#424312

What is the nature of cell walls in diatoms?

Solution

The process of cell walls construction of diatoms is known as Frustule. It has two thin overlapping shells fitting into each other just as a soap-box. Their walls are made up of silica. The dead and decomposed diatoms deposit the sillica present in their walls in form of diatomaceous earth. This diatomaceous earth is very soft and quite inert. It is used in filtration of oils, sugars, and for other industrial purposes.

#424421

What is a mesosome in a prokaryotic cell? Mention the functions that it performs.

Solution

Mesosome is a convoluted membranous structure formed in a prokaryotic cell by the invagination of the plasma membrane. Its functions are as follows :

(1) These extensions help in the synthesis of the cell wall and replication of DNA. They also help in the equal distribution of chromosomes into the daughter cells.

(2) It also increases the surface area of the plasma membrane to carry out various enzymatic activities.

(3) It helps in secretion processes as well as in bacterial respiration.

#424423

Name two cell organelles that are double membrane bound. What are the characteristics of these two organelles? State their functions and draw labelled diagrams of both.

Solution

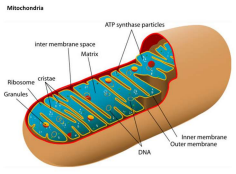
There are many cell organelles which are membrane-bound, The two organelles which have double membrane are the mitochondria and choloroplast.

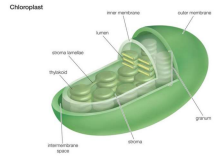
Mitochondria

- Are sausage or cylindrical-shaped organelles found in cytoplasm
- Are the sites of aerobic respiration (complete breakdown of glucose to release energy)
- Number and size varies.
- Has 2 membranes; outer membrane and inner membrane
- Inner membrane forms a number of infoldings called the cristae
- Cristae contains many enzymes required for forming ATP (storage form of energy inside a cell)
- Fluid-filled space inside the mitochondria is called the matrix
- Matrix contains a circular DNA, few RNA molecules and ribosomes (70S).
- Are also called the powerhouses of the cell (because they generate energy required for the cell and store it in the form of ATP)
- Are semi-autonomous (They have their own DNA and replicate on their own and can also synthesize most of its proteins)

Chloroplast

- They are mainly present in the in leaf epidermal cells.
- They are cylindrical-shaped organelles
- They are the sites of photosynthesis
- They have 2 membranes; outer and inner membrane
- The fluid-filled internal space is called the stroma
- The stroma contains thylakoids which contain the pigments chlorophyll and carotenoids.
- The stroma also contains a circular DNA, few RNA molecules and ribosomes (70S).





#424424

What are the characteristics of prokaryotic cells?

Solution

Prokaryotic cells are those cell that does not possess membrane-bounded nucleus e.g., bacteria, cyanobacteria. The characteristics of prokaryotic cells are as follows:

1. They are small in size 0.1 mm to 10 mm.
2. They do not possess membrane-bound organelles.
3. They have single circular DNA as genetic material and plasmid.
4. They possess mesosomes for respiration.
5. Some are autotrophic and some are saprotrophic.

#424429

Describe the structure of the following with the help of labelled diagrams.

(i) Nucleus

(ii) Centrosome

Solution

(i) Nucleus

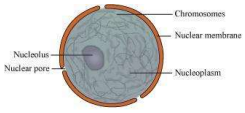
The nucleus is a double wall membrane structure. It regulates the cellular activities . It constitutes the following parts-

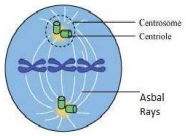
Nuclear membrane : It is a double membrane separating the contents of the nucleus from the cytoplasm. The narrow space between the two membranes is called the perinuclear space. Nuclear membrane has tiny holes called nuclear pores. These holes allow specific substances to be transferred into a nucleus and out from it.

Nucleoplasm/Nuclear matrix : It is a homogenous granular fluid present inside the nucleus. It contains the nucleolus and chromatin. The nucleolus is a spherical structure that is not bound by any membrane. It is rich in protein and RNA molecules and is the site of ribosome formation. Chromatin is an entangled mass of thread-like structures. It contains DNA and some basic proteins called as histones.

