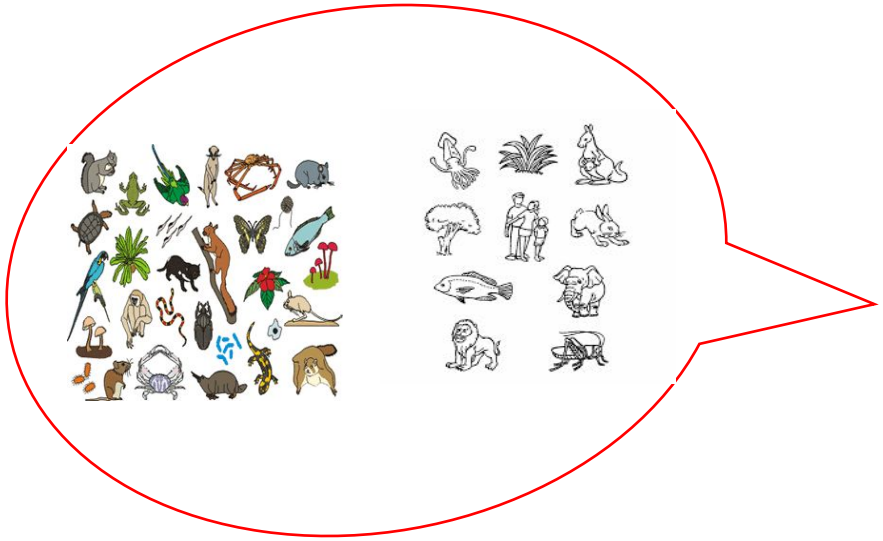
Unit :1

The Cellular Organization of a Living Organism

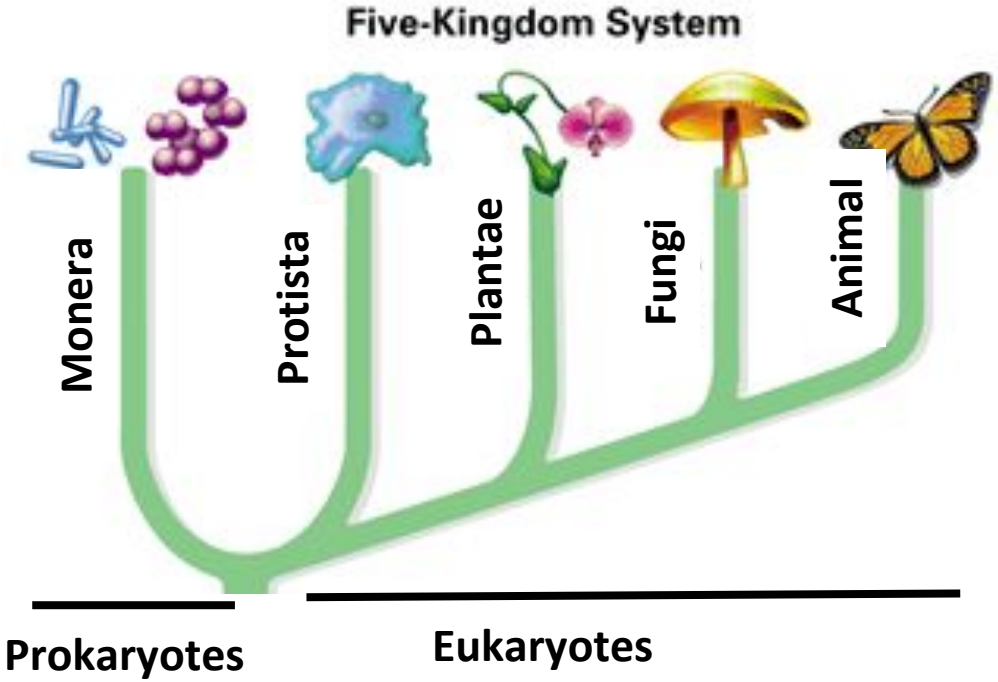
- Cell as the basic Unit of life
- Cell theory
- Structure and function of prokaryotic and eukaryotic cell

Biodiversity and classification of living world



Robert H. Whittaker in 1969 first introduced the five-kingdom system of classification

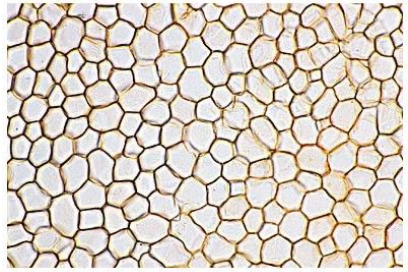
Classification????

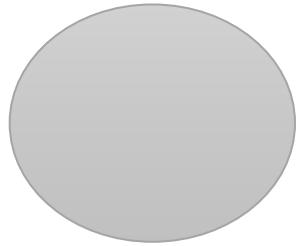


Cell as the basic Unit of life

Discovery: **Robert Hooke in 1665**

Structural and functional unit of life

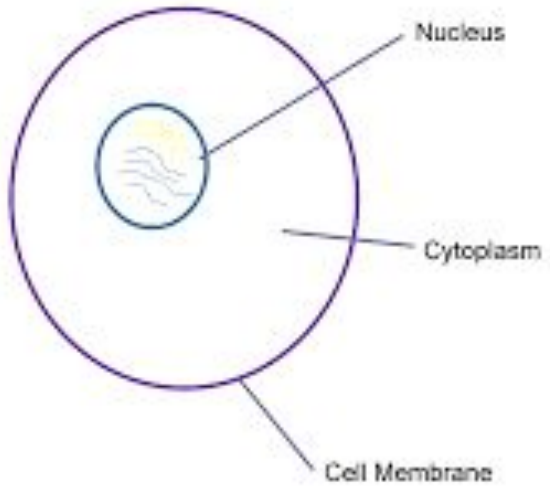




Discovery of cell

Cell as the basic Unit of life

Discovery: **Antony van Leeuwenhoek in 1674** first saw and described a live cell.

