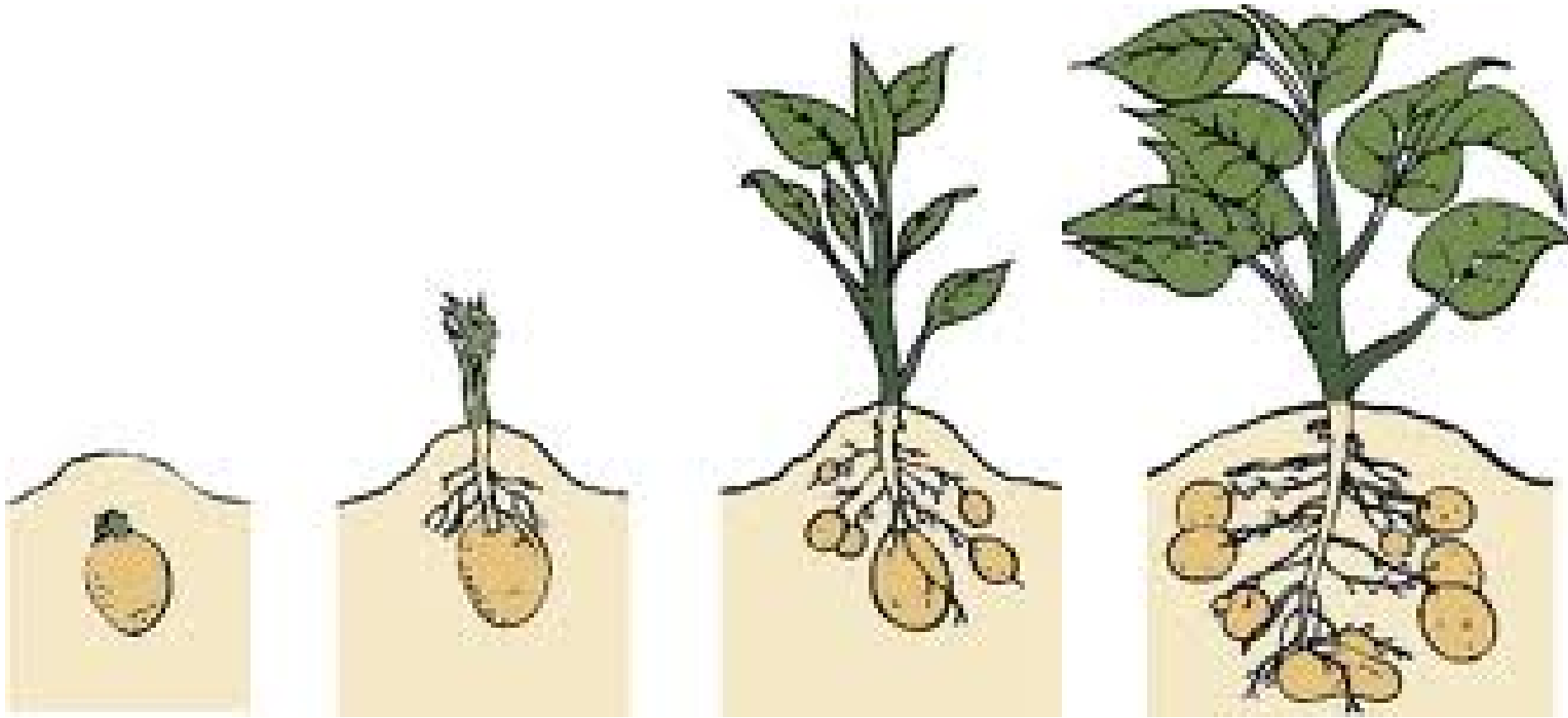


#2 How do organisms grow?



Why doesn't a cell keep growing larger and larger?

