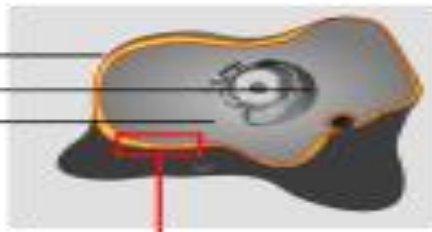


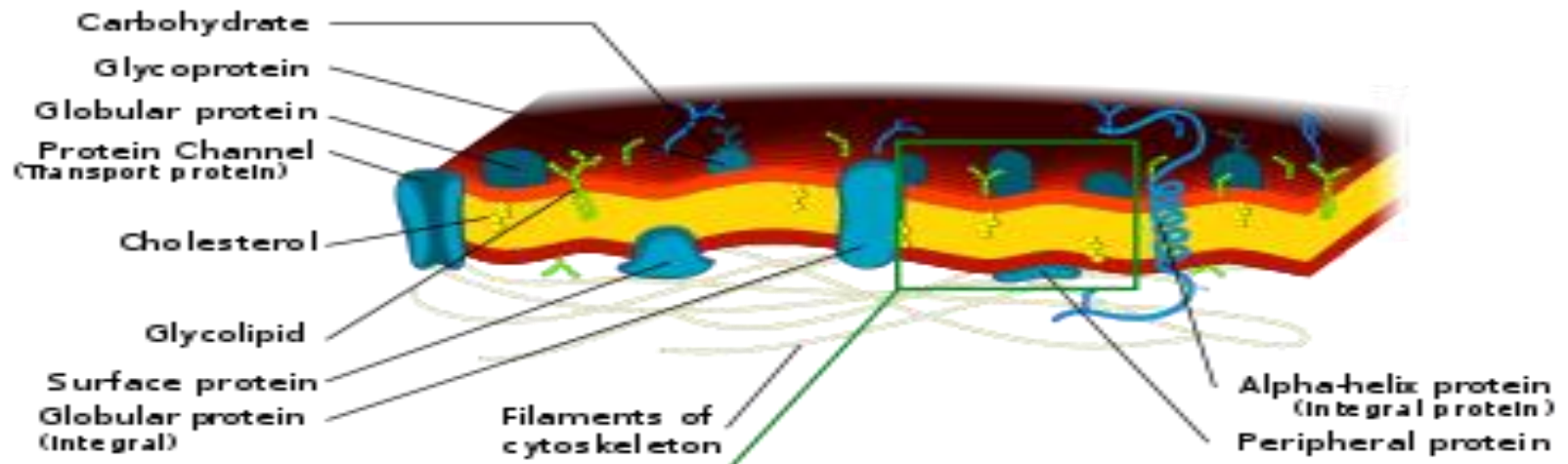
# CELL MEMBRANE, CYTOSKELETON AND ORGANELLES

# Cell

- Extracellular fluid
- Nucleus
- Cytoplasm



## Cell membrane



## Phospholipid bilayer



## Phospholipid (Phosphatidylcholine)



Hydrophilic head

Hydrophobic tail

# CELL MEMBRANE

- The cell membrane is selectively-permeable( ions and organic molecules), controls the movement of substances in and out of cells.
- It consists of the phospholipid bilayer, consisting of hydrophobic tails and hydrophilic heads with embedded proteins, which are involved in a variety of cellular processes such as cell adhesion, ion conductivity and cell signaling.
- The plasma membrane also serves as the attachment surface for the extracellular glycocalyx and cell wall and intracellular cytoskeleton

# Function

- The cell membrane surrounds the protoplasm of a cell and, in animal cells, physically separates the intracellular components from the extracellular environment.
- Fungi, bacteria and plants also have the cell wall which provides a mechanical support for the cell and precludes passage of the larger molecules.

- The cell membrane also plays a role in anchoring the cytoskeleton to provide shape to the cell, and in attaching to the extracellular matrix and other cells to help group cells together to form tissues.

- The barrier is differentially permeable and able to regulate what enters and exits the cell, thus facilitating the transport of materials needed for survival.
- The movement of substances across the membrane can be either *passive*, occurring without the input of cellular energy, or active, requiring the cell to expend energy in moving it. The membrane also maintains the cell potential.