(ii) Centrosome

Centrosome has two cylindrical structures called centrioles. Each has a cartwheel-like organisation. A centriole is made up of microtubule triplets in a ring. The adjacent triplets are linked together. There is a proteinaceous hub in the central part of a centriole. The hub is connected to the triplets via radial spokes. These centrioles help in organising the spindle fibres and astral rays during cell division. They form the basal body of cilia and flagella as well.





#424883

What are the factors affecting the rate of diffusion?

Solution

Diffusion is the passive movement of substances from a region of higher concentration to a region of lower concentration. Diffusion of substances plays an important role in cellular transport in plants. The rate of diffusion is affected by the concentration gradient, membrane permeability, temperature, and pressure. Diffusion takes place as long as there is a difference between the concentrations of a substance across a barrier. However, diffusion stops, when the concentrations of the substance on either side of the barri become equal. The permeability of a membrane affects the rate of diffusion. Diffusion rate increases as membrane permeability increases. Changes in temperature and pressu values also affect the diffusion of substances. Pressure plays an important role in the diffusion of gases as gases diffuse from a region of higher partial pressure to a region of lower partial pressure.

#424884

What are porins? What role do they play in diffusion?

Solution

Porins are proteins which forms pores of large sizes in the outer membranes of plastids such as the chloroplast, mitochondria and the membranes in bacteria. They help in facilitating the passive transport of small-sized protein molecules.

#424887

Differentiate between the following:

(a) Diffusion and Osmosis

(b) Transpiration and Evaporation

(c) Osmotic Pressure and Osmotic Potential

(d) Imbibition and Diffusion

(e) Apoplast and Symplast pathways of movement of water in plants.

(f) Guttation and Transpiration.

Solution

(a) Diffusion and Osmosis

Diffusion	Osmosis
1. Diffusion is the passive movement of particles, ions, and molecules along the concentration gradient.	1. Osmosis is the process in which the diffusion of a solvent (water) occurs across a semi-permeable membrane.
2. It can occur in solids, liquids, and gases.	2. It occurs in the liquid medium.
3. It does not require a semi-permeable membrane.	3. It requires a semi-permeable membrane.

(b) Transpiration and Evaporation

Transpiration	Evaporation
1. It occurs in plants.	1. It occurs from any free surface and involves living and non-living surfaces.
2. It is a physiological process.	2. It is a physical process.
3. It occurs mainly through the stomatal pores on plant leaves.	3. It is occurs through any free surface.
4. It is controlled by environmental factors as well as physiological factors of plants such as root-shoot ratio and number of stomata.	4. It is entirely driven by environmental factors.

(c) Osmotic pressure and Osmotic potential

Osmotic pressure	Osmotic potential
1. It is expressed in bars with a positive sign.	1. It is expressed in bars with a negative sign.
2. It is a positive pressure.	2. It is a negative pressure.
3. Its value increases with an increase in the concentration of solute particles.	3. Its value decreases with an increase in the concentration of solute particles.

(d) Imbibition and Diffusion:

Imbibition	Diffusion
1. Imbibition is a special type of diffusion. In this process, water is absorbed by solids and colloids, causing an enormous increase in volume.	1. Diffusion is the passive movement of particles, ions, and molecules along the concentration gradient.
2. It usually involves water.	2. It involves solids, liquids, and gases.

(e) Apoplast and Symplast pathways of water in plants

Apoplast pathway	Symplast pathway
1. The apoplast pathway involves the movement of water through the adjacent cell walls of the epidermis and cortex. The movement of water is restricted at the casparian strips of the root endodermis.	1. The symplast pathway involves the movement of water through the interconnected protoplasts of the epidermis, cortex, endodermis, and root pericycle.
2. It is a faster process of water movement and water moves through mass flow.	2. It is a slower process of water movement.

(f) Guttation and Transpiration

Guttation	Transpiration
1. It occurs usually at night.	1. It occurs usually during the day.
2. Water is lost from the leaves in the form of liquid droplets.	2. Water is lost from the leaves in the form of water vapour.
3. It occurs through the vein endings of leaves.	3. It occurs through the stomata.
4. It is an uncontrolled process.	4. It is a controlled process.