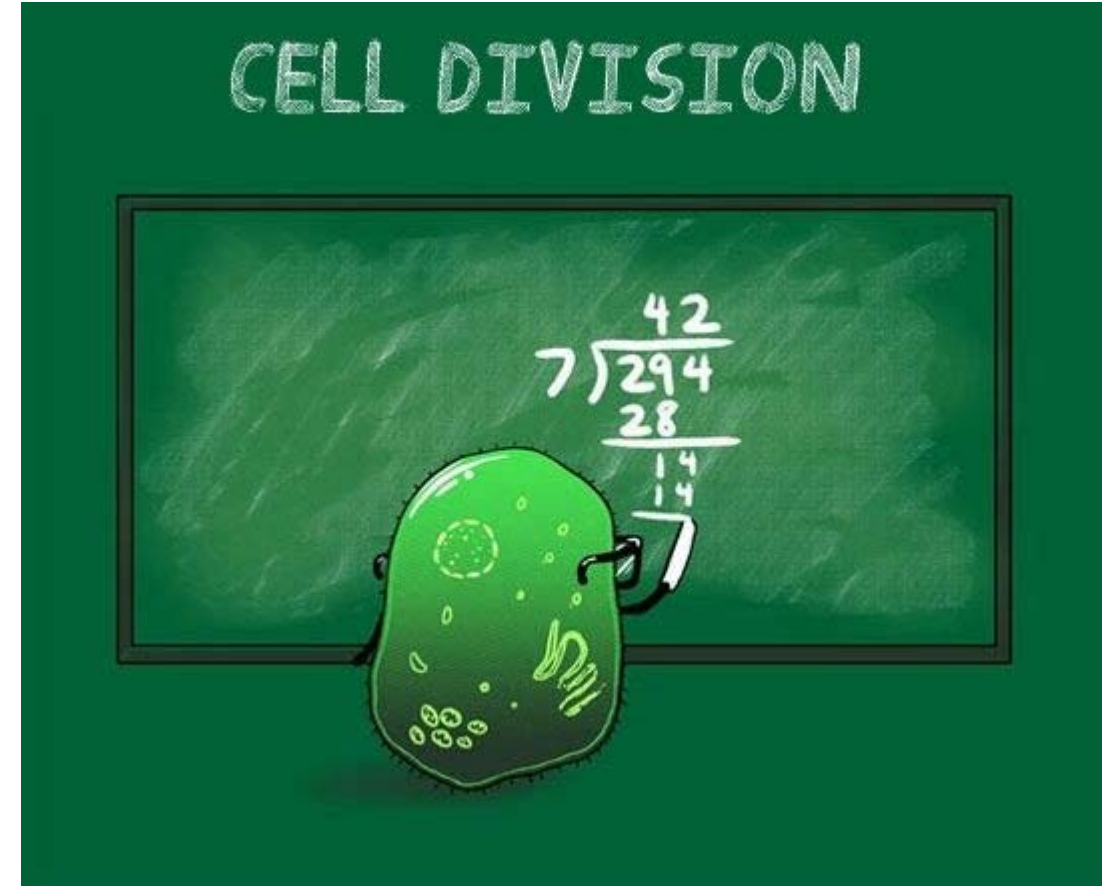
- The larger a cell becomes the more demands the cell places on its DNA.
- The cell also has trouble moving enough nutrients and wastes across the cell membrane
- Think about a small town with a small library
 - People are able to take out books with no problem and they are available when needed.
- What would happen if the size of the town started growing?



When you say you're a single-celled organism,
what do you mean by 'single'?

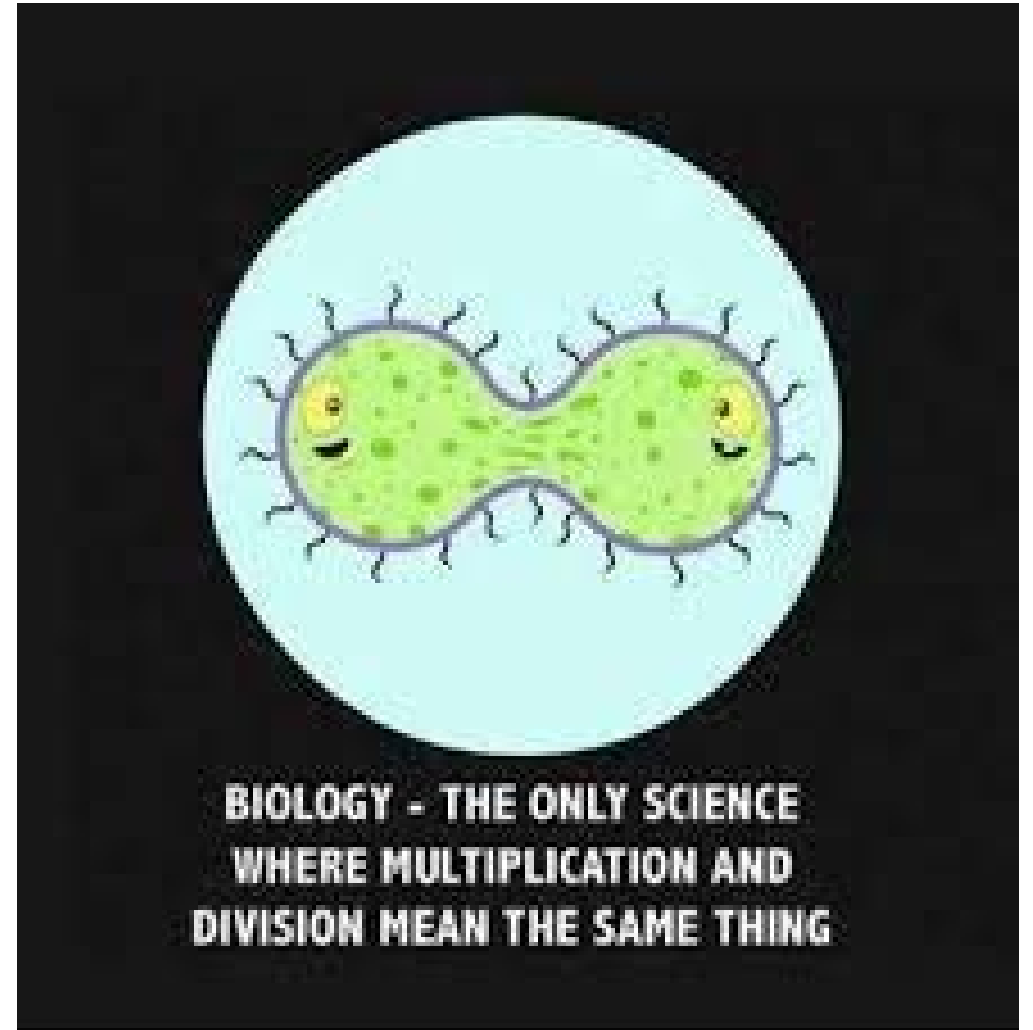
So what does the cell do?

- It divides!
- The process by which a cell divides into two new daughter cells is known as CELL DIVISION
- What needs to happen before it can divide?