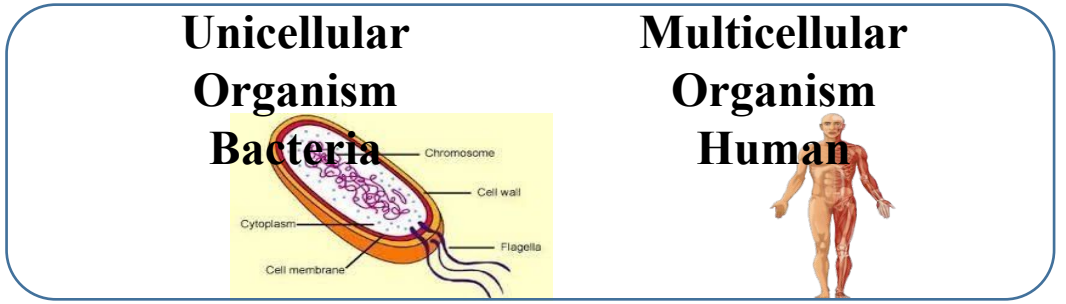


Cell theory

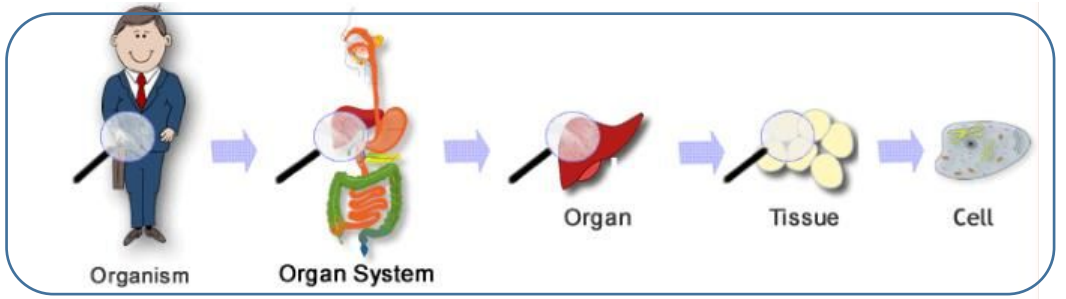
Cell theory was eventually formulated in 1839.
It is the basic principle of biology.
This is usually credited to **Matthias Schleiden** ,**Theodor Schwann** and **Rudolf Virchow**

Cell theory

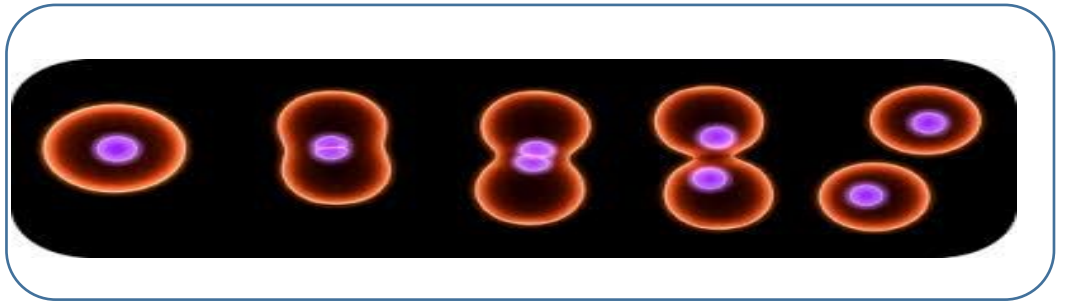
1. All living organisms are made up of **cells and their products**



2. Cells are basic **building unit** of life



3. New cells arises from the **pre-existing cells by division**

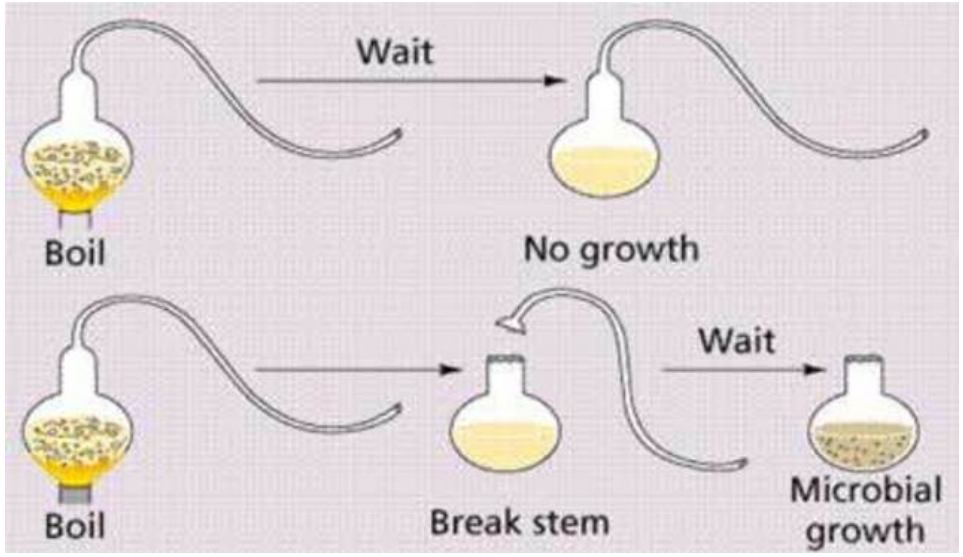


Spontaneous Generation

Spontaneous generation, also known as Abiogenesis, was the belief that living organisms were produced/generated from nonliving sources.

