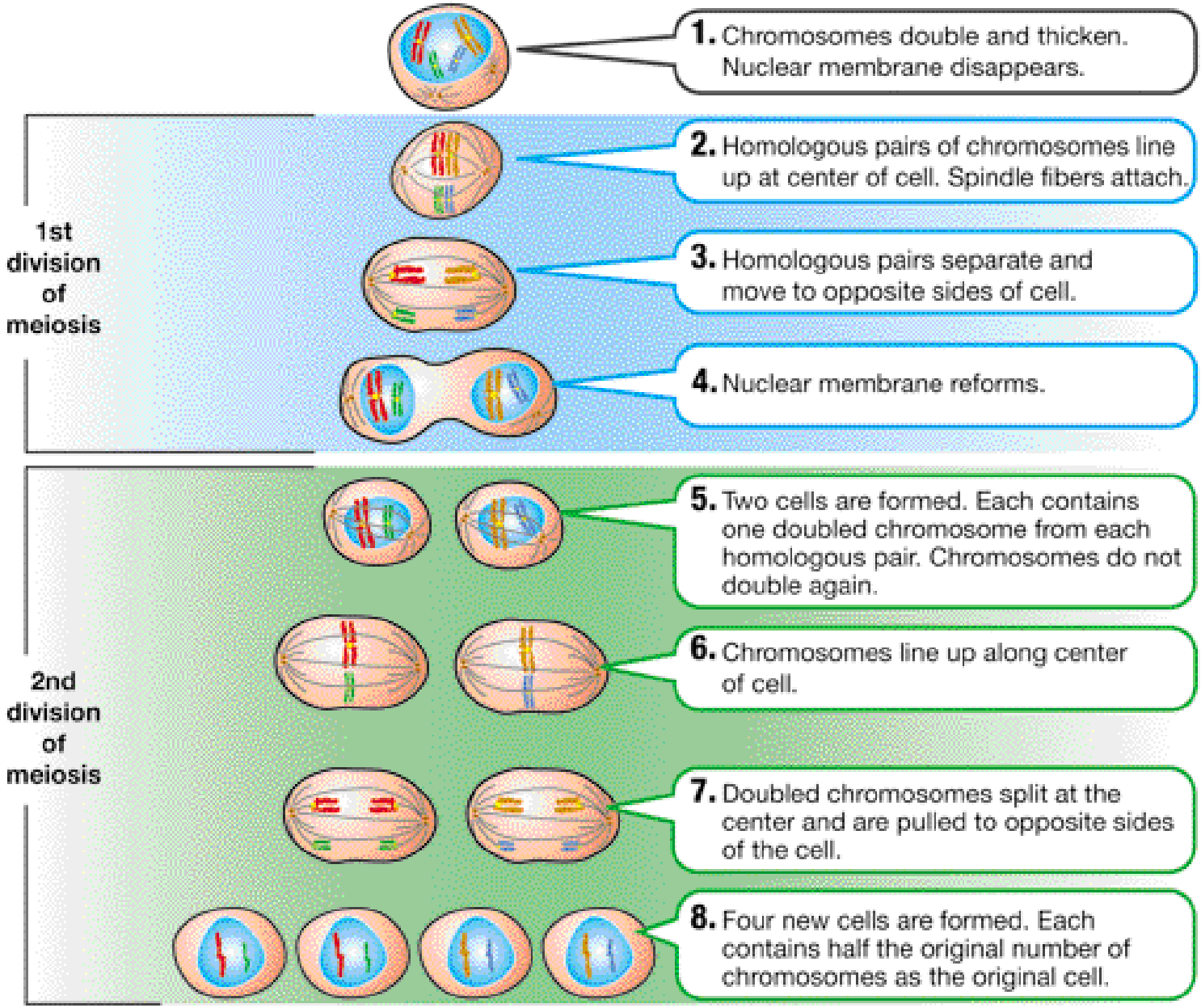


Meiosis – Final result

- The final result of meiosis is four gametes, each with half the number of chromosomes of the original parent cell.
- Each cell has only one chromosome from each original homologous pair.
- When male and female gametes combine to form offspring, each cell contributes half the normal number of chromosomes.
- The offspring has the normal number of chromosomes, half from the male parent and half from the female parent.



What Happens During Meiosis



Diploid sets

- A complete set of chromosomes is called a **diploid set**.
- Most animal cells except the sex cells have a diploid set of chromosomes.
- The diploid human set has 23 pairs of chromosomes (a total of 46).

