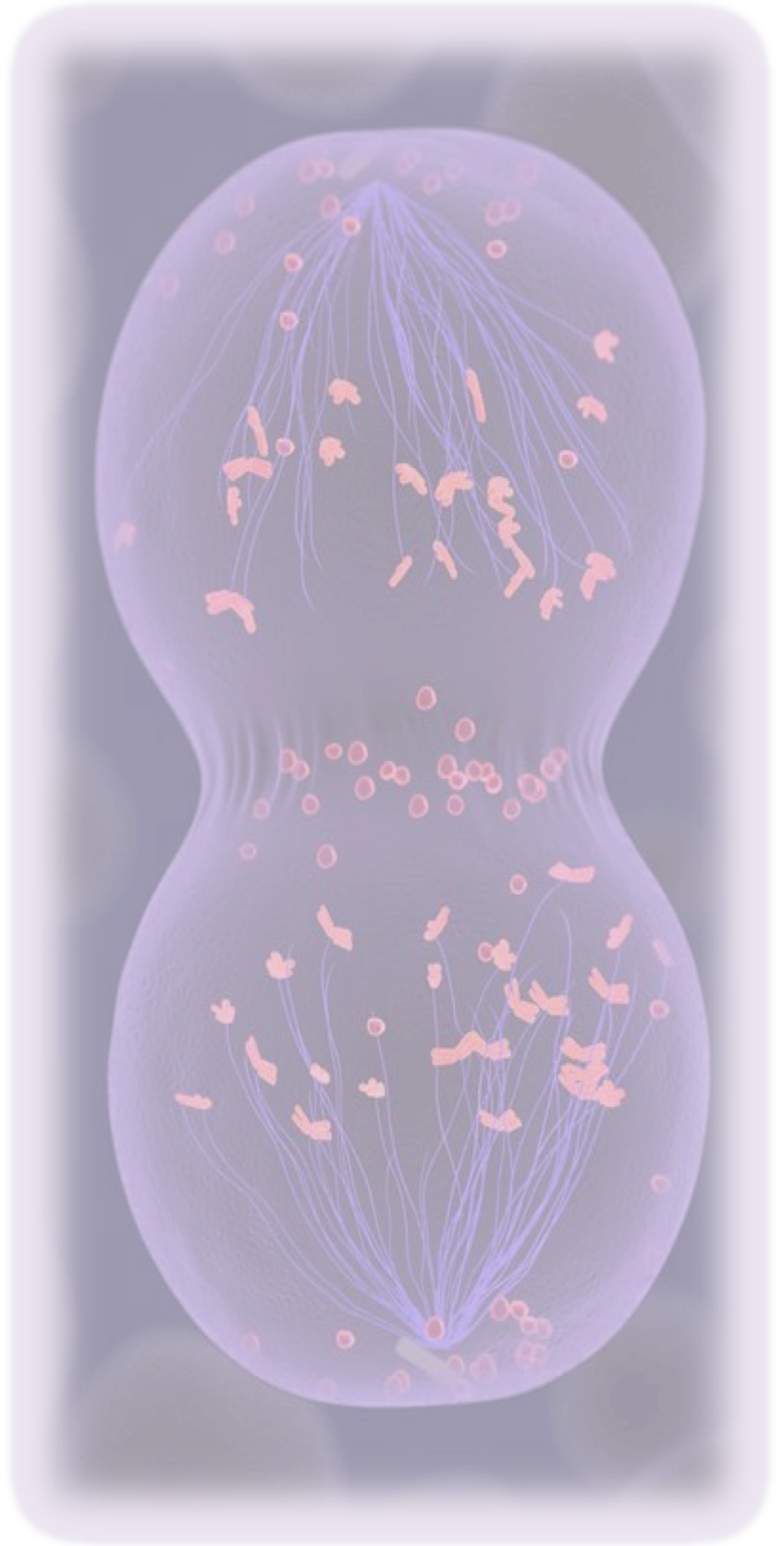


Science 9

Biology

Cell Division and
Reproduction Booklet 1
M. Roberts – RC Palmer



How do all living organisms reproduce and grow?