Evidence support to cell theory

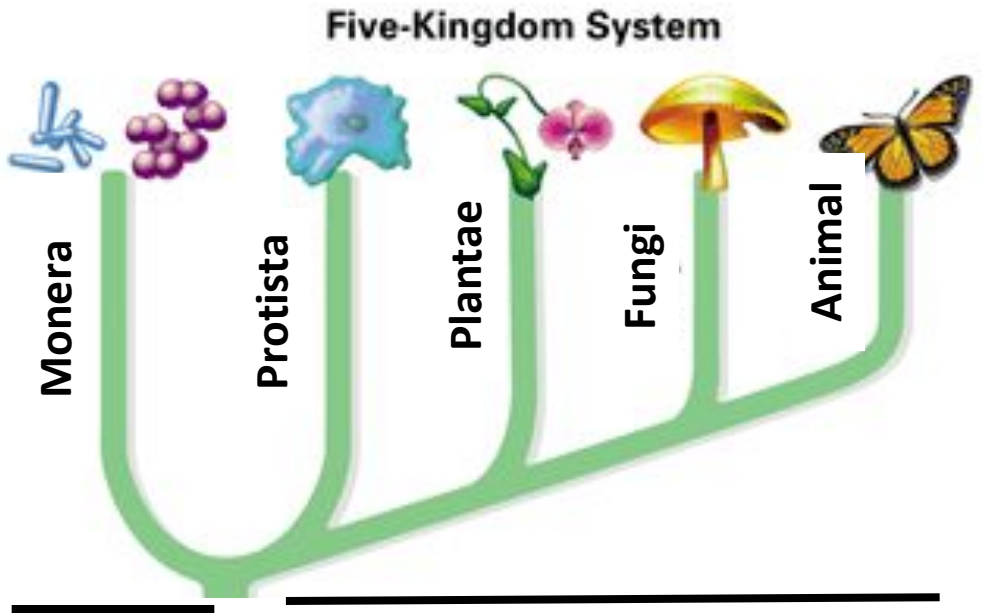
Nothing smaller than cell can live independently. So it was concluded that cell was the smallest unit of life.
Louis pasture experiment