A typical animal cell. Within the cytoplasm, the major organelles and cellular structures include:

(1) nucleolus

(2) nucleus

(3) ribosome

(4) vesicle

(5) rough endoplasmic reticulum

(6) Golgi apparatus

(7) cytoskeleton

(8) smooth endoplasmic reticulum

(9) Mitochondria

(10) Vacuole

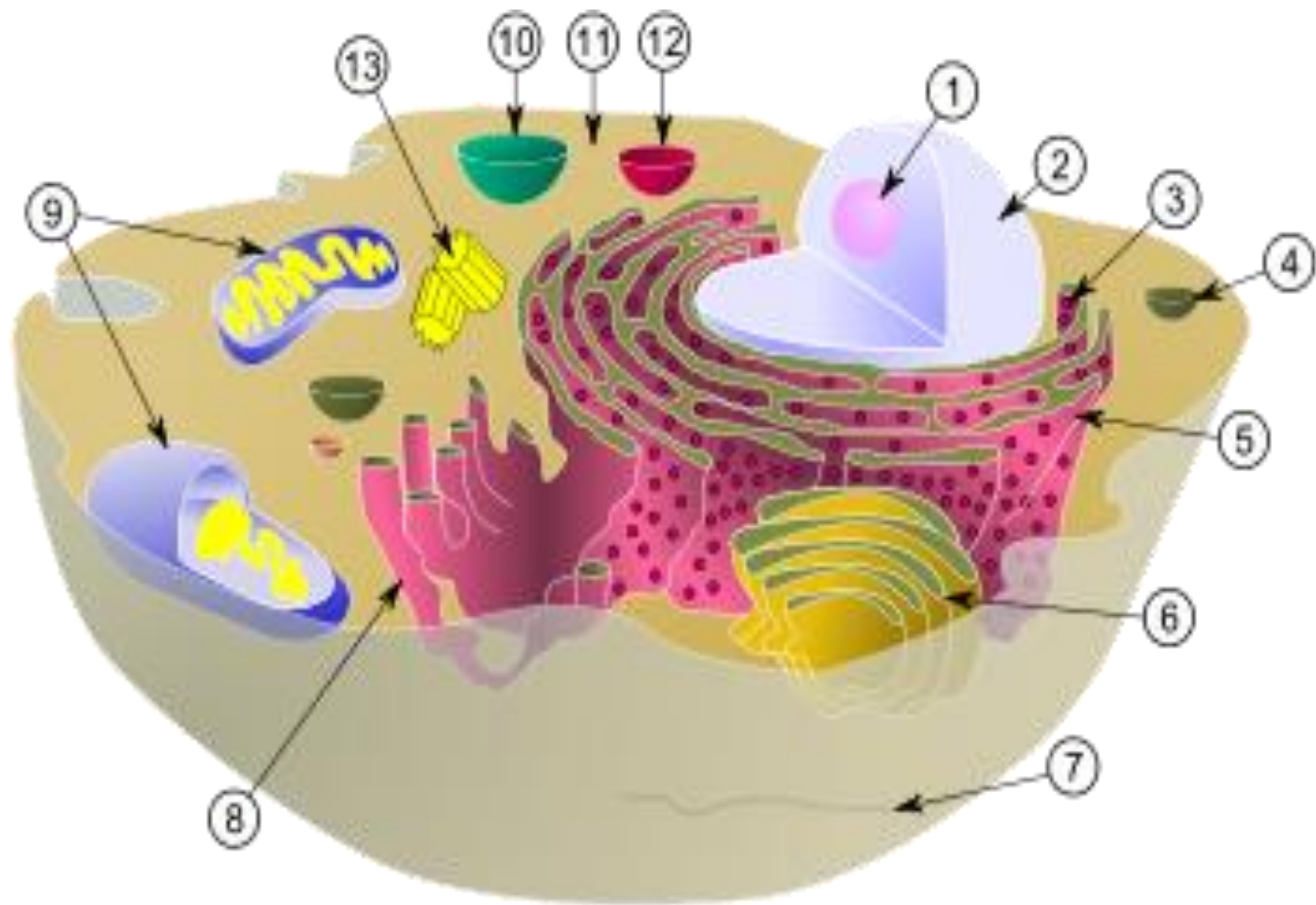
(11) Cytosol

(12) Lysosome

(13) Centriole

- The cytoplasm has three major elements
  1. cytosol
  2. organelles
  3. inclusions





- 1) nucleolus (2) nucleus (3) ribosome (4) vesicle (5) rough endoplasmic reticulum (6) Golgi apparatus (7) cytoskeleton (8) smooth endoplasmic reticulum (9) mitochondria (10) vacuole (11) cytosol (12) lysosome (13) centriole.

# Cytosol

- Cytosol makes up about 70% of the cell volume and is composed of water, salts and organic molecules.
- The cytoplasm also contains the [protein filaments](#) that make up the [cytoskeleton](#), as well as soluble [proteins](#) and small structures such as ribosomes
- The inner, granular and more fluid portion of the cytoplasm is referred to as endoplasm.

