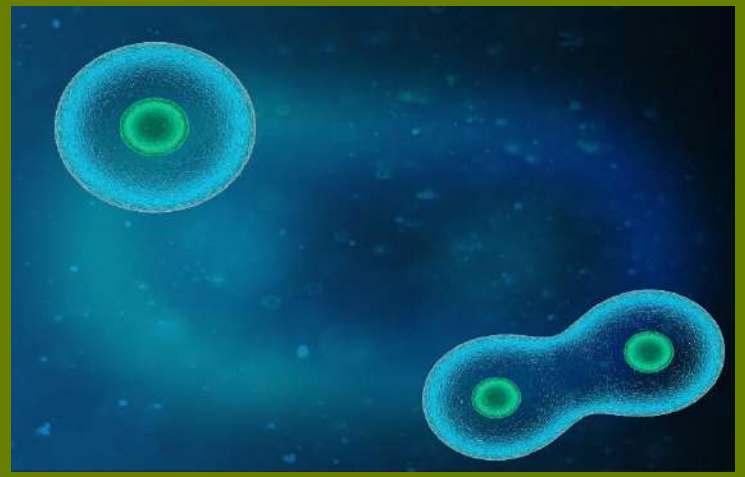
The Cell



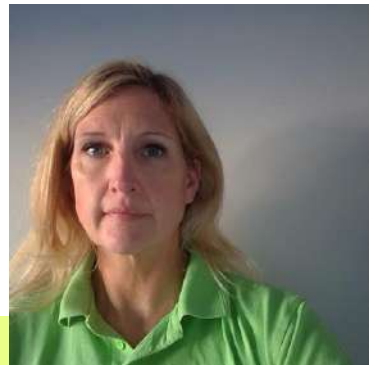






Learning Objectives

1. Structure of a cell
2. Function of a cell
3. Cell reproduction
4. Types of cell tissue



What is a Cell?

Cell - The smallest unit of matter that can live independently and reproduce

Tissue - group of cells with similar function

Organ – group of tissues with similar function

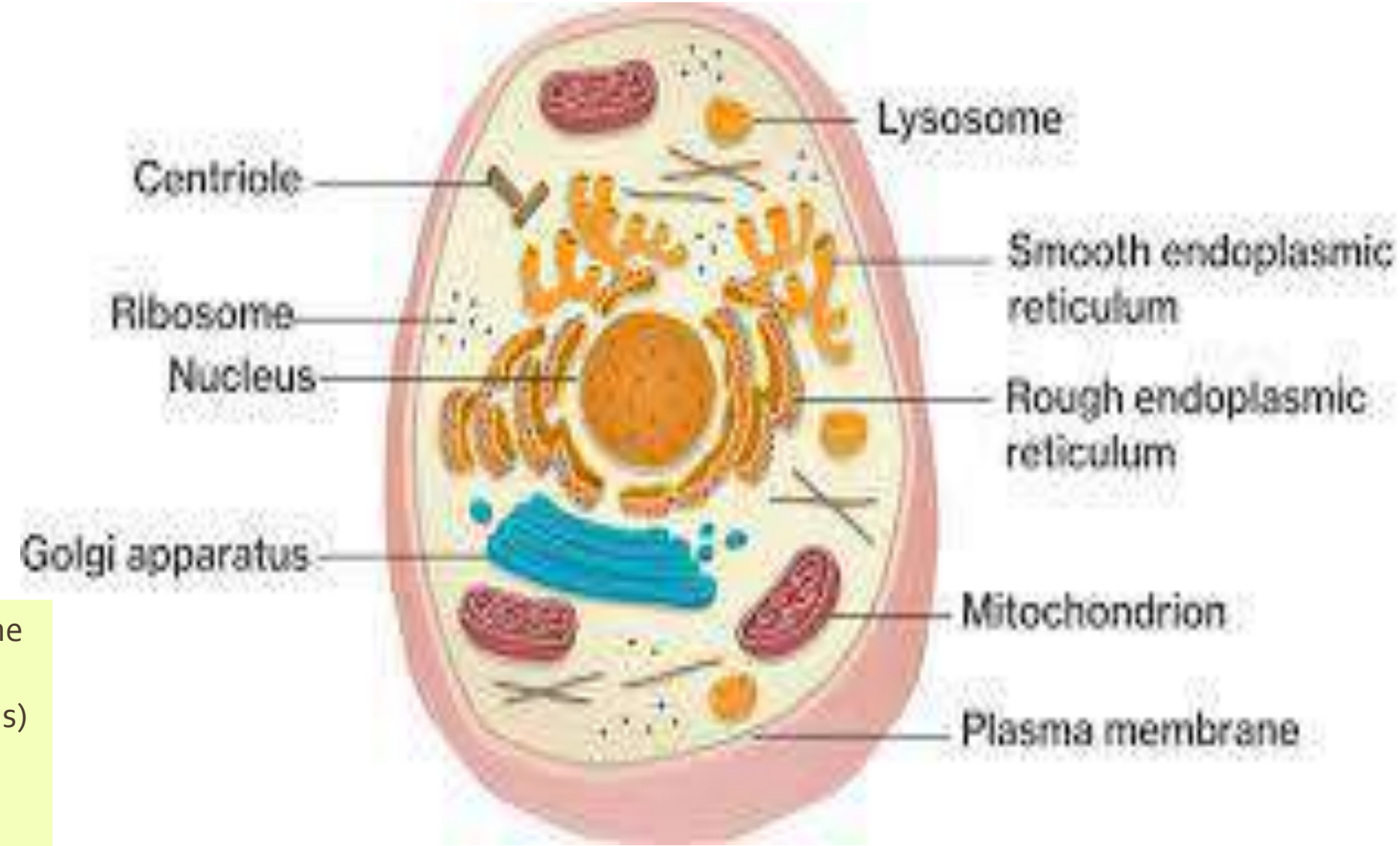
System – e.g. cardiovascular, respiratory