Conclusion: Cells can not arise from non living materials

Structure of prokaryotic and eukaryotic cell

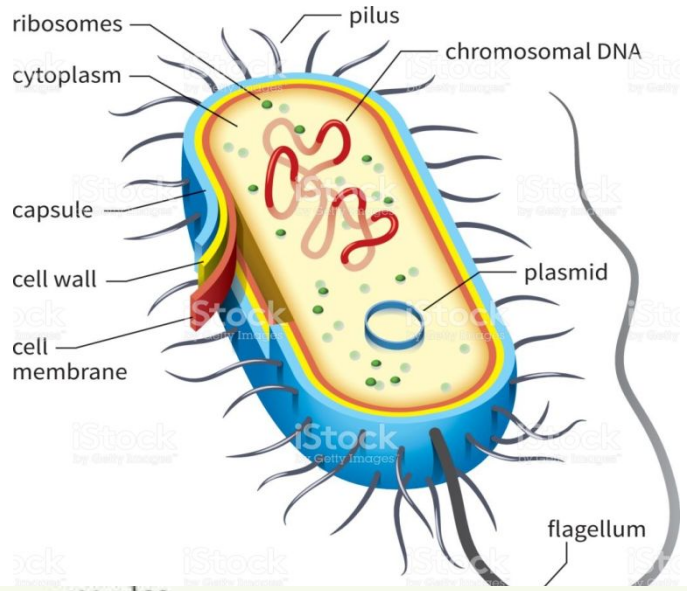
Living Things



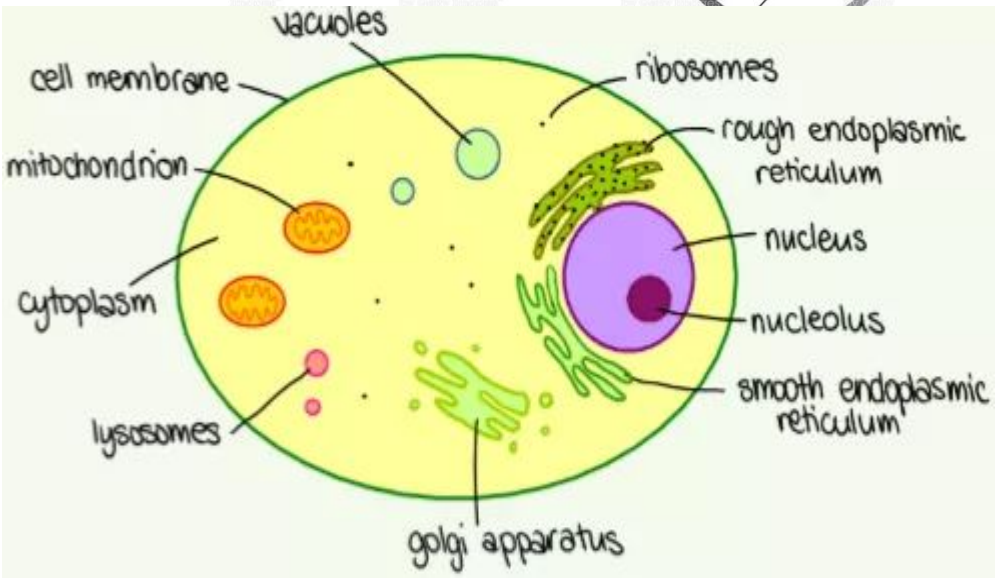
Bacteria

Protozoa, algae
Plant
Fungi
Animals

Prokaryotic cell

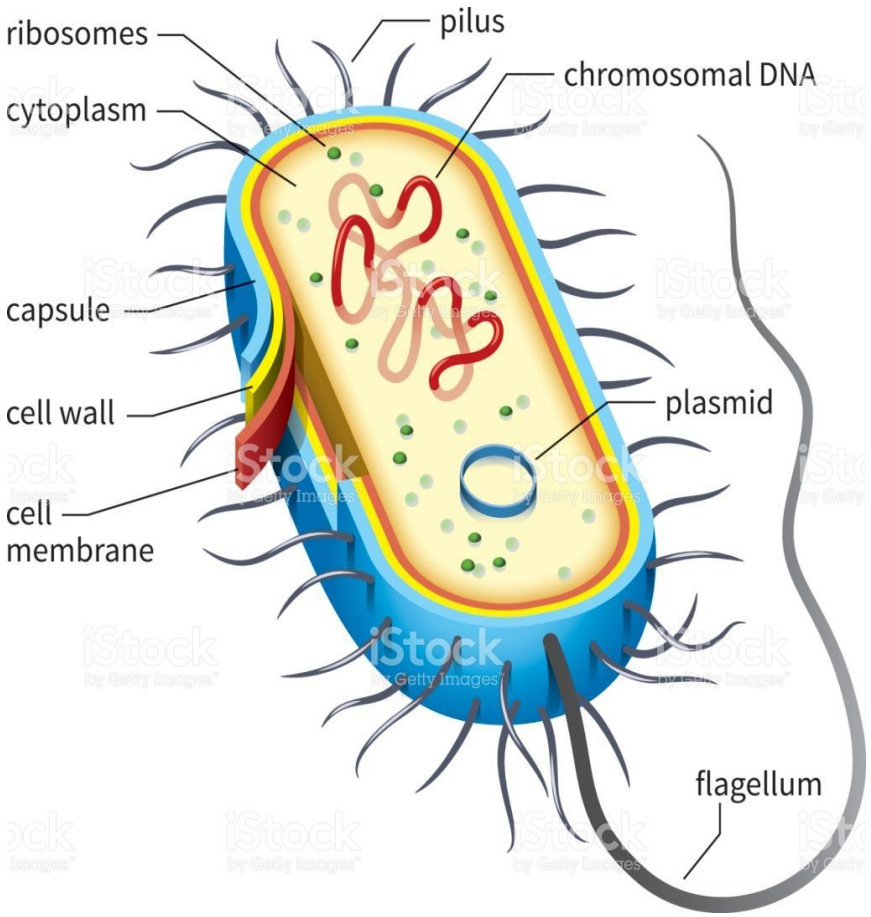


Eukaryotic cell



Structure and function of prokaryotic cell

Prokaryotic cell



Flagella: A slender whip like structure used for locomotion

Pili and fimbrae: Attachment to substrate

Cell wall: Structural support and protection against damage

Cell membrane: Provide protection and allow movement of substance from in and out of cells