# nucleolus

- This is a non-membrane bound structure composed of proteins and nucleic acids found within the nucleus. Ribosomal RNA (rRNA) is transcribed and assembled within the nucleolus.

# Neucleus

- A membrane enclosed organelle found in eukaryotic cells .
- It contains most of the cell's genetic material organized as multiple long linear DNA molecules in complex with a large variety of proteins such as histones, to form chromosomes.
- The genes within these chromosomes are the cell's nuclear genome

- The function of the nucleus is to maintain the integrity of these genes
- To control the activities of the cell by regulating gene expression — control center of the cell.
- The main structures making up the nucleus are the nuclear envelope a double membrane

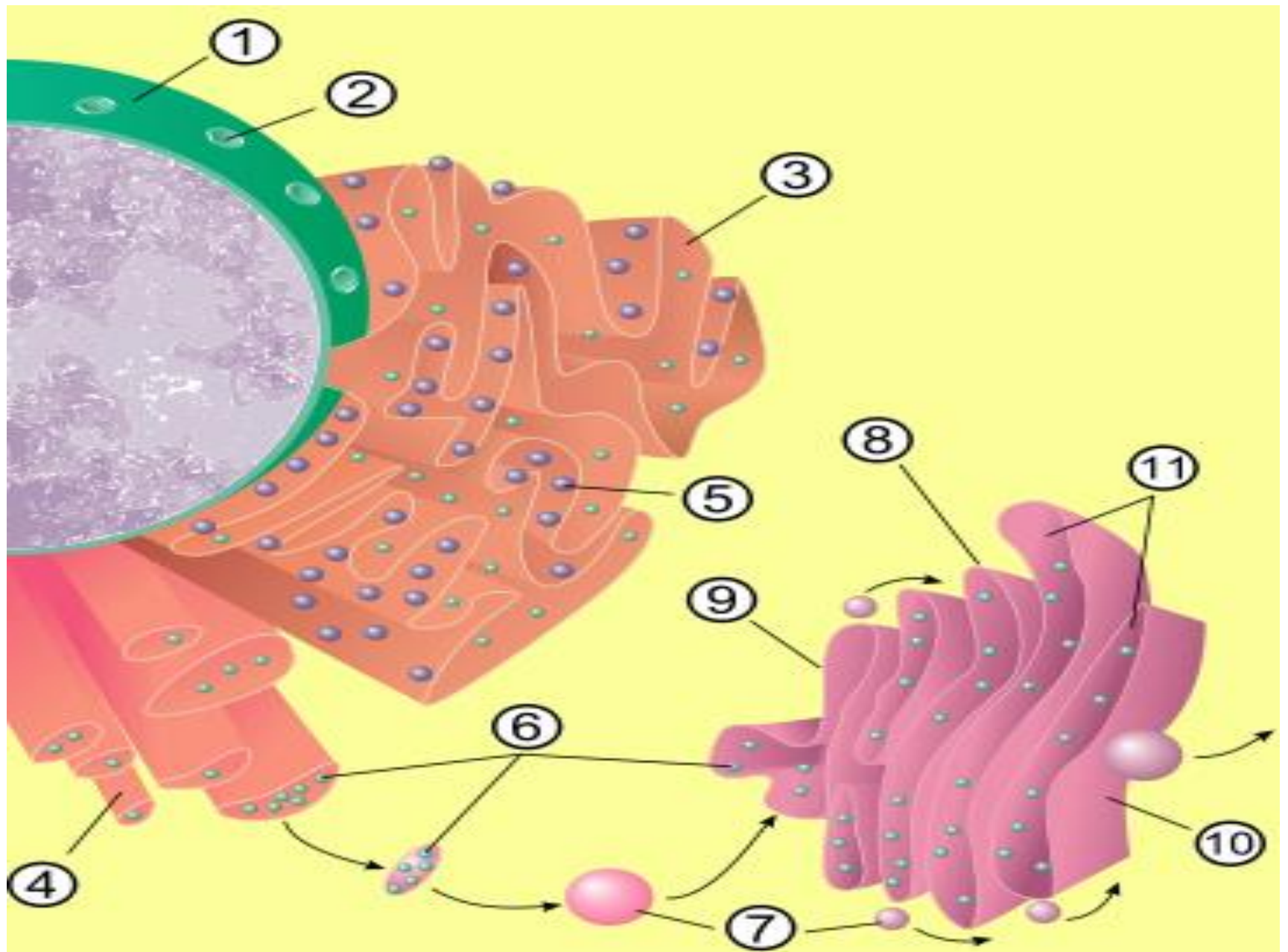
# Ribosomes

- components of cells that make proteins from all amino acids
- DNA is used to make RNA, which, in turn, is used to make protein

# Vesicle

- A **vesicle**, like [liposome](#) can be visualised as a bubble of liquid within another liquid, a [supramolecular](#) assembly made up of many different molecules.
- 
- More technically, a vesicle is a small membrane-enclosed sac that can store or transport substances.