MRSGREMS

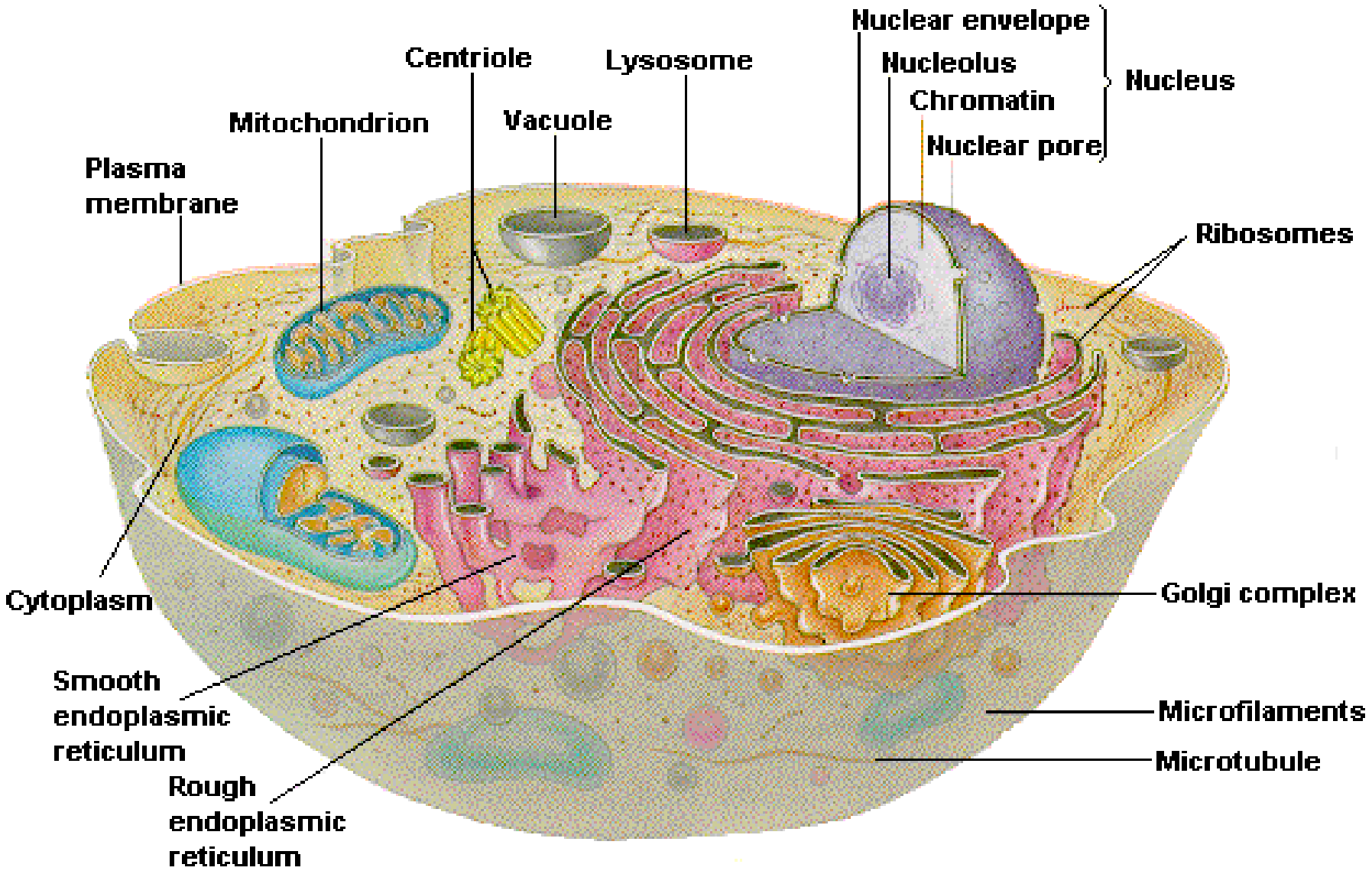
Functions

- **M**ovement
- **R**espiration
- **S**ensation
- **G**rowth
- **R**eproduction
- **E**xcretion
- **M**etabolism