	Diploid set	Haploid set
Human	46	23
Chicken	78	39
House fly	12	6
Tomato	24	12

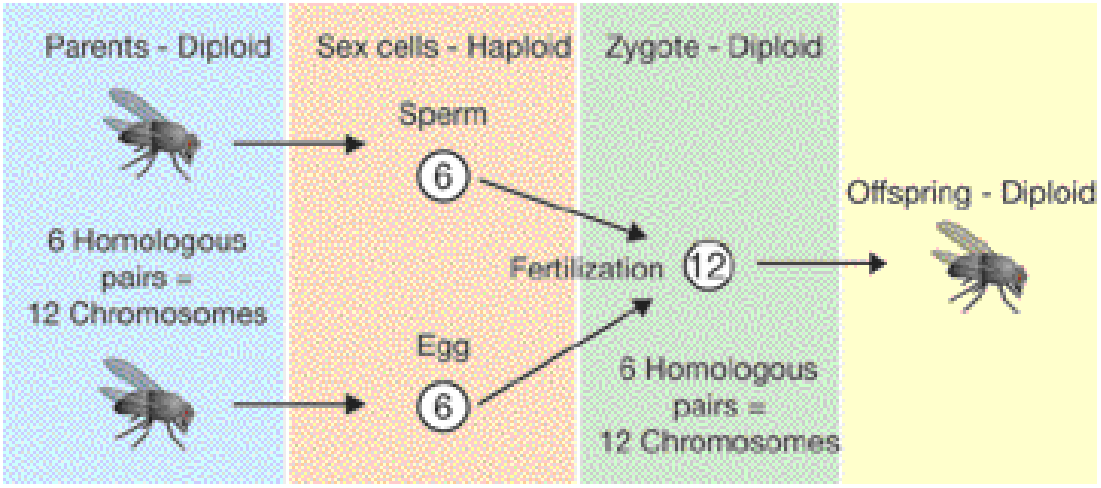
Haploid sets

- Sex cells have half of a complete set of chromosomes, or only one chromosome from each homologous pair.
- A half set of chromosomes is called a **haploid set**.
- Humans have 23 chromosomes in their sex cells—a haploid set.

	Diploid set	Haploid set
Human	46	23
Chicken	78	39
House fly	12	6
Tomato	24	12

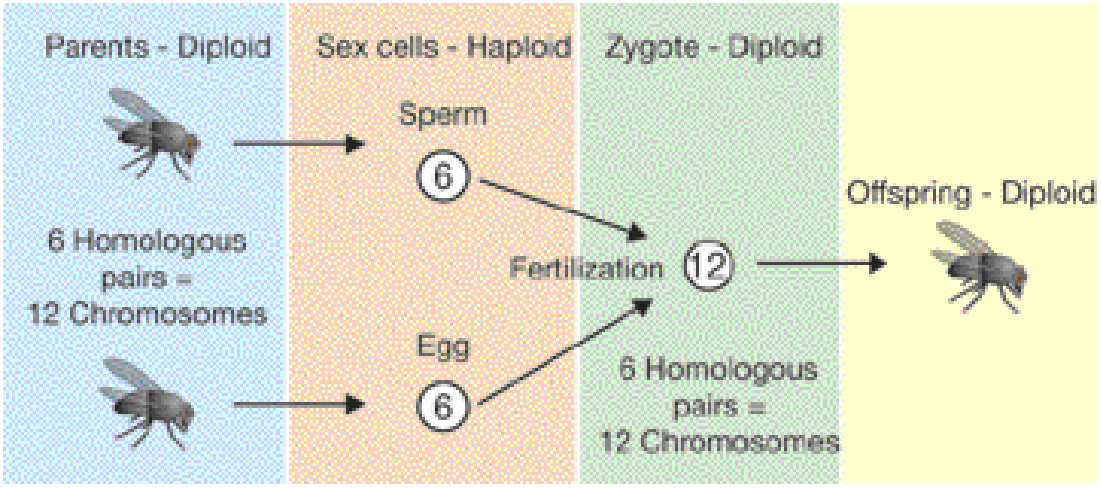
Fertilization

- **Fertilization is the union of egg and sperm to form a new organism.**
- **When an egg is fertilized by a sperm, the haploid set of chromosomes from the father unites with the haploid set of chromosomes from the mother.**