Ribosome: Protein synthesis

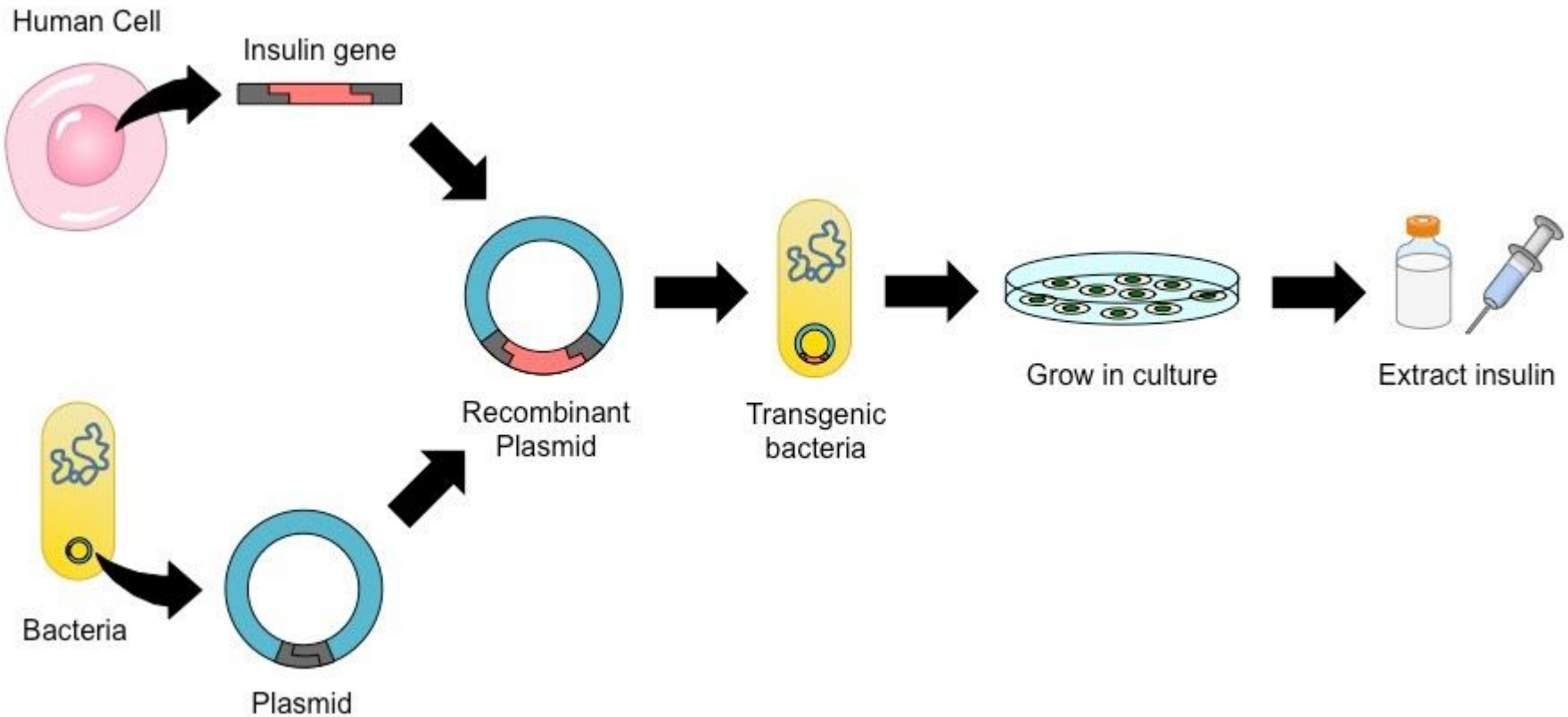
Naked DNA (Nucleoid): Store genetic information and passed to daughter cell

Structure some time present in prokaryotic cell

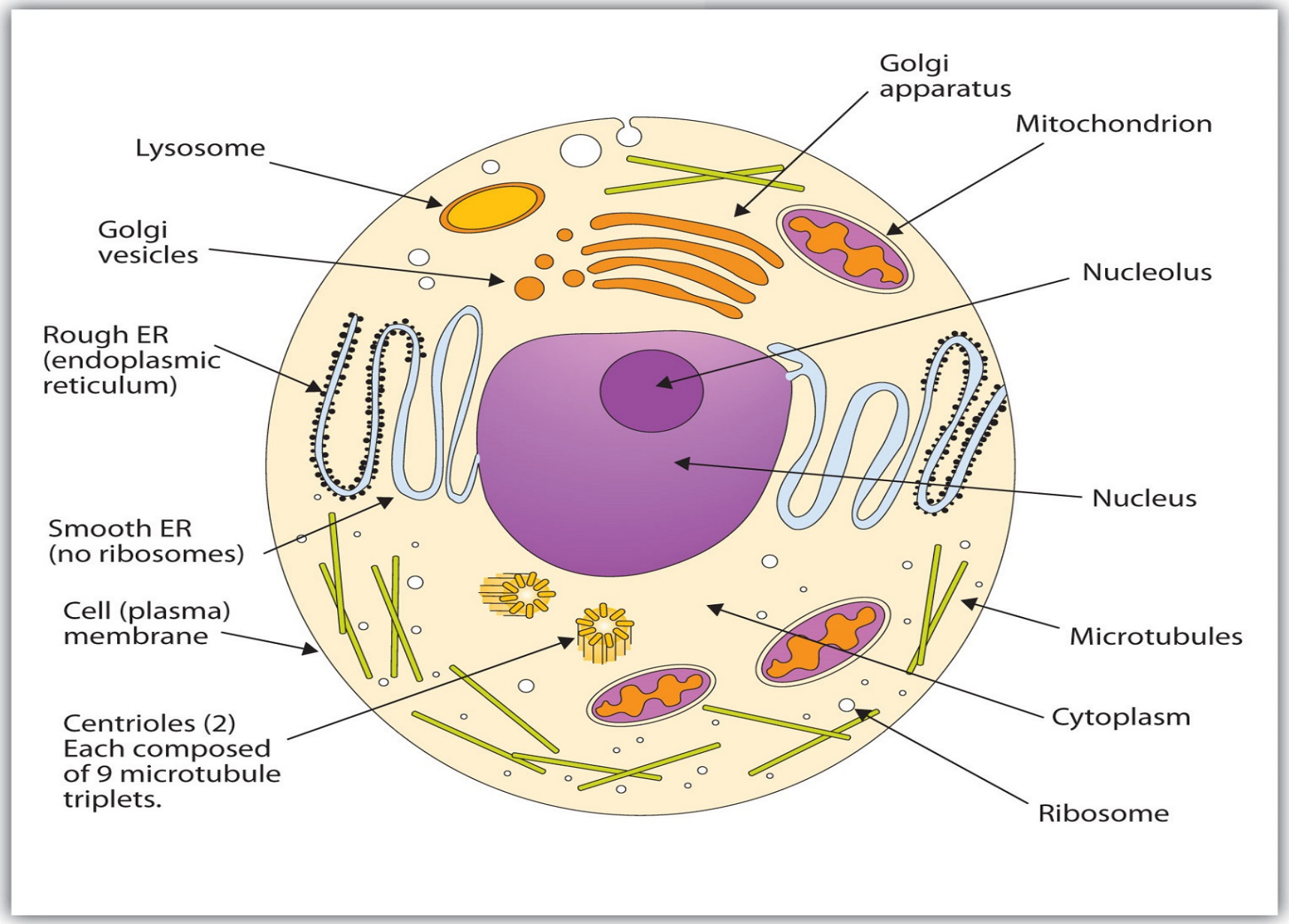
Plasmid: Extra chromosomal DNA. Contain antibiotic resistance gene.
Used as vector for genetic engineering.