Cell Structure

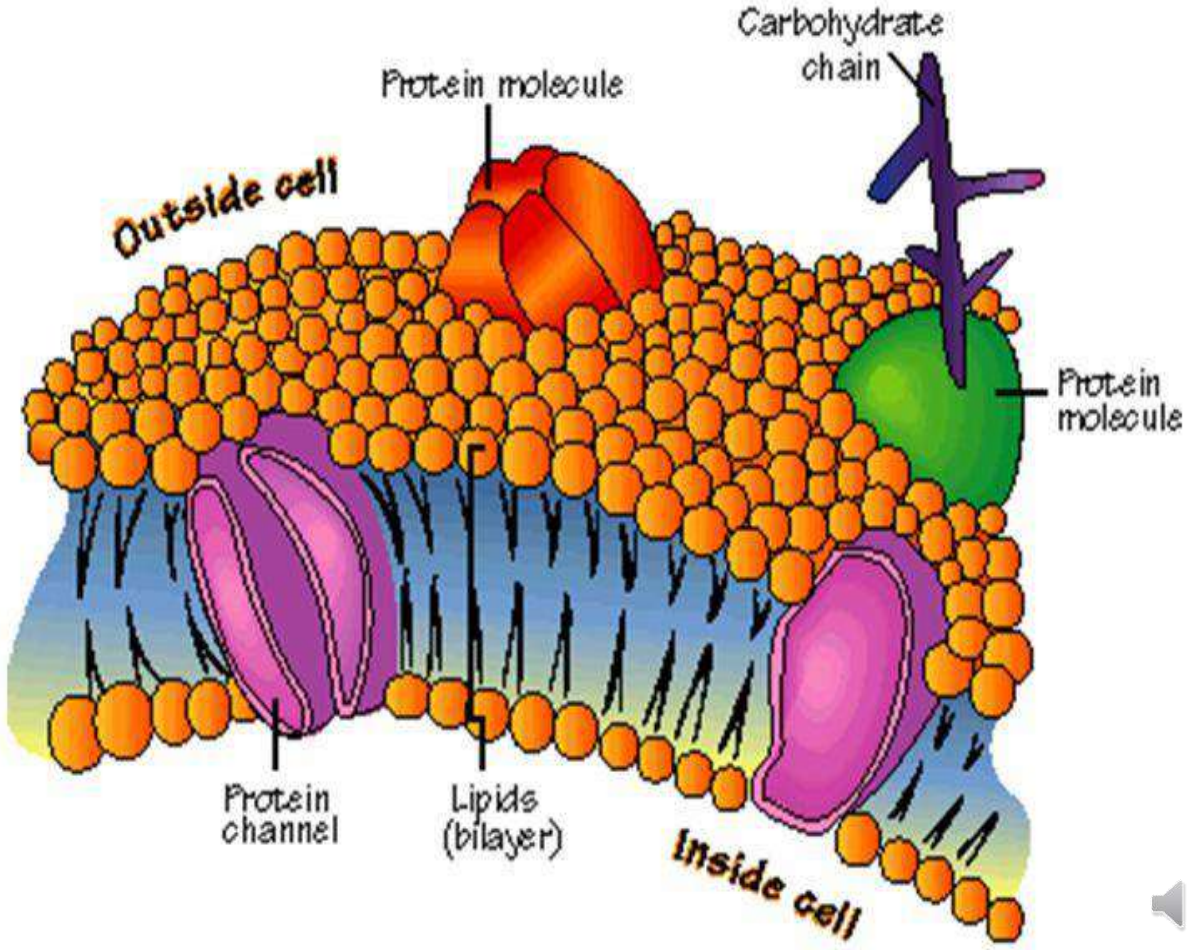


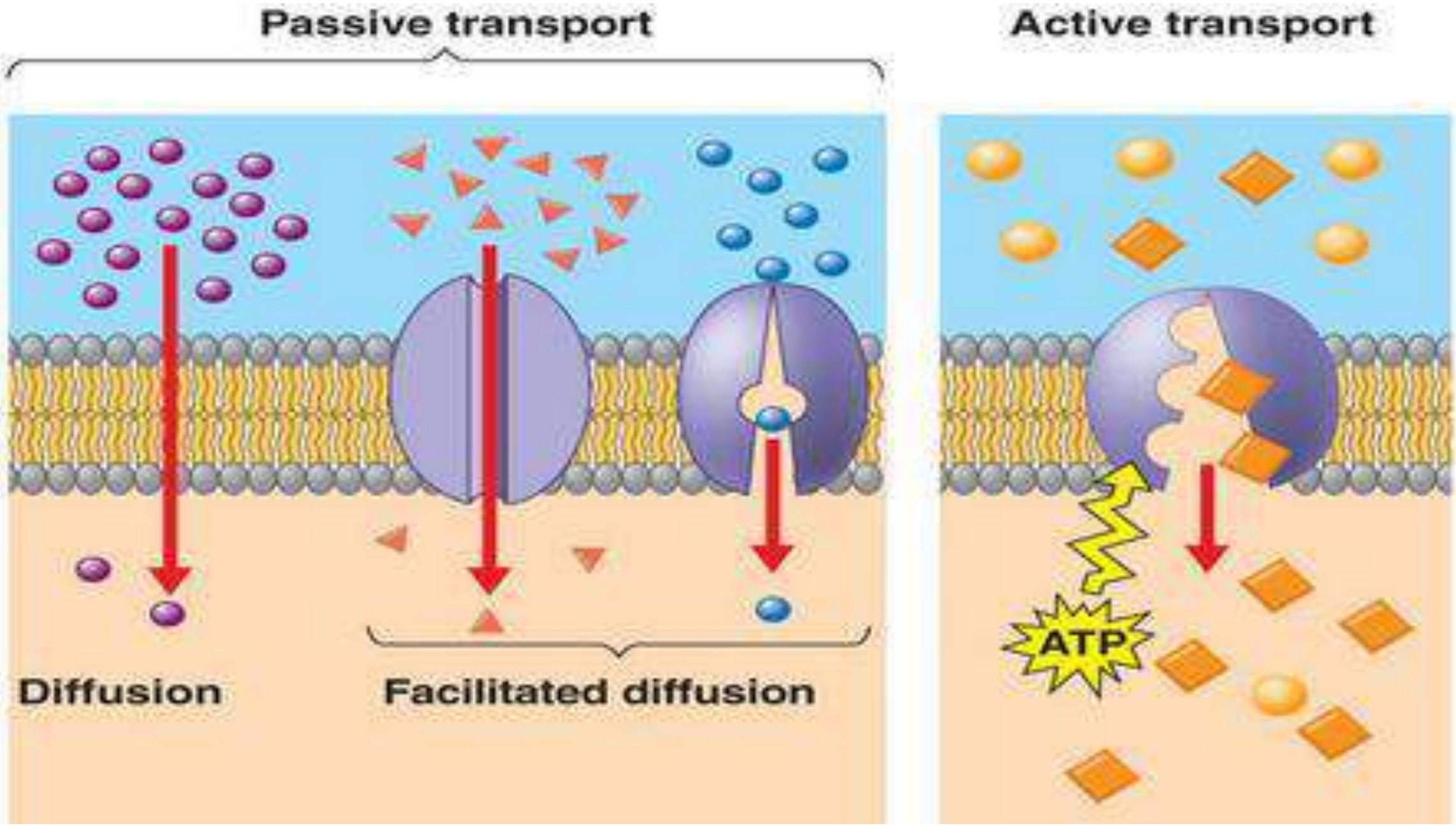
- Cell (plasma) membrane
- Cytoplasm
- Organelles (little organs)
  - Nucleus
  - Mitochondria
  - Ribosomes
  - Endoplasmic reticulum


Nuclear envelope
Nucleolus
Chromatin
Nuclear pore
Nucleus
Centriole
Lysosome
Mitochondrion
Vacuole
Plasma membrane
Ribosomes
Cytoplasm
Golgi complex
Smooth endoplasmic reticulum
Microfilaments
Microtubule
Rough endoplasmic reticulum