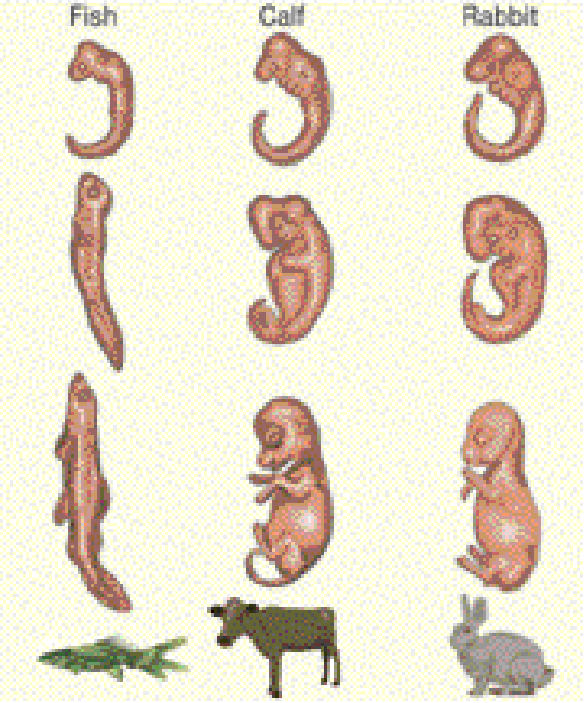
Fertilization - Zygote

- A fertilized egg, called a zygote, has a diploid set of chromosomes.
- For each homologous pair, one chromosome comes from the mother, and one from the father.



Cell differentiation

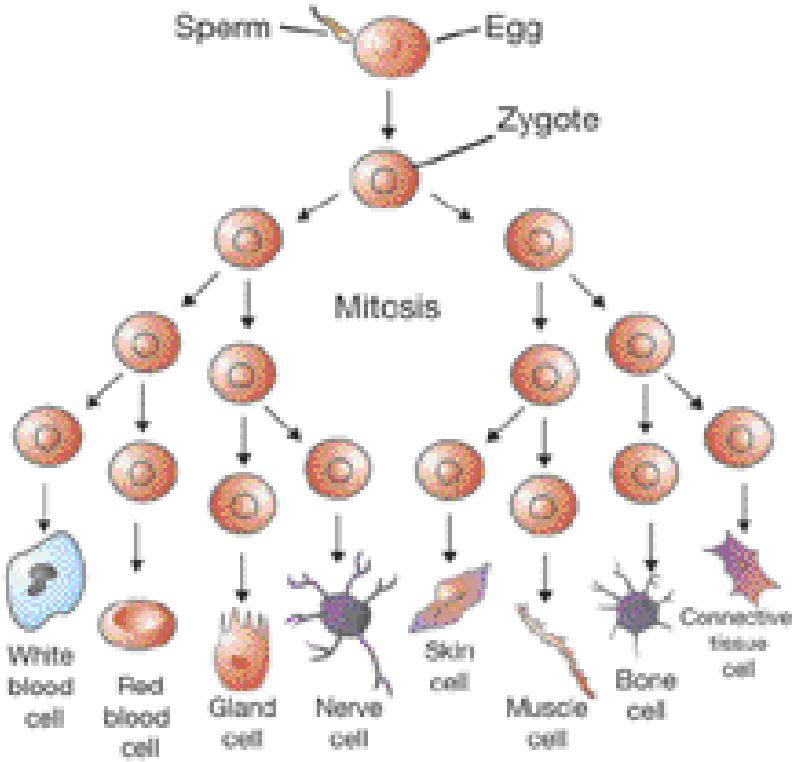
- After fertilization, the zygote rapidly divides by mitosis and becomes an embryo.
- An embryo is an organism in its earliest stages of development.



- The embryos of a fish, calf and rabbit, over time, develop into young organisms.

Cell differentiation

- The final outcome is a multicellular organism with many different types of specialized cells.
- You have brain cells, stomach cells, skin cells, and muscle cells to name just a few.
- All of those cells can be traced back to the zygote.



Cell differentiation

- An organism that is not fully developed is called an embryo. In the developing embryo, cells begin to differentiate.
- **Cell differentiation** is the process of cell specialization.
- For example, cells that eventually divide to become part of the stomach are different from those that will become part of the nervous system.
- As cells differentiate, they give rise to different tissues. These tissues eventually form the organs.

Questions: Meiosis Demonstration

1) When does DNA replication occur?

2) Why can crossing over occur only in Prophase I?

3) Why are there 2 divisions in meiosis instead of one like mitosis?

4) Gametes are described as haploid, while body cells are diploid. What do these terms mean?

5. What are homologous pairs of chromosomes?

6. What 2 events can happen during meiosis to produce more variation in the egg and sperm?

7. Were your gametes in the activity identical?