2- The basolateral domain modifications (proved by cell junctions):

In basolateral domain, between adjacent cells there are structures called cell junctions or **intercellular bridges**.

The cell junctions are a class of cellular structures consisting of multiprotein complexes that help to communicate the cells with each other and provide connect or adhesion between neighboring cells or between a cell and the extracellular matrix .

Cell junctions:

Water, solutes and ions can move through tissues by two different pathways:

1-Trans cellular pathway- material going through the cell, involves channel and transporter molecules.

2-para-cellular pathway, materials travel between adjacent cells. This process is regulated by cell junction that present in definite order from the apical to the basal ends of the cells.

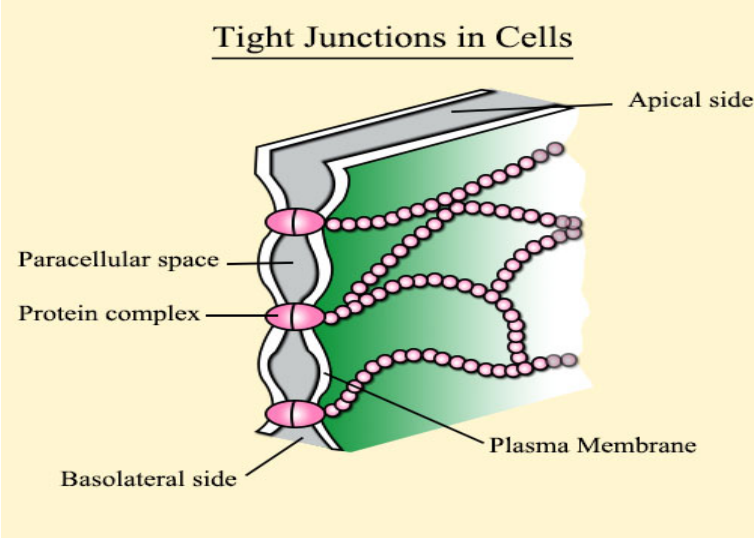
There are three major types:

1-Occluding junctions (zonula occludens, tight junctions)

Occluding junctions are symmetrical structures on opposite sides of two adjacent cells separating the apical domain from the basolateral domain. Its form a belt-like seal around the apical surfaces of two adjacent cells and dose not associated with cytoskeletal elements.

Occluding junctions (zonula occludens, tight junctions) are the most apical of junctions, **zonula** indicates that the junctions form bands completely encircling each cell and **occludens** refers to the membrane fusion that close of the space between the cells.
The junctions are tight and prevent the movement of lipids and proteins between adjacent cells thus setting paracellular pathway, also keep liquid from escaping between cells, allowing a layer of cells (for instance, those lining an organ) to act as an impermeable barrier.

For example, the tight junctions between the epithelial cells lining the bladder prevent urine from leaking out into the extracellular space.



2-Anchoring or adhesive junctions,
A- belt- desmosome
B- spot- desmosome
C- hemi- desmosome.

Desmosomes are specialized adhesive protein complexes that localize to intercellular junctions and are responsible for maintaining the mechanical integrity of tissues. Found bellow the tight junctions and mediated by trans membrane glycoprotein **cadherin's.**

Anchoring junctions are associated with cytoskeletal elements and connect the cytoskeleton of a cell either to the cytoskeleton of its neighbors or to the extracellular matrix.

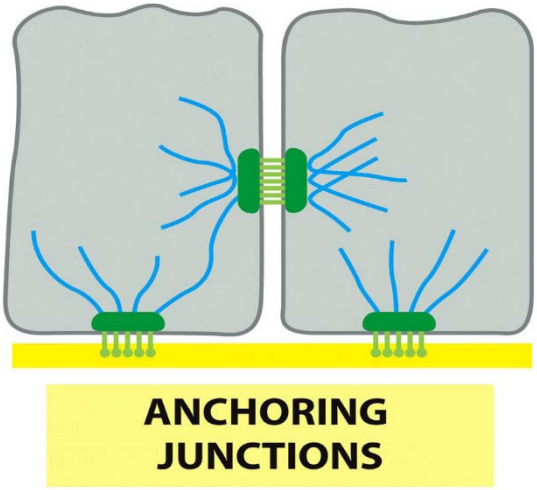
Belt desmosome and spot desmosome are symmetrical structures anchor adjacent cells at the apical domains and that provide strength and rigidity to the cell layers.

Belt desmosome has belt like distribution and associated with actin filaments, while **spot desmosome** has a spot like distribution and associated with inter mediate filaments.

Belt desmosome and tight junction are typically close together and each form a ribbon around the cells apical end.

Hemidesmosome are not symmetrical structures that anchor the basal domain of the cell to the basal lamina.

Anchoring junctions are widely distributed in animal tissues and most abundant tissues are subjected to several mechanical stresses, such as heart, muscle and epidermis.



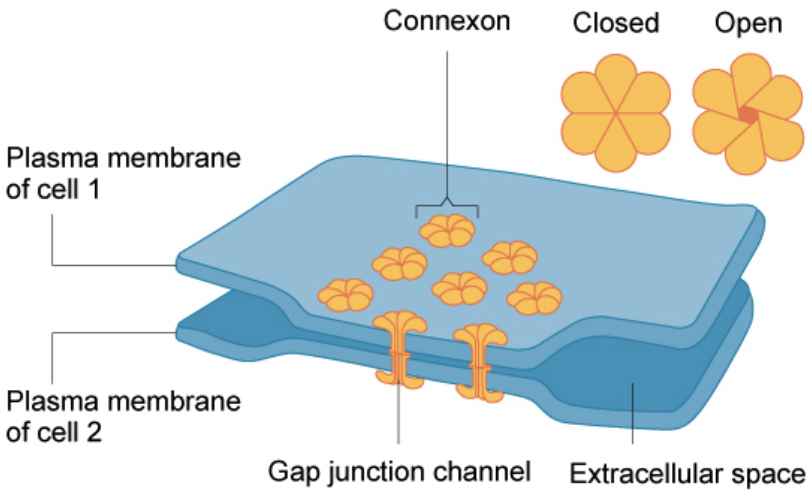
3-Gap (communicating) junctions

Button-like structures made up of integral membrane protein called **connexins**, six connexins sub units assemble in the plasma membrane to form a hollow cylinder called **connexons**.

Connexons from adjacent cells when aligned together form direct channels of communication between the cytoplasm of two cells.
Connexons usually form patches and facilitate the movement of molecules such as ca+2 and AMP between cells.

Most cells in animal tissues are in communication with their neighbors via gap junctions, which present in most mammalian tissues.

Gap junctions have a little strength but serve as intercellular channels for flow materials and allow the passage of small signaling molecules between adjacent cells to coordinate the response.



Functions of gap junctions

1-permit the rapid exchange between cells of molecules with small diameter (1.5 nm).

2-responsible for the heart coordinated beat because some molecules move radially through gap junctions, allowing cells in many tissues to act in coordinated manner rather than as independent units.