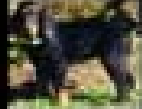
Cell division

- In Prokaryotes it is much simpler as there are no membrane bound organelles
- In Eukaryotes it is more complex and happens in two main stages
 - Mitosis
 - Cytokinesis
- Unicellular organisms can reproduce via mitosis/cytokinesis
 - Asexual reproduction as offspring are genetically identical to parent
- Mitosis is the source of new cells when a multicellular organism grows and develops.



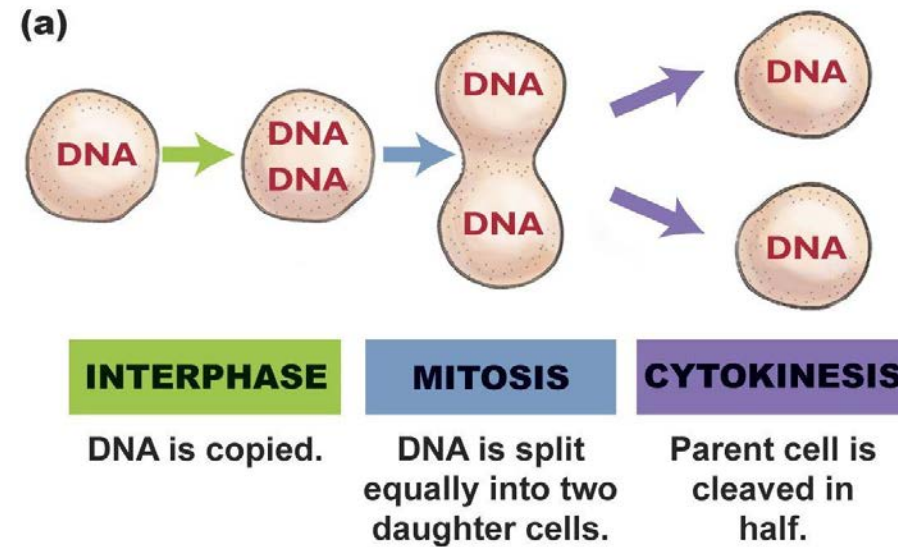
Chromosomes....why are they important?

- Chromosomes are made up of genetic information(DNA) and proteins
- The cells of every organism have a specific number of chromosomes
 - Ex carrot cells have 18 chromosomes and humans have 46 chromosomes

	Organism	Number of chromosomes
	pea plant	14
	sun flower	34
	cat	38
	puffer fish	42
	human	46
	dog	78

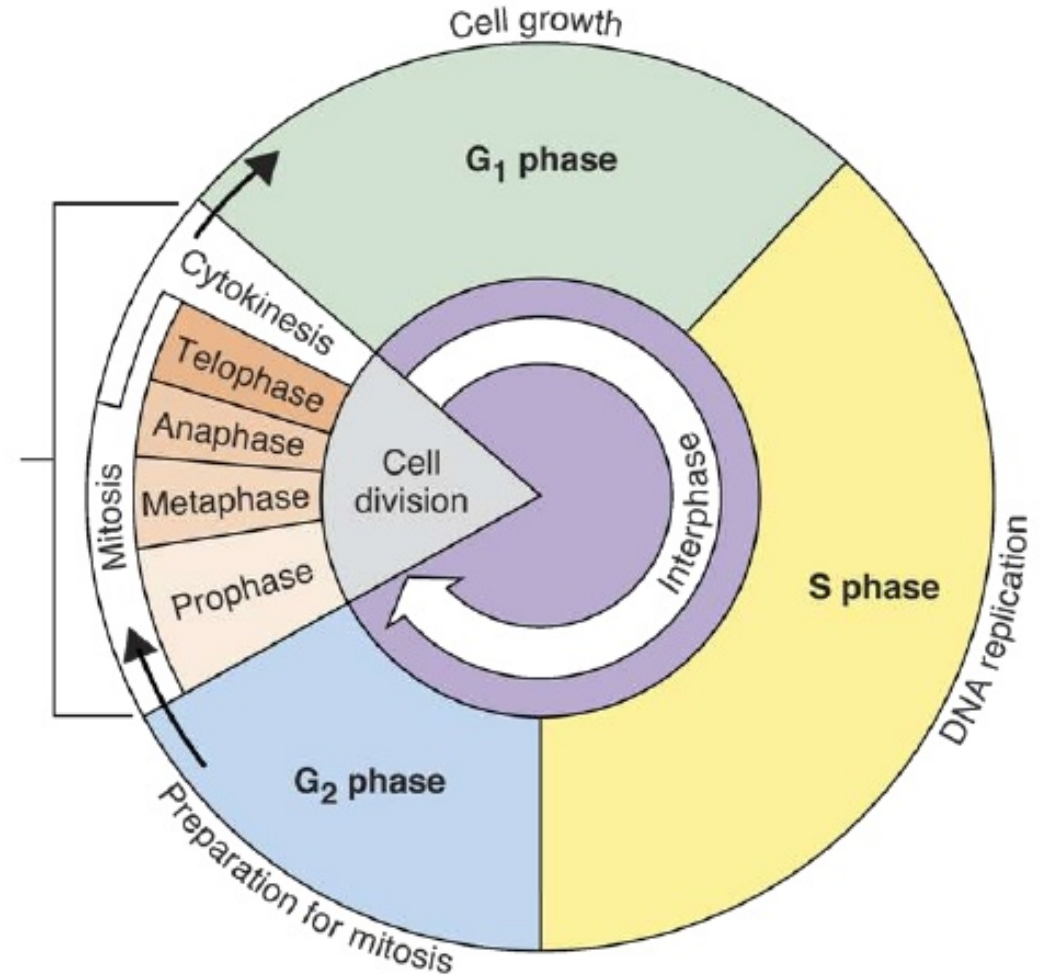
Cell Division

- Before the cell can divide its chromosomes (DNA) must be copied
- DNA will split equally into two daughter cells
- Daughter cells are genetically **IDENTICAL** to parent cell