Cell (plasma) membrane

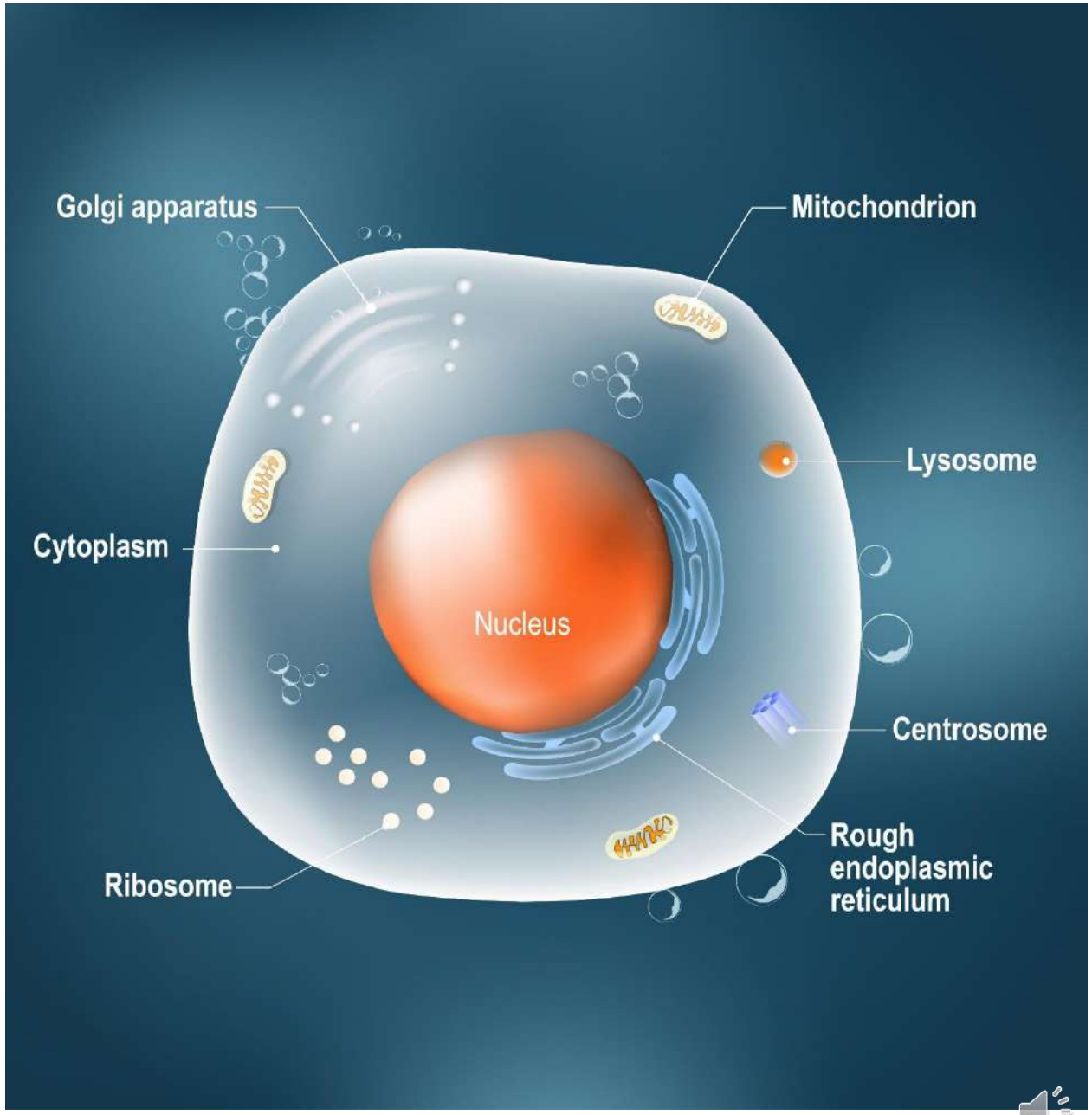
- Made of lipids (fats) and protein
- Function:
  - Protection
  - Transportation
  - Works as a filter (some substance can cross, other are blocked) - *semipermeable*
    - H_2O, O_2, Co_2 allowed
  - Keeps all cell elements together




