

Difference Between Resolution And Magnification:

Magnification is defined as the ability of an optical device to increase the size of the image.

The resolution, on the other hand, is the ability of a microscope to separate two objects from each other. So, the better the resolution of a microscope the finer the image quality will be.

In the light microscope, the resolution is determined by its wavelength. The resolution will be half of the wavelength. Visible light has a wavelength of 400-700 nm. Thus, the resolution of the light microscope will be calculated as 200nm. Any object smaller than this is difficult to be focused on a light microscope.

Electron microscope works by focusing the beam of electrons from the specimen. Since electrons have a shorter wavelength. The resolution achieved by an electron microscope is much better than a light microscope.

It is due to the electron microscope that we have discovered the different organelles present inside the cell.

To Find Magnification Using A Scale Bar:

- Use a ruler to measure the size of the image.
- For example: The image size is for example 2.6cm=26000micrometer
- The specimen size is 10um. (this is taken from the scale bar. The original size of the specimen will be different from this.)

- Convert the units to make the same.
- Use the equation to calculate magnification:

Magnification= size of image/ size of specimen

$$M= 26000/10$$

$$M=2600$$

Cell Organelles

Organelles are the structures that are present inside the cell. They perform different functions inside the cell. There is very little difference between animal and plant cells otherwise they have structural organization.

1) Endoplasmic Reticulum

Structure

The endoplasmic reticulum is the membrane-bound organelles. It comprises of tubules of the membrane which extends from nuclear membrane to cell membrane.

Types Of Endoplasmic Reticulum

There are two types of the endoplasmic reticulum. This classification is made based on the presence of ribosomes.

i) Smooth Endoplasmic Reticulum

Smooth endoplasmic reticulum has a smooth appearance due to the absence of ribosomes.

Its functions are lipid synthesis, detoxification, and storage of calcium ions.

ii) Rough Endoplasmic Reticulum

Rough endoplasmic reticulum appears granular due to the presence of ribosomes.

Their function is mostly associated with protein synthesis.

Function:

The main function of the endoplasmic reticulum is the transport of substances from the nucleus to the cytoplasm.

It also helps in maintaining the shape of the cell.

2) Cell Membrane

Structure

The cell membrane is the outermost boundary of the cell. It is made of phospholipid molecules. A phospholipid molecule has two ends hydrophobic and hydrophilic. The membrane has a fluid nature.

The cell membrane is semi-permeable. That is it allows a certain substance to pass through. This helps in maintaining the internal environment of the cell.

There are protein molecules that are attached to the membrane. These proteins help in the transport of a substance.

All the membrane inside the cell has the same structure.

Function:

The cell membrane serves as the outer boundary of the cell. Thus, it separates the intracellular environment from extracellular.

3) Nucleus

Structure

The nucleus is a double membrane-bound organelle. It is the control center of the cell.

1) Nuclear Membrane

It is a double membrane that forms the outer boundary. It separates the nuclear contents from the cytoplasm. The nuclear membrane has pores that allow exit and entry of substances.

2) Nucleolus

The nucleolus is present in the center of the nucleus. It consists of RNA and proteins.

3) Nucleoplasm

Nucleoplasm is a gelatinous substance present inside the nucleus. It consists of salts, enzymes and other substances dissolved within it. Nucleoplasm act as a medium for the transport of substances and helps the nucleus in maintaining its shape.

Function

The nucleus is the control unit of the cell. It contains all the hereditary information of the cell.

4) Golgi apparatus

Structure

Golgi apparatus consists of a stack of membranes.

Function

Its main function is the packaging and transport of substances outside the cell.

5) Lysosomes

Structure

Lysosomes are membrane-bound vesicles. It contains digestive enzymes that are required for the degradation of various substances.

Lysosomes originate from the Golgi apparatus itself.

Function

They help in the degradation and digestion of various substances. Lysosomes are also called suicide sac as they release enzymes that destroy its cells.

6) Cell wall

Structure

The cell wall is the outermost boundary of the plant cell. It is mostly made of cellulose. The cell wall can be divided into three parts. Primary cell wall, secondary cell wall, and middle lamella.

Unlike cell membrane it is permeable. There are pores in the cell wall for entry and exit of substances. These pores are called plasmodesmata.

Function

The main function of the cell wall is to provide support to the cell and maintain its shape.