The “Cell Cycle”

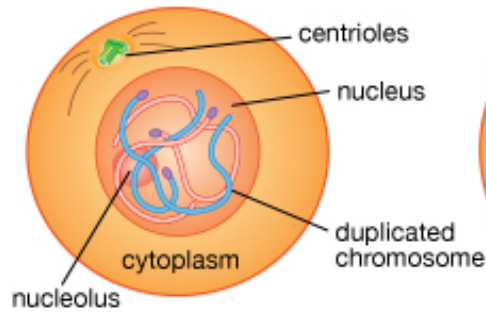
- Series of events cells go through as they grow and divide
 - Cell grows
 - Prepares for division
 - Divides
 - Repeat
- Cells spend 90% of their “life” in Interphase where the cell grows, develops and replicates its organelles/ DNA
- Mitosis/Cytokinesis is where the cell divides



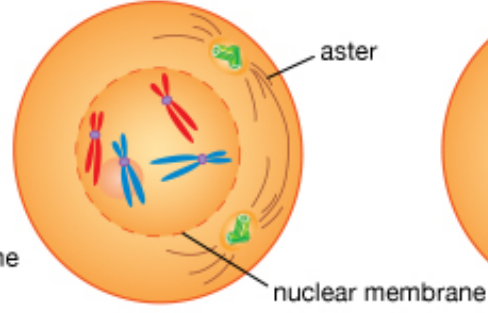
Mitosis

- 4 phases
 - Prophase
 - Metaphase
 - Anaphase
 - Telophase

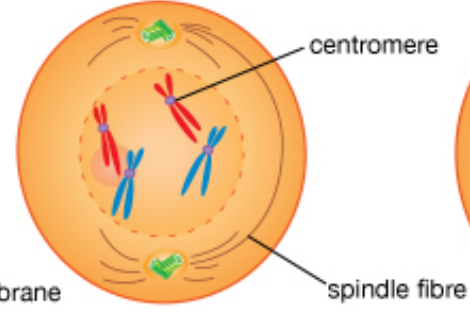
Mitosis, or somatic cell division



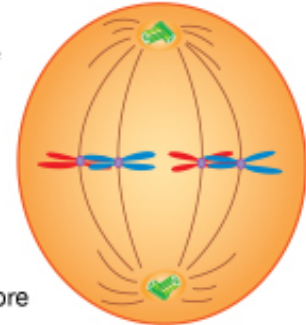
Prior to mitosis, each chromosome makes an exact duplicate of itself. The chromosomes then thicken and coil.



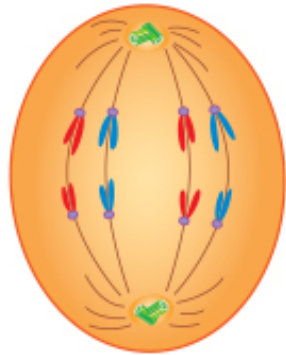
In early prophase the centrioles, which have divided, form asters and move apart. The nuclear membrane begins to disintegrate.



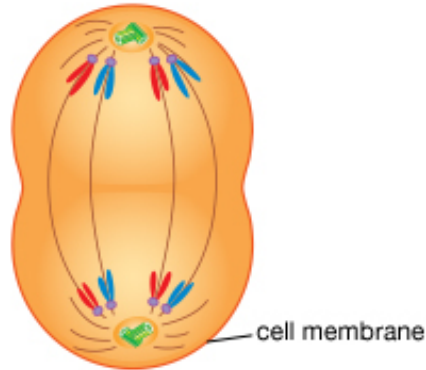
In late prophase the centrioles and asters are at opposite poles. The nucleolus and nuclear membrane have almost completely disappeared.



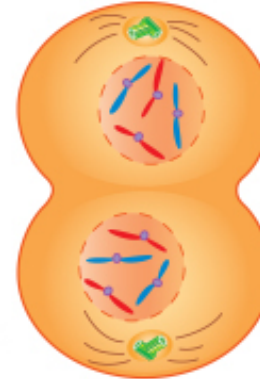
The doubled chromosomes—their centromeres attached to the spindle fibres—line up at mid-cell in metaphase.



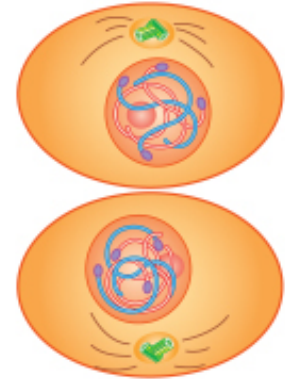
In early anaphase the centromeres split. Half the chromosomes move to one pole, half to the other pole.