Passive transport
Active transport
Diffusion
Facilitated diffusion
ATP

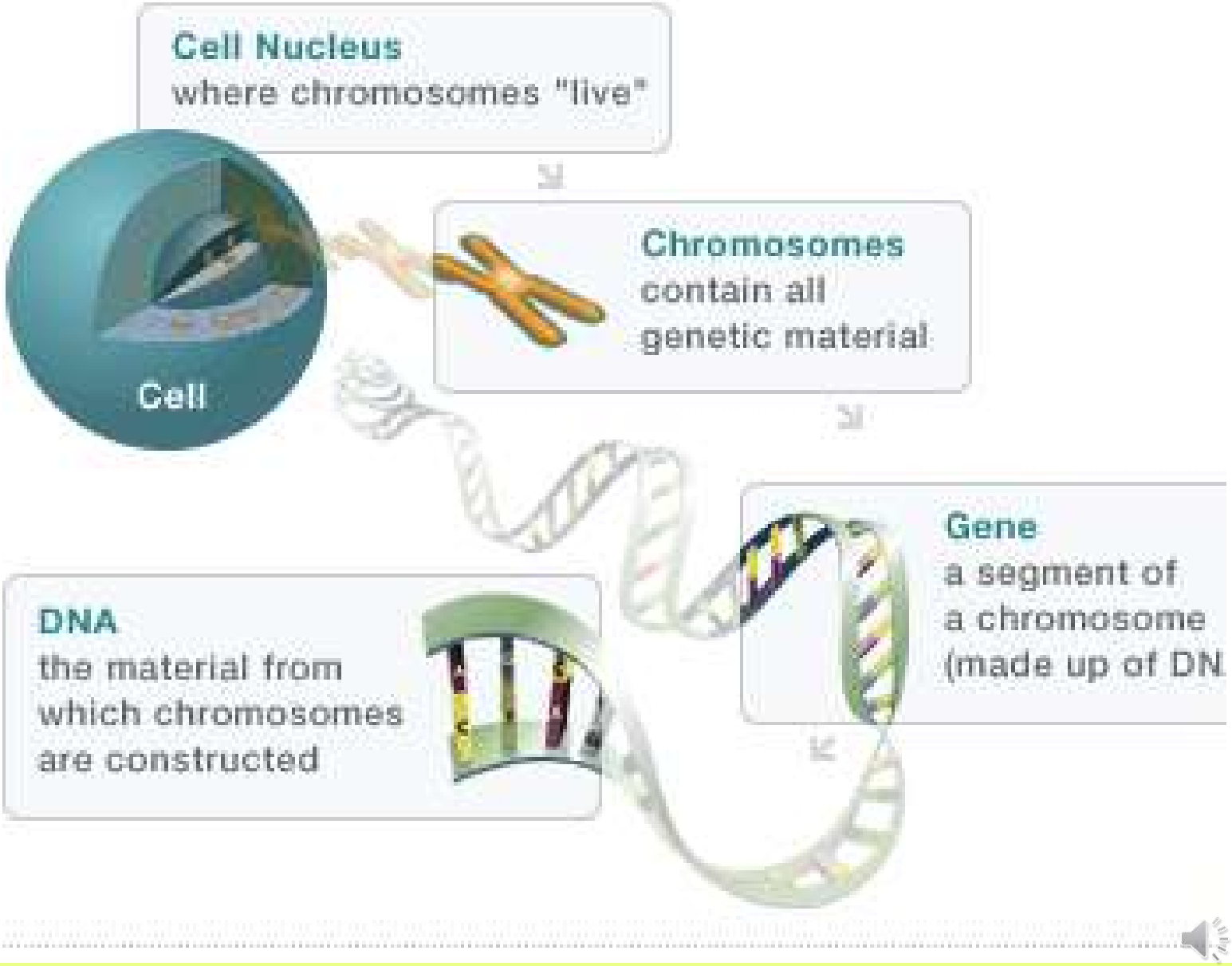
Cytoplasm

- Thick jelly-like substance inside the cell membrane and outside the nucleus that contains the organelles



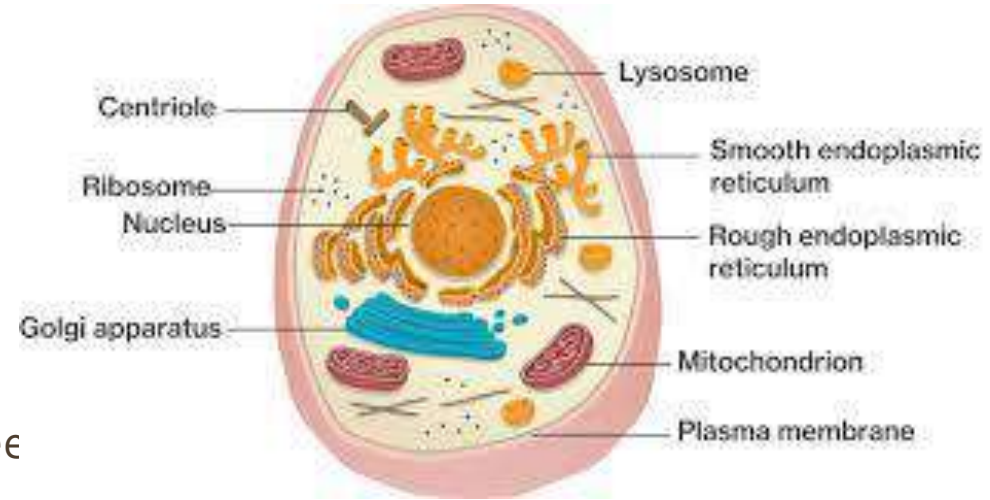
Nucleus

- Every cell has a nucleus
  - Skeletal muscle has several
- Contains genes, built from DNA
- DNA is arranged in groups of chromosomes. 46 (23) pairs chromosomes in every cell (F-XX / M-XY)
- "Control Centre": Controls activities in the cell