Capsule: Protect cell from chemical and dry environment

Human insulin production from plasmid



Structure and function of eukaryotic cell



Cell membrane: Protect the cell from its surroundings and controls the exchange of substances with the outside.

Nucleus. It stores the cell's hereditary material, or DNA, and it coordinates the cell's activities, which **include** growth, intermediary metabolism, protein synthesis, and reproduction.

Cytoplasm. Contents of the cell located between the plasma membrane and the nuclear membrane. Comprises a liquid medium or cytosol, comprising water and soluble substances, where the present other organelles.

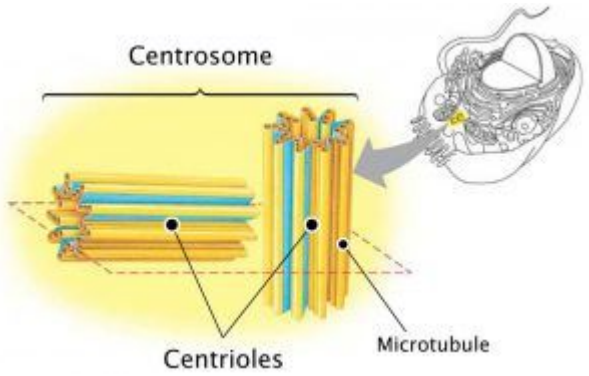
Mitochondria: Called as power house of the cells. Responsible for breakdown of sugar molecules for releasing ATP (the energy currency of cells). It also regulate cellular metabolism.

Endoplasmic reticulum: Structural frame work. Production and processing of protein (RER), Synthesis of carbohydrates and lipid (SER).

Ribosome: Ribosomes are a cell structure that makes protein. Protein is needed for many cell functions such as repairing damage or directing chemical processes. Ribosomes can be found floating within the cytoplasm or attached to the endoplasmic reticulum.

Golgi apparatus: A number of proteins synthesized by ribosomes on the endoplasmic reticulum are modified in the cisternae of the golgi apparatus before they are released from its *trans* face. Golgi apparatus is the important site of formation of glycoproteins and glycolipids

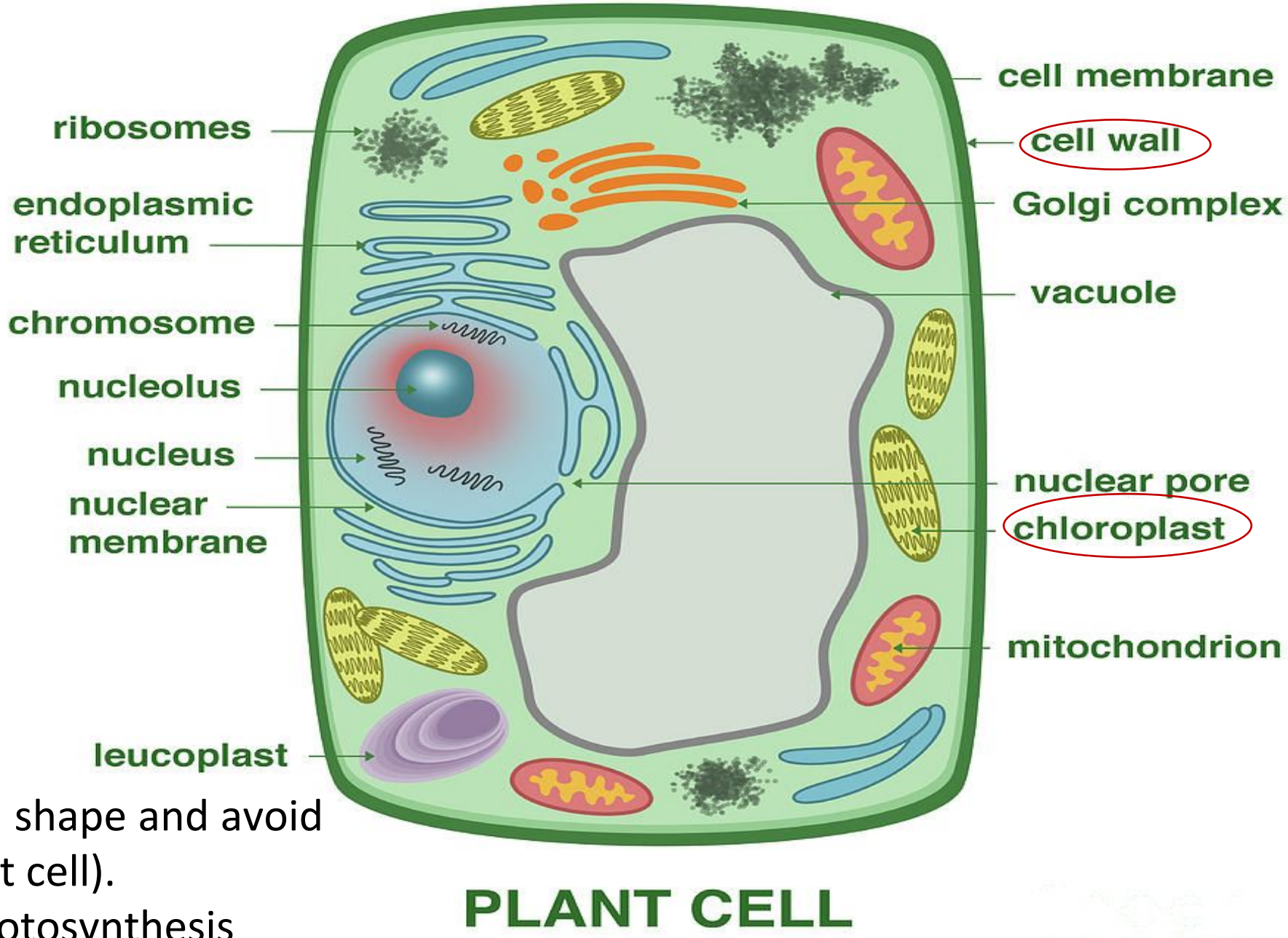
Lysosomes: Contain lytic enzyme. Site for intracellular digestion and destruction of certain organelles at the time of development. Also called as suicidal sac.