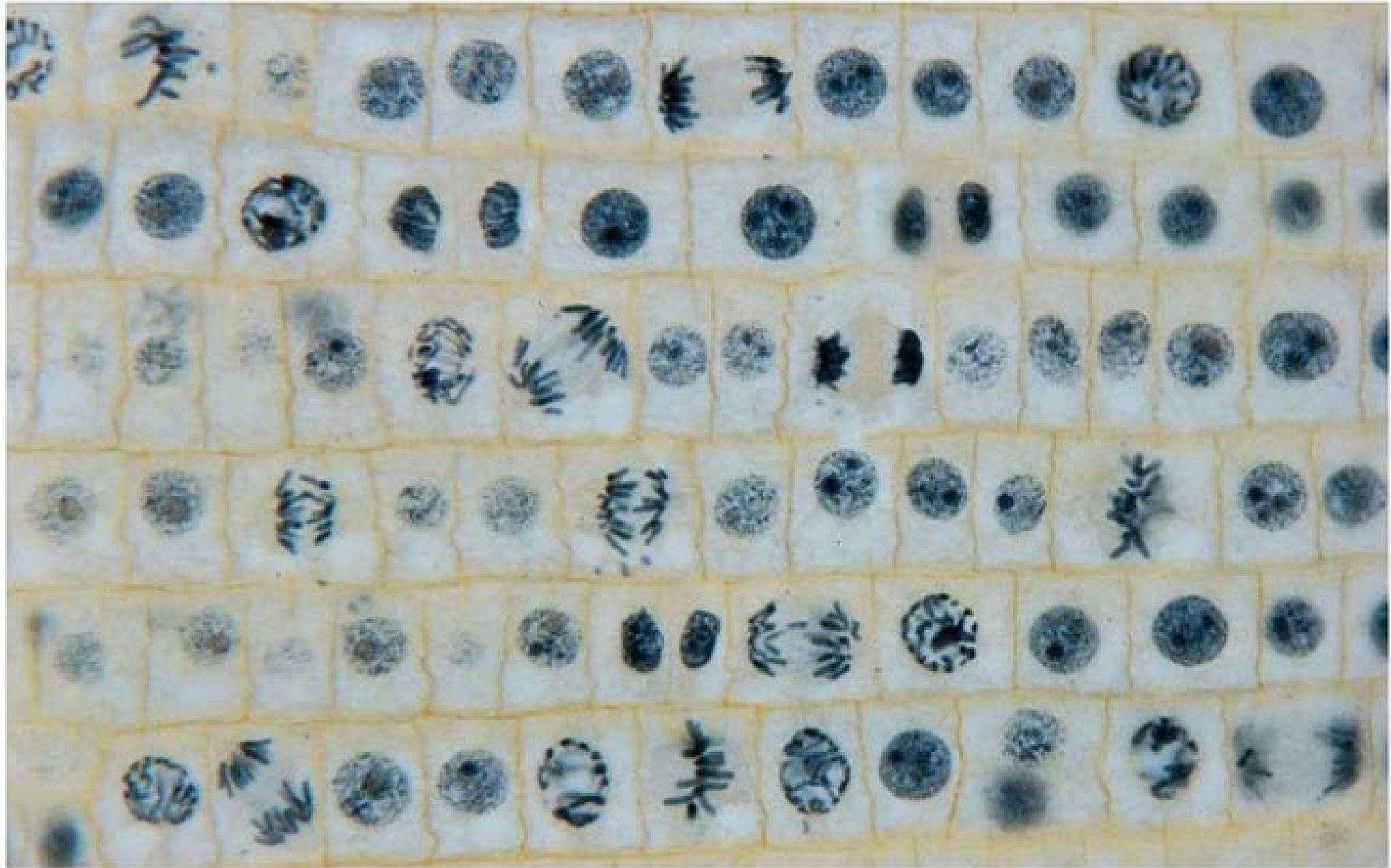
In late anaphase the chromosomes have almost reached their respective poles. The cell membrane begins to pinch at the centre.



The cell membrane completes constriction in telophase. Nuclear membranes form around the separated chromosomes.

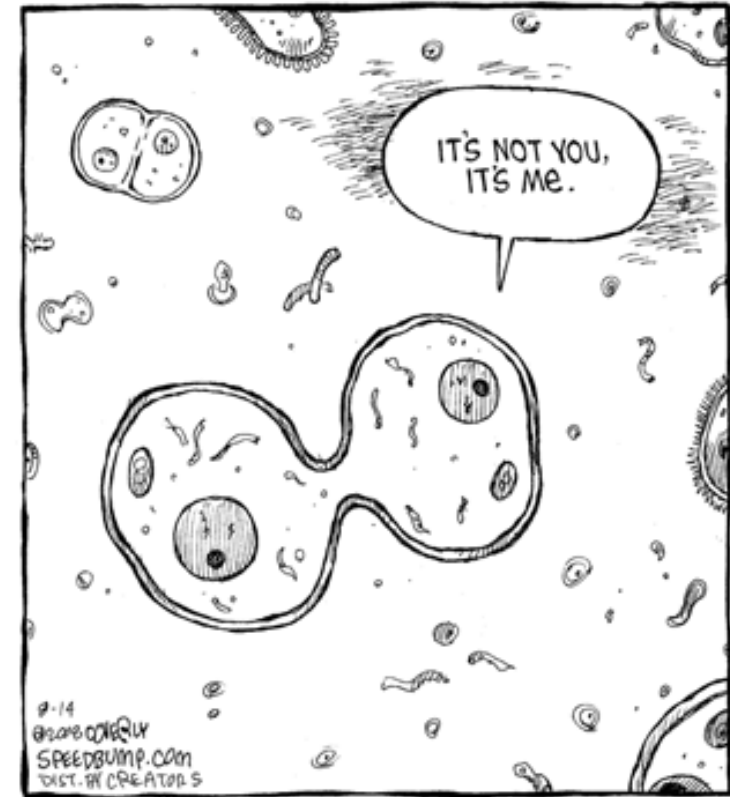


At mitosis completion, there are two cells with the same structures and number of chromosomes as the parent cell.