Goal 1: Cell Review – Recall and become reacquainted with the structures found in cells

Timeline: 2 – 3 classes

Activities:

Notes, Mix and Match, Assessments

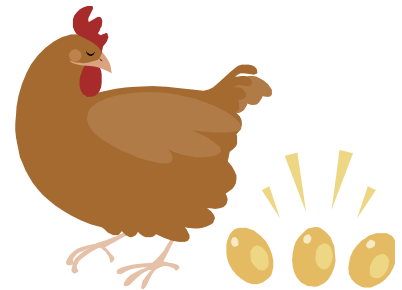
Assessments:

1. *Class cell:* Organelle teams (5 marks) – Find and research an organelle as selected from Ms. Roberts' slips. Create an 11 x 17 sheet with the organelle information on it and present to the class. Attach to the class cell image on white board.
2. *Exit Materials and Notes completion* (5 marks) – show completed notes and exit package questions for 5 marks.

Notes: CELL REVIEW

What is a cell?

- A cell is the _____ of life
- All living organisms have one or more _____
- All cells come from the _____ of preexisting cells



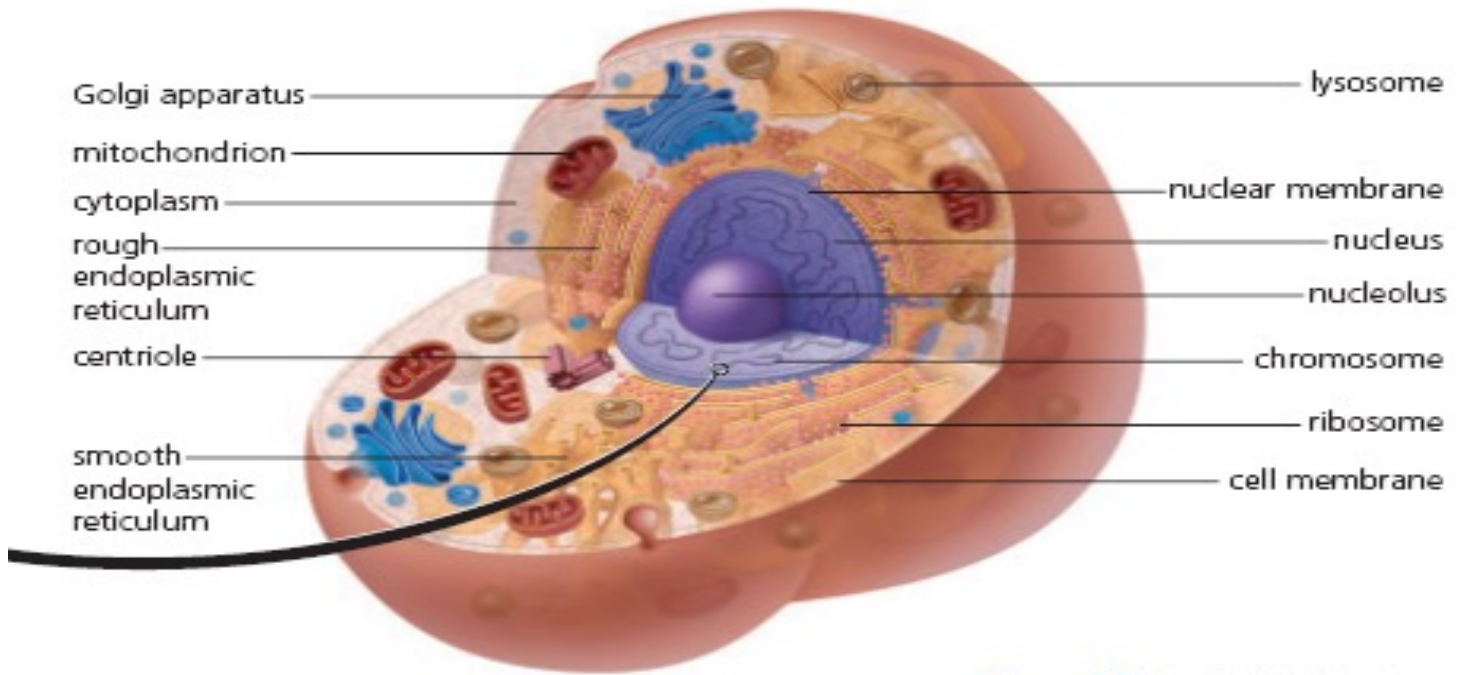
Other Interesting Cell Facts

- Most are _____ but some are large (ex. Chicken's egg is one single cell)
- **You** are composed of **up to 100** _____ cells! (that's 100,000,000,000,000 cells!)
- _____ **red blood cells** would fill the letter "O" on a page of type. Each square cm of your skin contains about _____ skin cells.