Cytoskeleton mechanical support, motility, maintenance of the shape of the cell.

Centrosome and Centrioles: The centrioles form the basal body of cilia or flagella, and spindle fibres that give rise to spindle apparatus during cell division in animal cells

Plant cell



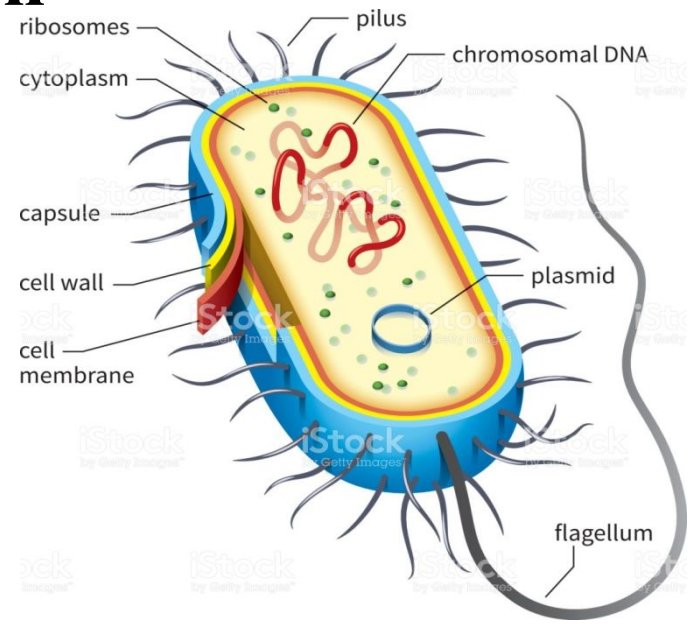
Cell wall: Maintain cell shape and avoid cell bursting (only plant cell).

Chloroplast: Site of photosynthesis

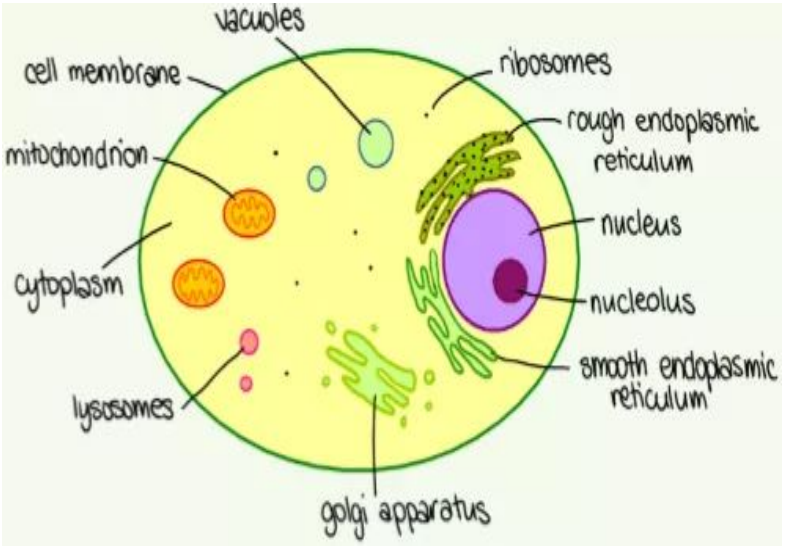
Difference between prokaryotic and eukaryotic cell

Characteristics	Prokaryotic cell	Eukaryotic cell
Meaning of name	Pro: Before/primitive Karyon: Nucleus	Eu: True Karyon: Nucleus
Size	Generally small	Generally large
Nucleus	Absent	Present
Chromosome	Single circular, Plasmid present	Many linear No plasmid
Nucleolus	Absent	Present
Membrane bound cell organelles	Absent	Present like mitochondria, ER
Pili, fimbriae, cilia, flagella	Pili, fimbriae (adhesion) flagella (motility)	Cilia,flagella (motility)