Discussion Questions

- Why can't the size of a cell continue to increase infinitely?
- How does an organism grow?
- What phase are cells in for the majority of the cell cycle? What occurs here?
- What is the result of the cell cycle? Draw a diagram.

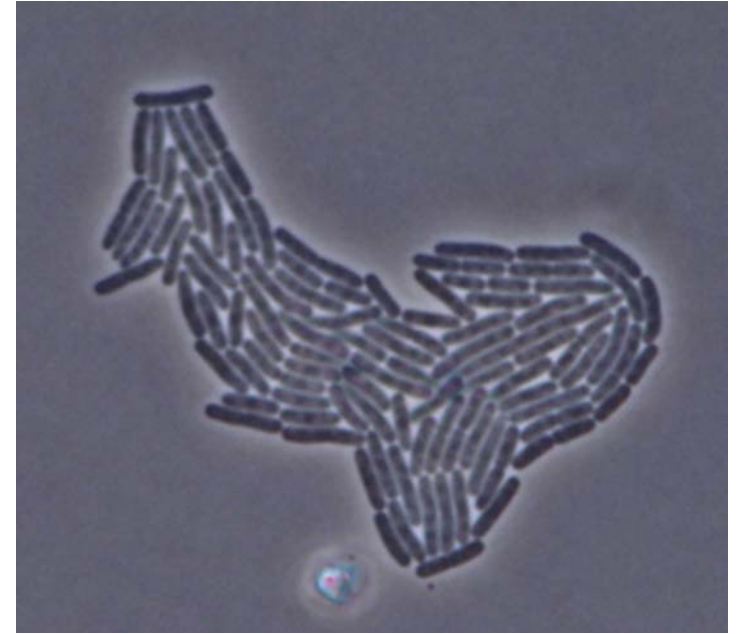


Why else does the cell divide?



#3 Reproduction

- Asexual
- Sexual



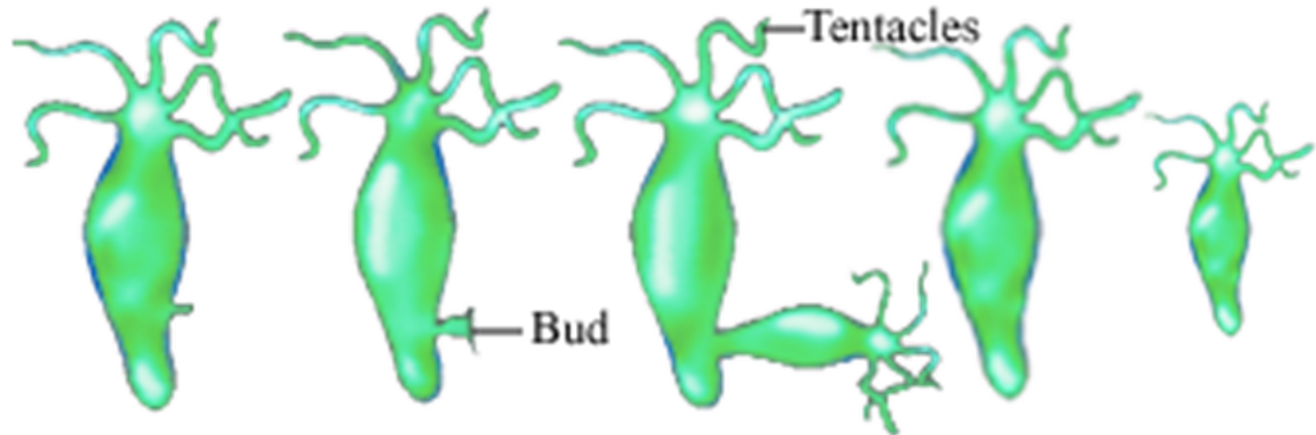
Asexual Reproduction

- Involves only one parent
- All offspring produced are genetically identical to the parent
- Reproduction is fast
- Lots of offspring are produced
- Not a lot of energy required