What are the basic structures found in cells?

What structures are found in all cells?

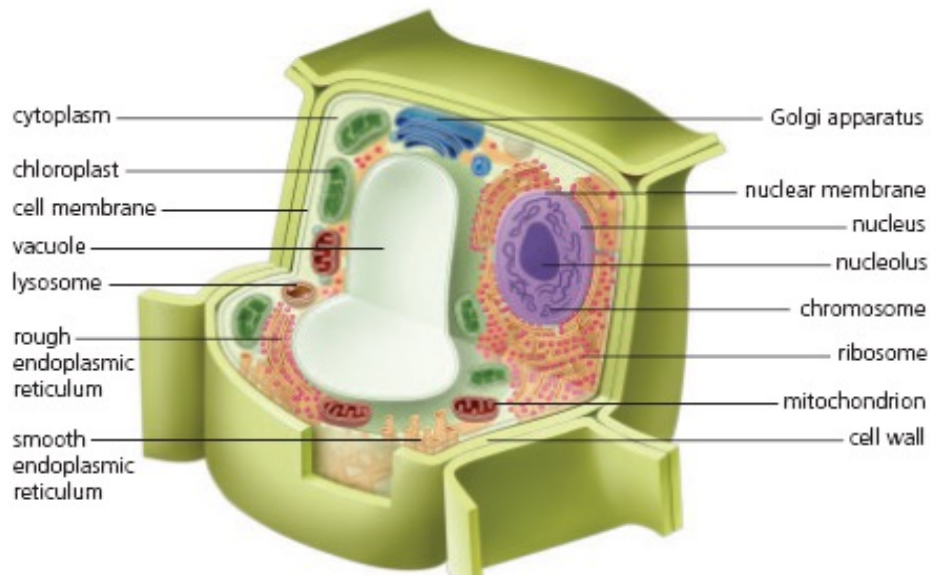
1. **CELL MEMBRANE:** the thin layer which **separates the cell contents from its environment.**
 - The cell membrane _____ **what goes** _____ **and** _____ **of the cell.**
2. **NUCLEUS:** (plural = _____) specialized structure within the cell which contains **DNA** (_____)
 - controls cell functioning and _____
3. **ORGANELLES:** small bodies with specific structures and functions within the cell.
 - Can be compared to human _____ like the stomach, brain.
4. **CYTOPLASM:** the _____ substance between the nucleus and the cell membrane, in which the organelles are located.



What structures do animal cells have?

1. **Lysosomes:** _____ **food** and **destroys wastes** or chemicals.
2. **Ribosomes:** Small structures that receive the message from the nucleus. Ribosomes are the **places where** _____ **are made**.
3. _____ **Reticulum:** (ER) " _____ " ER holds ribosomes and takes the proteins they make for further processing.
Can package them and ship them to the Golgi Apparatus.
4. " _____ " ER produces _____ for the cell and produces chemicals that can detoxify poisons.
5. _____ **Apparatus:** structures that look like stacks of pita bread.
proteins and other molecules are _____ and _____ for transportation around the cell and outside the cell.
6. **Mitochondrion** (pl.= _____): **produce** _____ for the cell
7. **Vacuoles & Vesicles:** _____ **substances within the cell and out of the cell.** _____ **are very large vesicles.**

What structures do plant cells have?



- Like Animal Cells, Plant cells include: _____

Structures that are found in PLANT CELLS that are NOT found in ANIMAL CELLS

1. **_____ wall:** Thick and strong outer layer _____ cell membrane.
 - Helps to protect the cell and _____ its shape.
 - Made out of _____
 - This is what is used to make _____
2. **Chloroplasts:** found **only** in _____ cells.
 - Chloroplasts change (_____) the energy of the sun and carbon _____ into sugar (_____) and _____
3. **Central Vacuole:** similar function as normal vacuoles, but also helps in the growth and _____ of the cell.