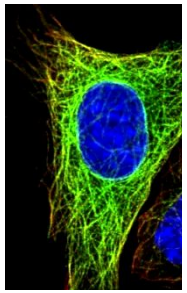
Prokaryotic cell

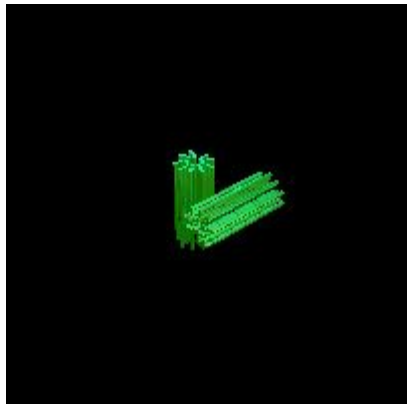


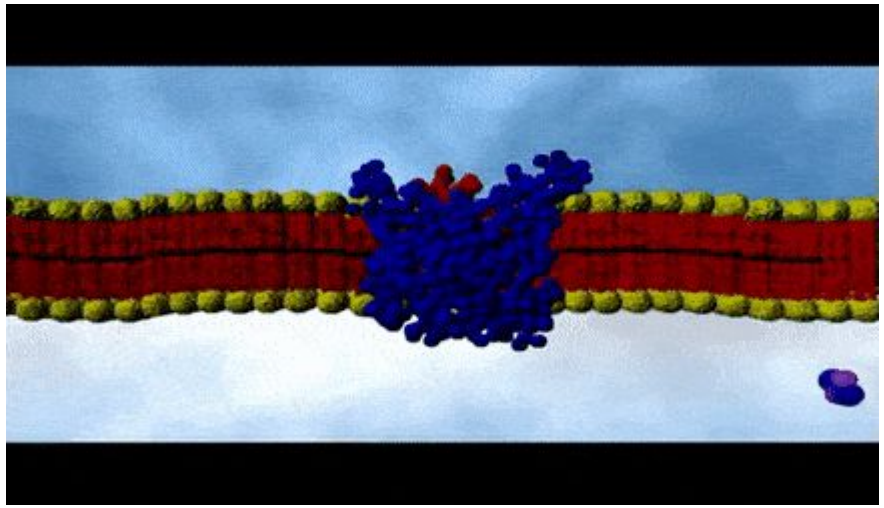
Eukaryotic cell

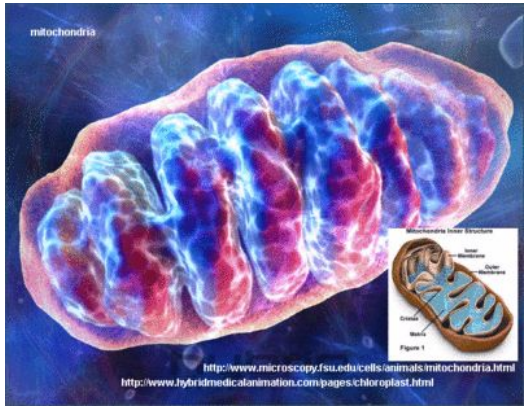


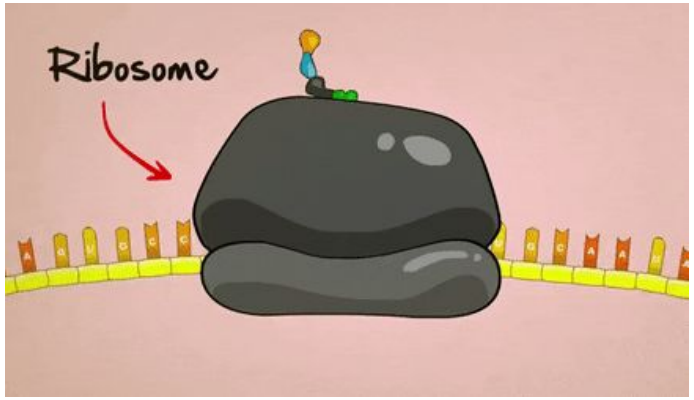
Plant Cell	***Animal Cell***
1. Plant cells have cell wall.	1. Animal cells don't have a cell wall.
2. They contain chloroplast.	2. They don't have chloroplasts.
3. They do not have centriole.	3. Centriole is present in them.
4. Vacuole is large and present in centre of the cell.	4. Vacuole is small.
5. Nucleus is present in the side of the plant cell.	5. Nucleus is present in the centre of the animal cell.








mitochondria
http://www.microscopy.fsu.edu/cells/animals/mitochondria.html
http://www.hybridmedicalanimation.com/pages/chloroplast.html


Ribosome


DIGESTING FOOD
Lysosome
Proteins
Food Vacuole
DIGESTING ORGANELLES
Mitochondria
DIGESTING CELLS
Cell Membrane

SUMMARY

- What is cell and how it was discovered
- Cell theory and evidence to prove it
- Structure and function of prokaryotic cell
- Structure and function of eukaryotic cell (animal and plant cell)
- Difference between eukaryotic and prokaryotic cell.

QUESTIONS

1. Define cell? Explain the postulates of cell theory?
2. What are prokaryotes? Draw the structure of a prokaryotic cell?
3. What are the differences between a prokaryotic and eukaryotic cell?
4. Draw a well labeled diagram of an animal cell?
5. Draw a well labeled diagram of a plant cell?
6. What are the differences plant and animal cell?
7. What are the function of different organelles in a cell (mitochondria, ribosomes, lysosomes etc.)?
8. What are the differences between plant and animal cells?