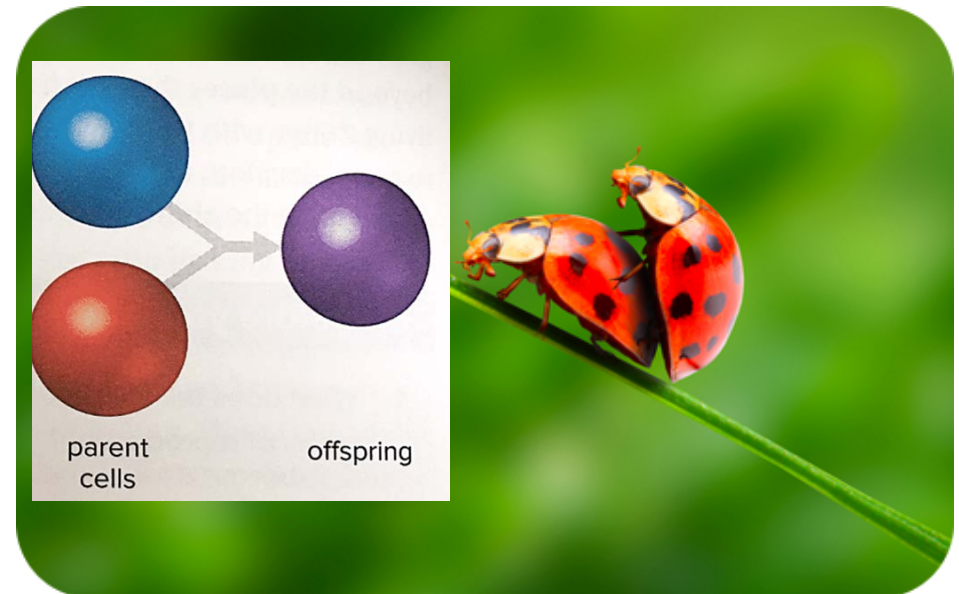
Types of Asexual Reproduction

- Binary Fission
 - The parent undergoes cell division to produce two genetically identical daughter cells
 - Allows for rapid population growth
 - Bacteria
- Cell Cycle
 - Eukaryotes
- Budding
 - Offspring begins as a small growth on the parent and then breaks off



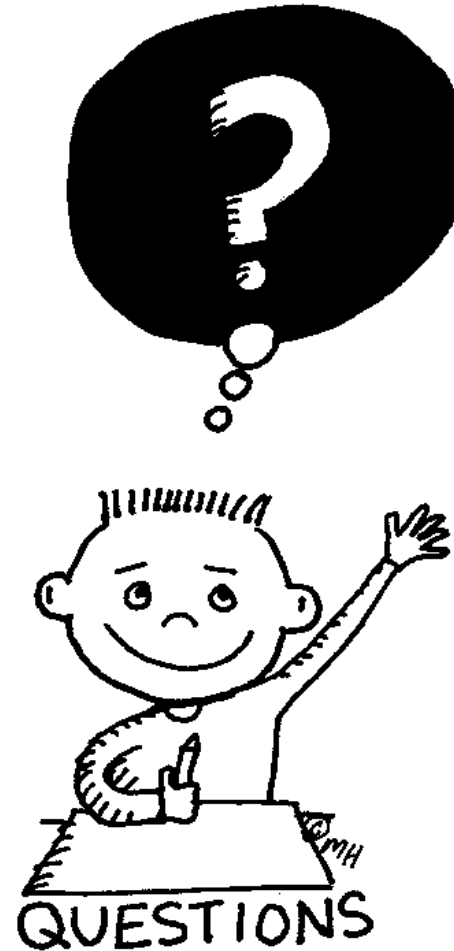
Sexual Reproduction

- Two separate organisms contribute genetic info in sex cells
- Offspring are genetically different from parents
- Few offspring produced
- Reproduction is slow
- Energy required
 - Search for a mate
 - Offspring often dependant on parent
 - Offspring often take time to develop



Question!

- How do we reproduce sexually but still keep the same number of chromosomes in our cells