Goal 2: Exploring the nucleus and understand the components of the nucleus and their importance in heredity.

Timeline: 2 – 3 classes

Activities:

Notes, Video- 23 and me- Genetics 101, Assessments

Assessments:

1. *Licorice DNA:* Construct a DNA molecule using edible ingredients. (20 marks)

2. *Exit Materials and Notes completion* (5 marks) – show completed notes and exit package questions for 5 marks.

Notes: The Nucleus: Control Center of the Cell

TODAY'S KEY WORDS:

Helix = _____

Nitrogenous Bases = _____

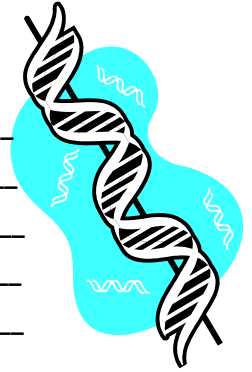
Sugar Phosphate = _____

Chromatin = _____

Proteins = _____

Chromosomes = _____

Genes = _____



If all your cells have the same organelles, then how do they have different roles?

- the _____ contains the instructions for the roles of cells
- the master set of instructions determines what each cell will become and how it will _____
- the instruction is the _____

What is the structure of DNA? DNA is a very long molecule with _____ strands

- It looks like a _____ ladder
- The word that scientists use is _____
- The sides of the molecule are made up of _____ and _____
- We call this the _____ - _____
- The steps (_____) of the ladder are made up of _____

Draw and label the structure of DNA

What makes each DNA molecule unique?

How the _____ are arranged is what gives the specific instructions

- The bases on each side always join:

_____ bonds to _____

_____ bonds to _____

- The order and number of bases can vary because a DNA molecule is SO _____
- In humans a single DNA molecule can be several _____ base pairs in length

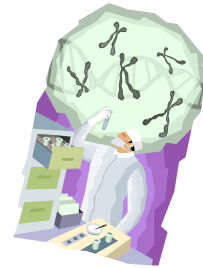
How is DNA stored?

In the nucleus, when DNA is being used it is stored as _____

- It contains DNA and _____
- Each strand of chromatin is one _____ of DNA
- DNA is in the chromatin form when the cell is _____
- This is when the cell is making _____ which it needs, the DNA gives the instructions for what types of proteins are to be made

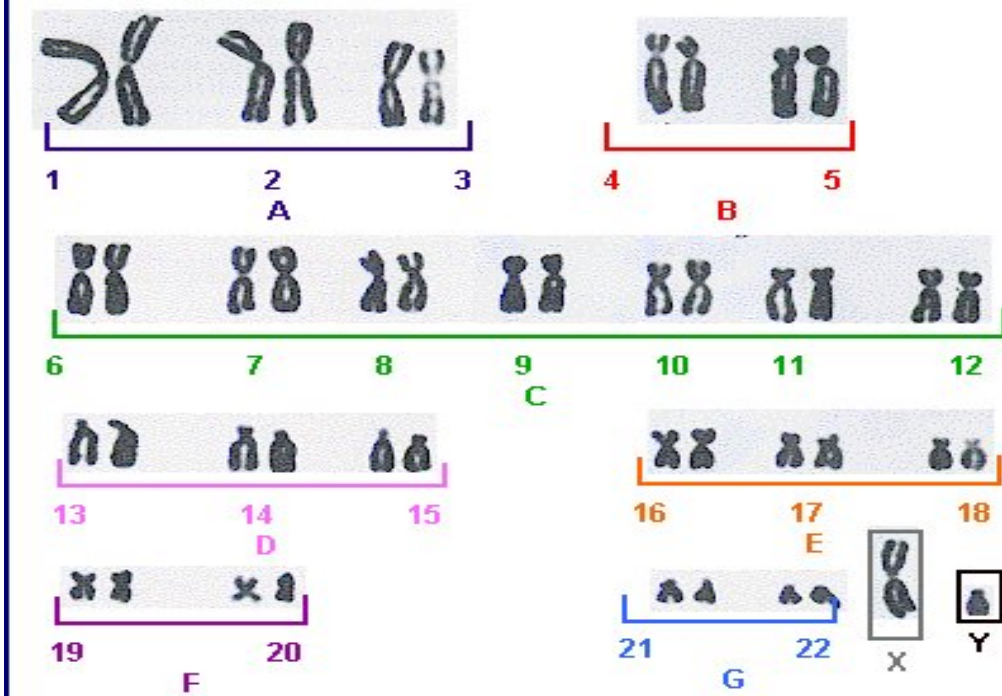
What form is DNA when the cell is dividing?