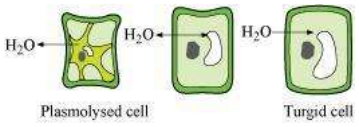
#424890

(a) With the help of well-labelled diagrams, describe the process of plasmolysis in plants, giving appropriate examples.

(b) Explain what will happen to a plant cell if it is kept in a solution having higher water potential.

Solution

(a) Plasmolysis can be defined as the shrinkage of the cytoplasm of a plant cell, away from its cell wall and toward the centre. It occurs because of the movement of water from the intracellular space to the outer-cellular space. This happens when the plant cell is placed in a hypertonic solution (i.e., a solution having more solute concentration than the cell cytoplasm). This causes the water to move out of the cell and toward the solution. The cytoplasm of the cell shrinks and the cell is said to be plasmolysed. This process car be observed in an onion peel kept in a highly concentrated salt solution.



Process of plasmolysis

(b) When a plant cell is placed in a hypertonic solution or a solution having higher water potential, the water diffuses into the cell (i.e., the movement is observed from higher to lower water pressure region). The entry of water in the plant cell exerts pressure on the rigid cell wall. This is called turgor pressure. As a result of its rigid cell wall, the plant ce does not burst.

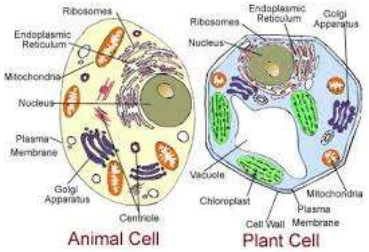
#462769

Make sketches of animal and plant cells. State three differences between them.

Solution

Animal cell - Cell wall is absent. Chloroplast is absent. Vacuoles are absent. Nucleus usually lies in the centre.

Plant cell - Cell wall is present. Vacuoles are very large often takes up entire space in the cell. Chloroplast is present. Nucleus lies on one side in the peripheral cytoplasm.



#462770

State the difference between eukaryotes and prokaryotes.

Solution

1. Eukaryotic cells contains membrane bounded organelles, such as the nucleus, while prokaryotic cells do not.
2. Prokaryotes are also known as the primitive life forms as they arrived earlier than the eukaryotes during the course of evolution.
3. Eukaryotes are multicellular and prokaryotes are unicellular.
4. Ribosomes are smaller in prokaryotes and larger in eukaryotes.
5. Prokaryotes lacks 'true nucleus', whereas eukaryotes possess nucleus as well as nuclear membrane.

#462773

Where are chromosomes found in a cell? State their function.

Solution

Chromosomes are located inside the nucleus of animal and plant cells. Each chromosome is made of proteins (histones and non-histones) and a single molecule of deoxyribonucleic acid (DNA). The function of chromosomes is to carry the genetic material from one generation to another.

#464521

Make a comparison and write down ways in which plant cells are different from animal cells.

Solution

Comparison between plant and animal cells.

Plant cells	Animal cells
1. Plant cells are rectangular and larger than animal cells.	1. Animal cells are mostly round/oval and smaller than plant cells.
2. Cellulose cell wall is makes the outer most boundary.	2. Animal cells lack cell wall.
3. A mature plant cell has single, large, well developed vacuole..	3. Mostly absent, if present, they are small and scattered.
4. Golgi bodies components are diffused all over the cell and make dictyosomes.	4. Well developed Golgi bodies are present near the nucleus.
5. Centrioles and centrosomes are absent; rather polar caps are present.	5. Centrioles and centrosomes are present.
6. Plant cells have plastids.	6. Plastids are absent.
7. Starch or oil serve as storage food material.	7. Glycogen serves as storage food material.

#464522

How is a prokaryotic cell different from a eukaryotic cell?

Solution

Differences between prokaryotic and eukaryotic cell

Prokaryotic cell	Eukaryotic cell
1. They are generally small in size (1-10 micrometer).	1. Eukaryotic cells are comparatively larger in size.
2. Nuclear matter is undefined without any nuclear membrane and is called as nucleoid.	2. A true nucleus with nuclear membrane is present.
3. Single chromosome is present as genetic material.	3. More than one chromosome is present.
4. It lacks any membrane bound organelles, i.e., ER, Golgi body, mitochondria etc, are absent.	4. It is characterized by presence of membrane bound organelles.
5. 70S type ribosome is present.	5. 80S type ribosome is present.
6. Cell division occurs by fission, budding or fragmentation.	6. It exhibits mitosis and meiosis as cell division processes.