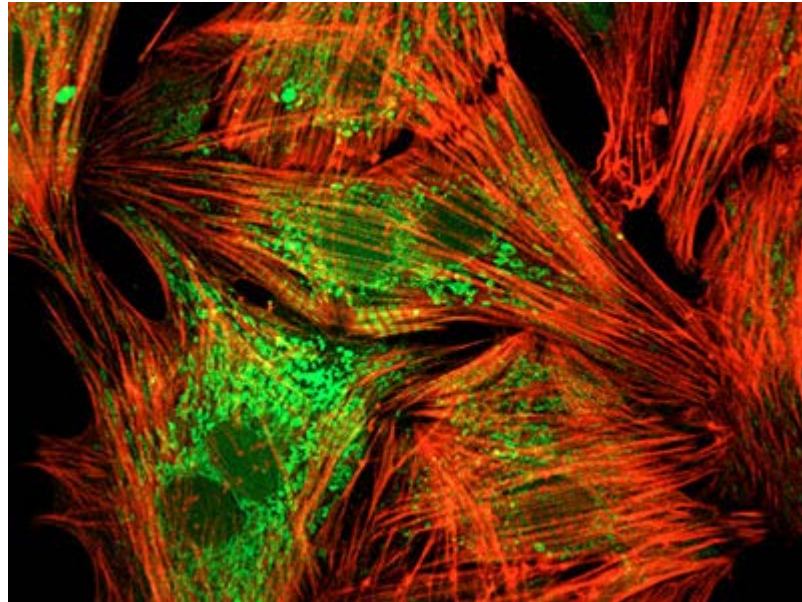
Multicellular Organisms

- Reproduce sexually
- Have two types of cells:
 - Somatic cells
 - Sex cells



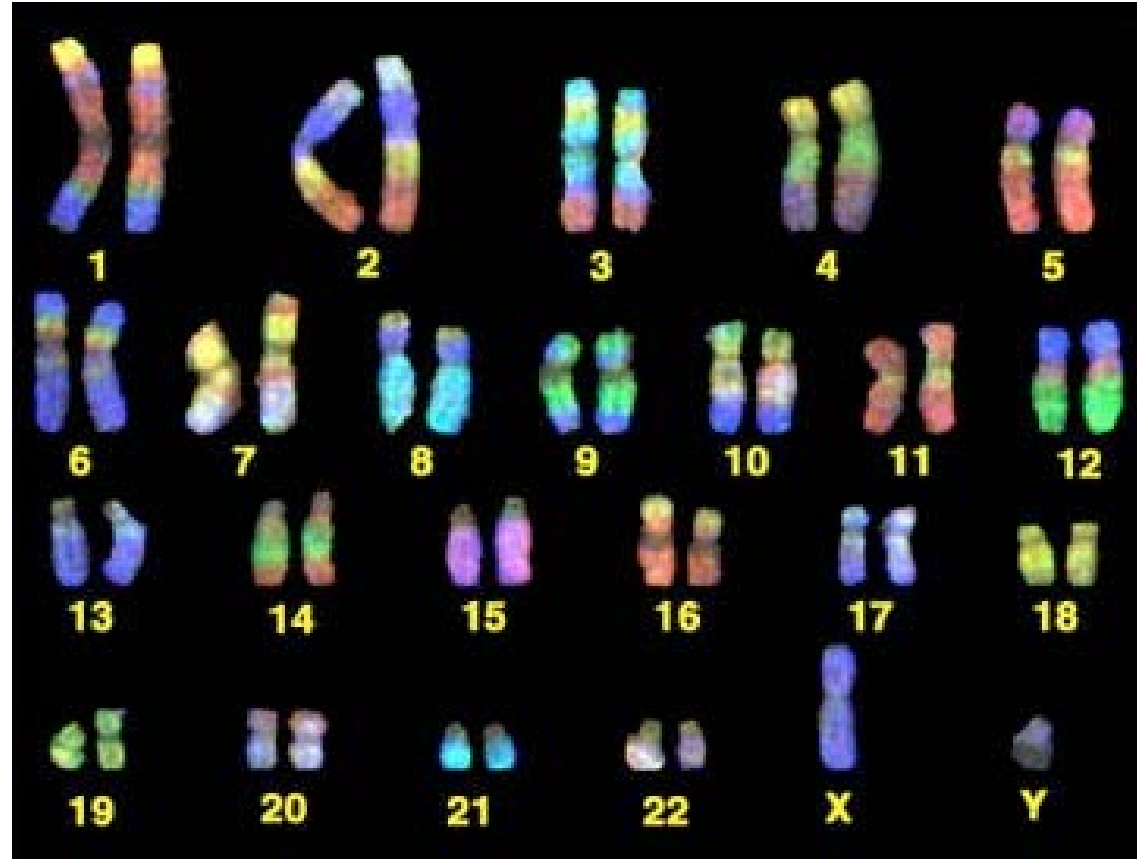
Somatic Cells

- Reproduce by cell division (asexually)
- Make up the majority of the organism



Human Somatic Cells

- Have a full set of chromosomes 46 total or 23 pairs (Diploid)
 - Paired chromosomes
 - 1 comes from the female, 1 from the male
 - Known as homologous chromosomes
 - Carry same genes but not necessarily the same version of the gene
 - Ex Eye colour
 - Versions (Alleles)
 - Brown, Blue, Green, Grey etc



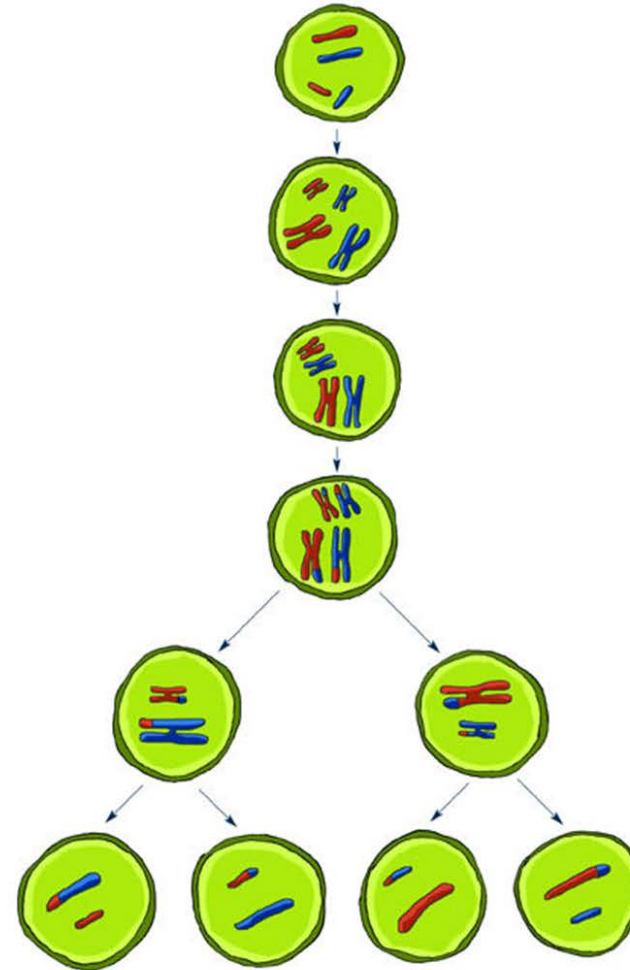
Sex Cells

- Are called gametes
- Have half the number of chromosomes (Haploid)
- Male: sperm
- Female: egg



How are Sex Cells Produced

- Meiosis
 - Meiosis happens only in the cells that produces gametes – reproductive cells
- These cells go from diploid to haploid
 - Diploid – complete set of chromosomes
 - Haploid – half the # of chromosomes



Product of Meiosis

- Sex cells that have HALF of the genetic information
- When sexual reproduction occurs the gametes fuse to produce a zygote with the correct number of chromosomes
 - 46 for humans
- This ensures diversity (differences) in the population



Discussion Questions

- How come sexual reproduction does not result in doubling of chromosome #'s?
- What produces Somatic cells?
- What produces sex cells?
- Why does sexual reproduction produce genetically different offspring?