7) Mitochondria

Mitochondria is also a double membrane-bound organelle. It consists of an outer membrane and an inner folded membrane. Inside the inner mitochondrial membrane is the matrix.

Function

Mitochondria is the powerhouse of the cell. It produces ATP by cellular respiration.

Mitochondria contain their DNA. Thus, it has a semi-autonomous existence.

8) Chloroplast

Structure

The chloroplast is also a double membrane-bounded organelle. The inner membrane is in the form of stacks called the thylakoid membrane. This thylakoid membrane has a light-harvesting system called the photosystem. The photosystem consists of chlorophyll and other pigments.

Function

The chloroplast is the site of photosynthesis.

It also consists of a small circular DNA. It encodes genes necessary for the function of the chloroplast.

9) Ribosomes

Structure

Ribosomes are the protein factories present freely in the cytosol or attached to the endoplasmic reticulum. It consists of two subunits.

The large subunit is called the 60s and the small subunit is 40s. Both of these together are called the 80s.

Ribosomes In Chloroplast And Mitochondria

The ribosomes are also present in mitochondria and chloroplast. It consists of 70s subunits. These ribosomes resemble the one which is present in bacteria. Thus, it is believed that these organelles are originated from bacteria.

10) Centrioles And Microtubules

Centrioles are present in animal cells only. They are located adjacent to the nucleus. It consists of an array of nine microtubules. Its function is to produce spindles during cell division.

Microtubules are polymers of tubulin protein. They play an important role in cell division and the transportation of substances within cells.

11) Vacuoles

Vacuole may be present in animal cells but mostly a large vacuole is present inside plant cells. They are membrane-bound organelles whose function is to store substances. The membrane of the vacuole is called tonoplast.

Function

To store nutrients, waters and other substances.

Mitochondria and atp production:

Mitochondria is the powerhouse of the cell. It is the site where energy is produced by aerobic respiration. This energy is then used by plants for various purposes.

During aerobic respiration, glucose enters mitochondria and is broken down in the presence of oxygen to release energy. This energy is used to form a molecule called ATP.

ATP is the energy currency of cells. Whenever a cell needs energy a molecule of ATP is broken down by hydrolysis. The energy released is then used to drive the cellular processes.

ATP consist of an adenosine molecule bonded with 3 molecules of phosphate. These phosphates are bounded by a high energy bond. When this bond is broken energy is released.



In chloroplast, the light energy trapped is first converted to ATP. This ATP is then used to produce glucose.

Prokaryotic Cell

Prokaryotic cell means Before the nucleus, these cells do not have a true membrane-bound nucleus. The nuclear membrane is absent thus, the nucleus is freely dispersed in the cytoplasm. Bacteria are an example of prokaryotic cells.

Besides this, prokaryotic cells also lack other membrane-bound organelles such as mitochondria, endoplasmic reticulum, etc.

FEATURES OF BACTERIA

- Bacteria are the smallest organisms. They range in size from 1-5 micrometers.

- It consists of a cell wall that is made of peptidoglycans. The function cell wall is to protect bacteria from osmotic lysis.
- Inside the cell wall is the cell membrane
- Bacteria also have a polysaccharide capsule around their cell wall.
- There are no membrane-bound organelles. But, they have ribosomes 70s and glycogen droplets.
- There is no true nucleus and the genetic material is freely dispersed in the cytoplasm.
- They have mesosomes which are cell membrane invaginations. Their function is the transport of substances. Mesosomes also contain enzymes that produce energy.
- Bacteria have flagella which help them in transportation.
- They also contain pilli. It is a hollow tube and is associated with conjugation.
- An extra genetic material called plasmid is also present.

Difference Between Prokaryotic And Eukaryotic Cell

Prokaryotic Cell	Eukaryotic Cell
Nuclear membrane absent	Nuclear membrane present
Mitochondria, golgi bodies, endoplasmic reticulum and mitochondria absent	Mitochondria and other organelles present
70s ribosome	80s ribosome
Cell wall made of peptidoglycan	Cell wall made of cellulose

Viruses

Viruses are intracellular obligate parasites. They reproduce inside a host cell as they lack the cellular components to make their proteins. They range from 200 to 250 nm.

Viruses are referred to as smallest living particles but in many ways they are placed on a borderline between living and non living substance.

It consist of a nucleic acid molecule which is surrounded a protein

coat. The protein coat is made up of capsomere subunits which is called capsids.

Some viruses also have an accessory envelope.