When the cell is dividing DNA takes the shape of _____



How many chromosomes do your cells have? Human cells have _____ chromosomes.

- They are found in the _____ in pairs
- That means most cells have _____ pairs of chromosomes



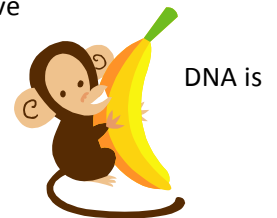
What parts of the chromosomes (DNA) hold the instructions?

The _____: sections of DNA that code for a protein

- The arrangement of bases is what instructs what type of _____ protein to be made
- Every chromosome has _____ of genes
- Depending on the cell, only certain _____ are read, and then their _____ proteins are made

Video- “Genetics 101 - What are genes?”

1. What percentage of the DNA in your cells is found in the nucleus? _____
2. Where is the other DNA in your cells found? _____
3. How many genes are found in our DNA? _____
4. If you stretched out the DNA in one nucleus how long would it be? _____
5. The _____ and _____ of bases determines what you are.
6. Genes are like _____ for making specific proteins.
7. You appear to have _____ a gene _____ a gene or genes from your father that makes a _____ that instructs your hair follicle cells to produce hair that curls like your father’s.
8. Genes tell a cell how to _____ and what _____ to express.
9. Molecules of DNA are organized into _____
10. Humans have _____ pairs of chromosomes, Chimpanzees have _____ pairs, Rhesus Monkeys have _____ pairs, cows have _____ pairs, chickens have _____, fruit flies have _____, and bananas have _____.
11. We share _____ of our DNA with monkeys, _____ with chimpanzees and _____ of our DNA is shared with other humans.
12. A _____ is the entire set of chromosomes found in an organism DNA.
13. Our genome has _____ base pairs.
14. If there is a variation at a single base pair this is called a _____. Which stands for _____ nucleotide _____.
15. There are around _____ SNP’s in the human genome. These account for all the _____ between humans on earth.



Notes: DNA codes for proteins

Genes:

- a gene has _____ for what _____ a cell will make
- the order _____ on DNA determines what _____ will be made
- all of an organisms genes are called a _____
- the human genome was first mapped out in _____

What are proteins and why are they important?

- Proteins are made up of building blocks called _____.
- The cells is supplied these amino acids from _____.
- Proteins have many functions in living organisms:
 - _____: special proteins that control _____
 - _____: act as _____ between _____
 - _____: proteins build parts of the body such as collagen and keratin.

How DNA makes proteins?

- technically, DNA itself _____ make proteins, it is far too important to leave the nucleus so instead it has a whole complex system set up to make proteins... all while hanging out in the comfort of the nucleus
- if the DNA were to leave the nucleus it would be swiftly _____... well not really, but it would be _____ by the materials in the _____.
- so to make proteins, DNA sends a messenger with a copy of it's special _____ out into the cytoplasm.
- that messenger then has it's code read and a _____ constructed as per the DNA's instructions.

Goal 3: Understand how and why cells grow and divide

Timeline: 3 – 4 classes

Activities:

Notes, Video- Cell Division (playlist on Ms. Roberts’s Youtube channel)

Assessments:

1. *Microscope Lab – Mitosis* (15 marks)

2. *Exit Materials and Notes completion* (5 marks) – show completed notes and exit package questions for 5 marks.

Notes: Introduction to Cell Division

Key words

Cell Cycle	
interphase	
daughter cell	
mitosis:	
Cytokinesis	
chromosome	
Spindle	
Cell Cycle	
interphase	
sister chromatids	
daughter cell	

What are the functions of cell division?