#464523

What would happen if the plasma membrane ruptures or breaks down?

Solution

Plasma membrane serves as selectively permeable barrier between cell component and the surroundings. It allows only selected material to move in and out of cell thereby maintains the cell's interior intact. Rupture or break down of plasma membrane would result in the exposure of cell component to the external environment and would ultimate result in cell death.

#464524

What would happen to the life of a cell if there was no Golgi apparatus?

Solution

Golgi apparatus consists of flattened sacs stacked on each other and serves to process and transport the secretory and synthetic products from the endoplasmic reticulum (ER (lipids and proteins). In absence of Golgi apparatus, these ER products would not be carried to the designated location in cell. Golgi apparatus also serves to store and modify the material synthesized in cell, these materials would not be stored and modified. Lysosomes are the suicidal bags of cell that digest and remove the wear and tear organelles and molecules from cell. In absence of Golgi apparatus, lysosomes would not be produced and accumulation of dead and damaged organelles and molecules in cell would ultimately result in cell death.

#464525

Which organelle is known as the powerhouse of the cell? Why?

Solution

Mitochondria is known as powerhouse of cell because it serves as site for synthesis of ATP (adenosine triphosphate), the energy currency of cell, through the process of aerob cellular respiration. ATP serves as energy currency for different cell activities.

#464526

Where do the lipids and proteins constituting the cell membrane get synthesised?

Solution

The lipids constituting the membrane are synthesized in smooth endoplasmic reticulum (SER) and are transported to cell membrane. Membrane proteins are synthesized on cytoplasmic ribosomes from where they are transported to Golgi apparatus and endoplasmic reticulum for further modifications and then transported to cell membrane.

#464527

How does an *Amoeba* obtain its food?

Solution

In *Amoeba*, a cell membrane invagination (pseudopodia) surround the food particle. This is followed by formation of food vacuole surrounding the food by joining of pseudopodia of both sides and engulfment of food vacuole in animal body. Also known as phagosomes, these food vesicles serve as site of food digestion.

#464528

What is osmosis?

Solution

Osmosis is diffusion of water or solvent through a semi-permeable membrane from the region of lower solute concentration to that of higher solute concentration, i.e., down th concentration gradient.

#464529

Carry out the following osmosis experiment:

Take four peeled potato halves and scoop each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup in a trough containing water. Now,

(a) Keep cup A empty.

(b) Put one teaspoon sugar in cup B.

(c) Put one teaspoon salt in cup C.

(d) Put one teaspoon sugar in the boiled potato cup D.

Keep these for two hours. Then observe the four potato cups and answer the following:

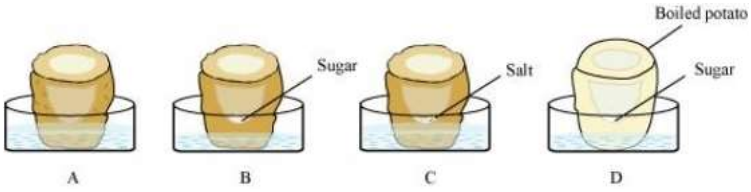
(i) Explain why water gathers in the hollowed portion of B and C.

(ii) Why is potato A necessary for this experiment?

(iii) Explain why water does not gather in the hollowed out portions of A and D.

Solution

(i) Since, sugar and salt was present in B and C respectively, water from the trough gathered in the hollowed portions of potato in B and C by the process of osmosis.

(ii) Potato A is necessary for carrying out this experiment because it act as a control experiment. Control helps us to check what changes occurred during the course of the experiment and helps us to compare the results.

(iii) Water does not gather in the hollowed portion of potato A as it was empty. Water also does not gather in the cup D because the potato used was boiled which makes it inactive as after boiling its protein structure were denatured, resulting in the disruption of cell membrane.