Cell organelles

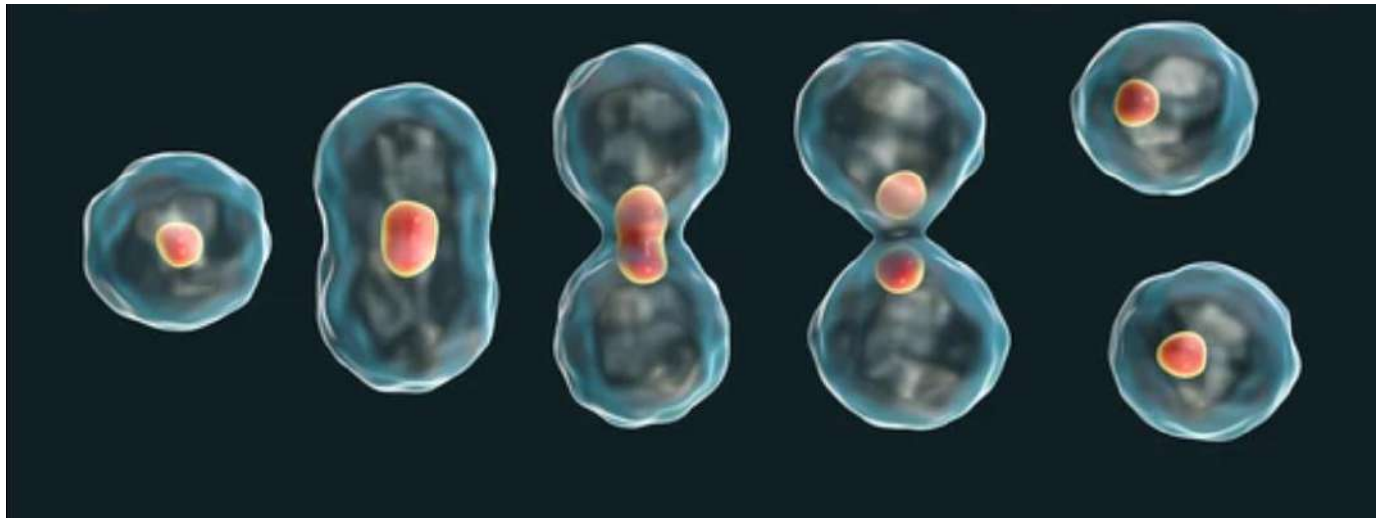
- **Golgi apparatus (packaging):**
  - Package proteins, carbohydrates and lipids for export from the cell
- **Mitochondria (energy):**
  - Powerhouse of the cells
  - Main energy transport (ATP)
- **Endoplasmic reticulum (transport)**
  - "circulatory system"
  - Transports lipids, carbohydrates, proteins
- **Lysosomes (rubbish collection)**
  - Contains enzymes that can break down cellular components that nee



Cell Organelle	Job in the Factory	Function of the organelle
Plasma membrane	Security guard	Regulates what enters and leaves the cell
Cytoplasm	Factory floor	Contains the organelles; site of most cell activity
Nucleus	The Boss!	Controls all cell activity; determines what proteins will be made. Holds the DNA, or the cell's genetic code. Also contains chromatin, which allows formation of chromosomes (humans have 23 pairs, 22 of which are identical in males and females. XX for females and XY for males). The nucleus also contains the **nucleolus**, which controls the formation of ribosomes. It's important to know this when learning about mitosis, or cell division!
Mitochondria	Power house	Supply cell with power via a series of chemical reactions (ATP)
Ribosomes	Workers in the assembly line	Build the proteins
Endoplasmic Reticulum (ER)	Conveyor belt	Canals that transport the proteins made by ribosomes. Can be rough or smooth (lipids)
Golgi apparatus	Finishing/packaging department	Prepares proteins for use or export
Lysosomes	Maintenance crew / cleaners	Contain digestive enzymes and help to break down and absorb materials taken in by the cell
Centrioles	Human resources (HR)	Rod-like structures contained in **centrosome** that help with cell reproduction (mitosis)

Cell reproduction

- Essential to keep the body alive
- 2 types:
    1) Mitosis
    2) Meiosis – forms sex cells



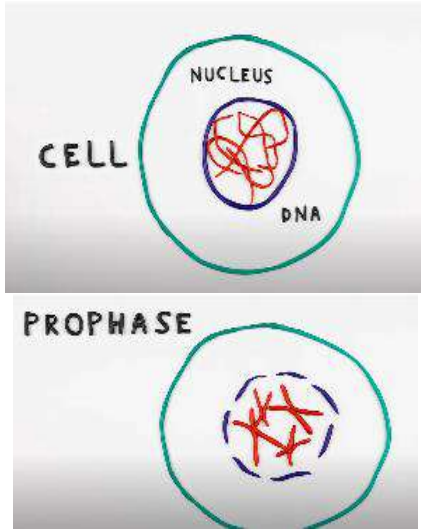
1) Mitosis:
    - Prophase
    - Metaphase
    - Anaphase
    - Telophase
    - Interphase