- Cell division occurs :
 - when organisms _____
 - to _____ damaged cells
 - to _____



Why is GROWTH important?

To increase size _____ organisms (many celled beings) undergo cell division

- A single cell is limited in how large it can grow, the _____ increases at a greater rate than the _____
- If a cell grows too large it must _____ into two smaller cells that are able to function _____

Why is REPAIR important?

_____ organisms (many celled beings) repair damaged cells by cell division

- every second _____ of your cells are damaged
- _____ which have had a branch cut off repair cells the same way that we scar

Why is REPRODUCTION important?

_____ organisms (one celled beings) use cell division to reproduce

- _____ form two new cells by dividing

What are the structures involved in cell division? What role do they play?

The _____ contains all the genetic material in the form of _____

- directs all the cell division
- Chromosomes are tightly wrapped _____
 - provide instructions for repairing and replacing worn and damaged cells
- Nucleolus is a dark _____ in the nucleus
 - is where _____ are made
- Ribosomes found on the Rough Endoplasmic Reticulum or floating in the _____
 - where _____ needed for cell division are assembled
 - ER will transport proteins to where they are needed
- Cytoplasm is the _____ inside the cell in which the organelles float
 - microtubules needed for cell _____ are found in the cytoplasm

The life of a Cell: _____

As we have talked about already, your body is made of trillions of cells

- There are 3 general categories of cells in your bodies:
 - _____ cells make up most of your body these are the cells in your _____
 - _____ have the ability to divide for indefinite periods and to give rise to specialized cells.
Example: _____
 - _____ which give rise to the sperm and eggs THESE DO NOT UNDERGO MITOSIS
- For mitosis, we will be focusing on _____

Interphase:

- These cells spend _____ of their lives in a stage called _____.
- _____ is the time in which a cell carries out all its _____.
- It will also make new copies of its _____
- Once the cell is large enough it will make a _____
- When the cell makes this copy of its DNA it is called _____
- the replication of DNA means that copy of all the cell's DNA is made, for a short period of time there are _____
- These multiple copies fold up and become _____
- Once this has happened the cell is ready to _____

Cell Division:

- o Cell division has two major parts: _____ and _____
- o NOTE: these are continuous processes that we divide in order to make it easier to understand.

What is Mitosis? Mitosis is the process in which _____ divides into _____.

- Each cell has the same _____ information as the parent cell
- Mitosis is the most common form of _____
- cells must reproduce to:
 - _____
 - _____ old or injured cells (ex. scraped knee)
 - _____
- *About 25 million times, each and every second, reproduction of cells occurs in your body!!*

What are the key structures and processes involved in cell division?

Mitosis (process) 1. Interphase 2. Prophase 3. Metaphase 4. Anaphase 5. Telophase

- o *We will be studying these phases for the next 2 classes. Today, I'd just like you learn the order and general images*

Figure 2- page 50

Chromosome (structure; Fig 3 page 50)

- Replicated chromosome consists of two sister _____ joined by a centromere

Spindle (structure)

- A series of microtubules called _____ fibres that form from the _____
 - _____ attach to each of the sister _____ at the _____.
- When the cell divides the _____

Cytokinesis (process; Figure 4 page 51)

- the _____ part of cell division in which the two new cells physically split and separate
- _____ cells: a membrane forms, dividing the cytoplasm and producing two new _____ cells
- _____ cells: cell plate forms, dividing the cytoplasm, the walls of two new cells form

The Cell Cycle Continued: More Details

KEY WORDS:

Describe and draw INTERPHASE:

- cell is _____ preparing for _____
- DNA replicated but not observable, as it is in _____ form

Mitosis Begins:

EARLY PROPHASE _____ appear

- Nuclear membrane _____ down
- _____ fibres appear
- _____ fibres join to sister _____

METAPHASE

- Chromosomes line up along the _____ of the cell
- Spindles prepare to pull!

ANAPHASE

- Sister chromatids separated
- pulled to opposite ends
- Once separate each is a _____

TELOPHASE AND CYTOKENESIS

- Spindle fibres and other structures used in mitosis are _____
- _____ envelope re-forms
- In animal cells, _____ forms
- In plant cells a _____ forms
- Outcome = 2 _____ cells