# Rough endoplasmic reticulum

- synthesize proteins
- **smooth endoplasmic reticulum** synthesize lipids and steroids, metabolize carbohydrates and steroids, and regulate calcium concentration, [drug detoxification](#), and attachment of receptors on cell membrane proteins.
- **Sarcoplasmic reticulum** solely regulate calcium levels.

# Golgi body or the Golgi complex

- an organelle found in most eukaryotic cells
- The Golgi apparatus processes and packages macromolecules, such as proteins and lipids after their synthesis and before they make their way to their destination;
- it is particularly important in the processing of proteins for [secretion](#).

# a mitochondrion

- is a membrane-enclosed organelle found in most eukaryotic cells. These organelles range from 0.5 to 10 micrometers ([μm](#)) in diameter.
- described as "cellular power plants" because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy
- Also involved in a range of other processes, such as signaling, cellular differentiation, cell death, as well as the control of the cell cycle and cell growth.

# Vacuole

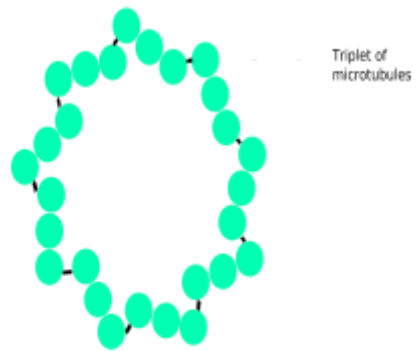
- membrane bound organelle are filled with water containing inorganic and organic molecules including [enzymes](#) in solution or engulfed solids
- Vacuoles are formed by the fusion of multiple membrane [vesicles](#) and are effectively just larger forms of these.

# Functions of vacuoles

- Isolating materials that might be harmful or a threat to the cell
- Containing waste products
- Maintaining internal hydrostatic pressure or turgor within the cell
- Maintaining an acidic internal pH
- Containing small molecules
- Exporting unwanted substances from the cell

# Lysosomes- suicide bags (Autolysis)

- cellular organelles which contain acid hydrolase enzymes to break up waste materials and cellular debris.
- Lysosomes digest excess or worn-out organelles, food particles, and engulfed viruses or bacteria.
- Lysosomes fuse with vacuoles and dispense their enzymes into the vacuoles, digesting their contents via the use hydrolytic enzymes



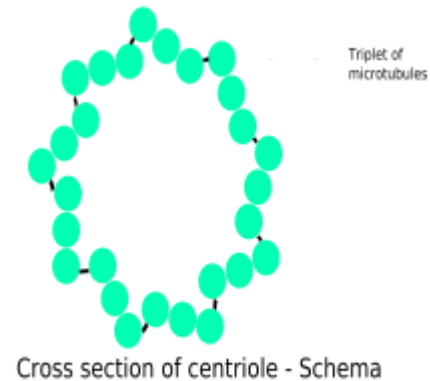
Cross section of centriole - Schema



# Centriole

- **centriole** is a barrel-shaped cell structure-found in most animal eukaryotic cells, though absent in higher plants and most fungi.
- The walls of each centriole are usually composed of nine triplets of microtubules (protein of the cytoskeleton).
- A pair of centrioles, arranged perpendicularly and surrounded by an amorphous mass of dense material (the pericentriolar material) constitutes the compound structure known as the centrosome

- Centrioles are involved in the organization of the mitotic spindle and in the completion of cytokinesis



# CYTOSKELETON

- is a cellular "scaffolding" or "skeleton" contained within the [cytoplasm](#) and is made out of protein.
- The cytoskeleton is present in all cells; it was once thought to be unique to eukaryotes, but recent research has identified the prokaryotic cytoskeleton.
- It has structures such as [flagella](#), [cilia](#) and [lamellipodia](#) and plays important roles in both intracellular transport (the movement of [vesicles](#) and organelles, for example) and [cellular division](#)

- Eukaryotic cells contain three main kinds of cytoskeletal filaments, which are microfilaments, intermediate filaments, and microtubules.
- The cytoskeleton provides the cell with structure and shape, and by excluding macromolecules from some of the cytosol it adds to the level of macromolecular crowding in this compartment