Mitosis

- Where cells reproduce in order to allow the body to continue to function as the old cells die.
- Simply put, mitosis creates two identical copies from one original. The cell duplicates its DNA and the two new cells (daughter cells) have the same pieces and genetic code. That is, its **23 pairs of chromosomes are maintained**.
- There are 5 stages of mitosis- four where the cells are actively dividing, and one is a resting phase. The easiest way to learn this is to remember the anagram **PMATI**.
- **Simple whiteboard demo here - https://www.youtube.com/watch?v=dCGhq8J92j4**

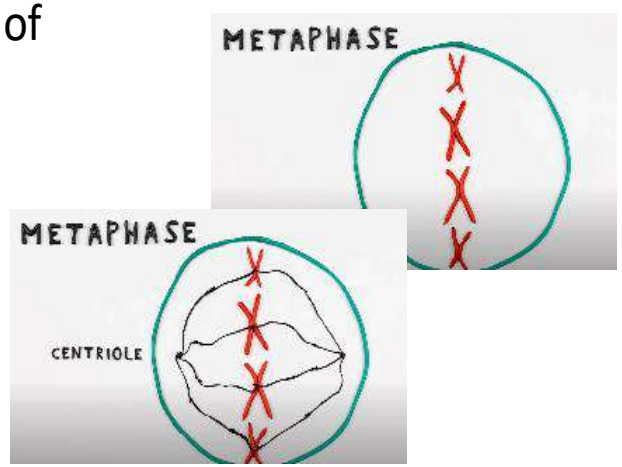
Prophase

- The is the preparation stage. The cell needs to duplicate DNA and get the centrioles in the right position.
- The chromosomes condense from loose strands into tightly packed bundles and the nucleus begins to break down.
- The centrosome divides into 2 centrioles
- Nucleolus disappears



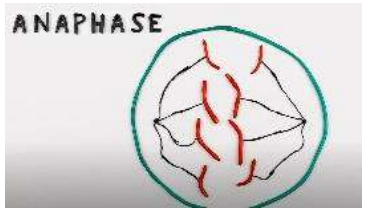
Metaphase

- The nucleus breaks down completely – the nuclear membrane of nucleus disappears
- Chromosomes line up in the middle of the cell
- The chromosomes attach to centrioles located on each side of the cell
- End stage of Metaphase is when each chromatid begins to pull apart



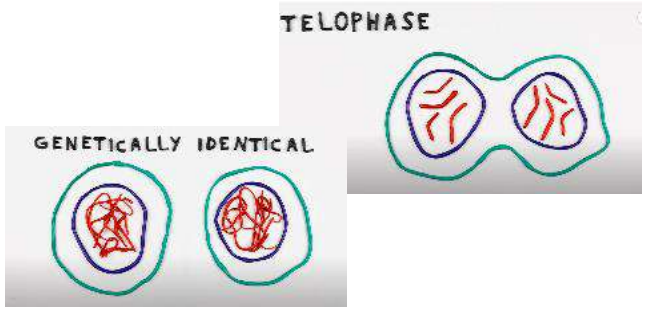
Anaphase

- The duplicated chromosomes separate as the centrioles are drawn apart.
- Identical halves move to opposite ends of the cell
- The cell membrane constricts in the centre



Telophase

- Two new nuclei form with a nuclear membrane around each set of chromosomes
- Cell membrane splits to form two identical cells.



Interphase

- DNA is reproduced
- Nuclear protein is synthesised
- Cell size increases

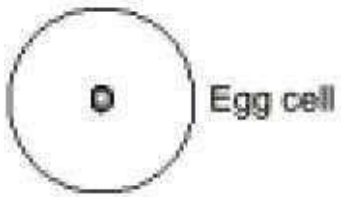
Final product is 2 daughter cells. The frequency with which cell division occurs varies with different types of cells.

Meiosis

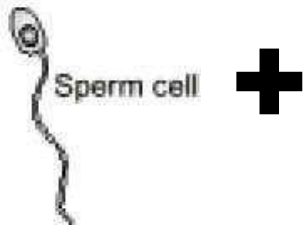
Meiosis: So, while mitosis produces two daughter cells from one parent cell, meiosis is the reproduction of cells that results in a gamete, aka a sperm or egg cell.

Its goal is to make daughter cells with exactly half as many chromosomes as the starting cell.

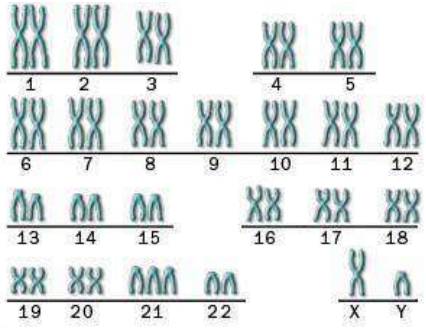
- On fertilization:



23 chromosomes



23 chromosomes



23 Paired set