ANSWERS TO TOP 100+ QUESTIONS BIOLOGY QUESTIONS FOR NDA

All living organisms can be classified into 3 primary domains:

Bacteria, Archaea, and Eukarya.

Bacteria and Archaea are prokaryotes. They are single-celled microorganisms with no nuclei. On the other hand, Eukarya or Eukaryotes includes all other animals including human beings, plants, fungi, and single-celled protists. These organisms have nuclei to enclose their DNA apart from the rest of the cell.

Kingdom Monera is divided into two major groups (subkingdoms), namely, Archaebacteria (Archaea) and Eubacteria (Bacteria).

Pellagra is a disease caused due to low levels of niacin, Niacin also known as vitamin B-3. Its symptoms are dementia, diarrhea, and dermatitis, which are commonly known as "the three Ds".

Scurvy is caused due to deficiency of Vitamin C, Rickets results due to deficiency of Vitamin D, and deficiency of Vitamin B12 causes Pernicious anemia.

Protein structure is the 3D arrangement of atoms in an amino acid-chain molecule. Proteins are polymers with peptide bonds. This bond is formed between the amino group of one amino acid and the carboxyl group of neighboring amino acids. This linear sequence of amino acids in a protein is its primary structure.

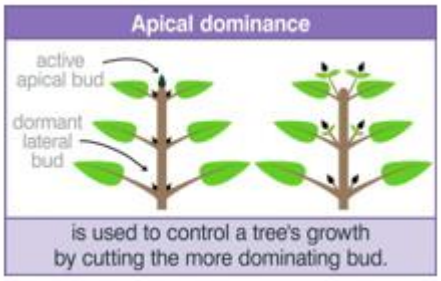
The prostate gland is walnut-size and located between the bladder and the penis. The urethra passes through the center of the prostate, from the bladder to the penis, and allows the exit of urine from the body. It secretes fluid that nourishes and protects sperm. It helps sperms to swim vigorously.

Seminal vesicles produce seminal plasma which is in the form of fluid that makes the transport of sperms smooth.

Photosynthetic organisms are classified based on the generation of oxygen during photosynthesis, it may be oxygenic or anoxygenic. Oxygenic organisms are prokaryotes and eukaryotes and anoxygenic organisms are only prokaryotes

phycobilins have a non-cyclic, linear tetrapyrroles structure. It shows the same structure as bile pigment called bilirubin. This photosynthetic pigment is covalently bound to water-soluble protein, phycobiliprotein.

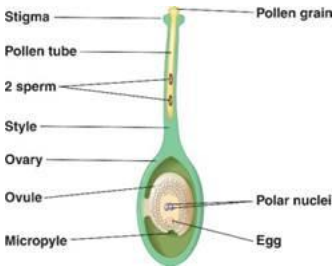
Auxin (IAA) hormone produced by the apical bud that inhibits the growth of the lateral bud further down on the stem towards the axillary bud, The plant hormone auxin likely regulate apical dominance.



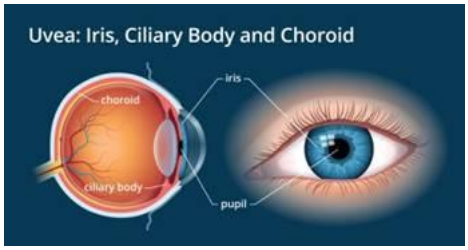
Alcoholic fermentation is a type of anaerobic respiration that includes glycolysis followed by the conversion of pyruvic acid to ethanol and carbon dioxide. In anaerobic respiration, glucose is broken and generated products are energy, alcohol, and carbon dioxide.

The Systole is the part of the cardiac cycle during which some chamber of the heart muscle contract after refilling with blood. During Systole, the aortic and pulmonic valves open to permit ejection into the aorta and pulmonary artery.

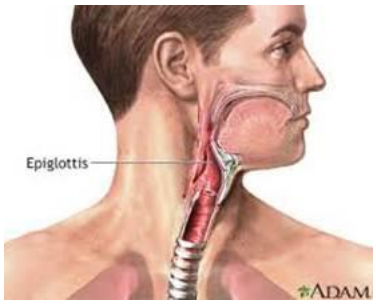
Calcium is an essential requirement for pollen tube growth in vitro. Pollen is produced in pollen cones. Pollen is a male gametophyte of higher plants. The major function is to deliver sperm cells to the ovule to ensure successful fertilization.



The color of the eyes depends on how much pigment melanin present in the iris. The more pigment you have the darker your eyes will be. Grey, blue and green eyes are lighter because they have less melanin in the iris.



Epiglottis is a leaf-shaped flap in the throat that prevents food from entering the windpipe and the lungs. It stands open during breathing, allowing air into the larynx.



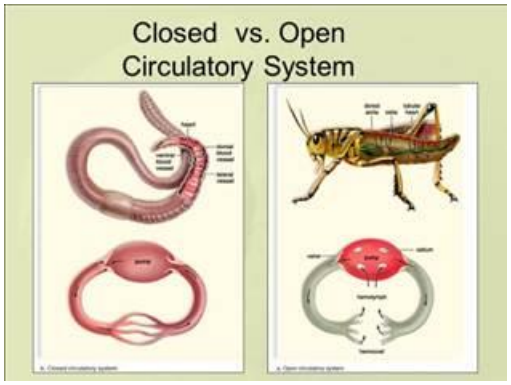
Green and Purple photosynthetic organism is an anoxygenic photosynthetic organism. it works under the absence of light and takes part in light-independent reactions.

Gibberellins are known as the growth hormone. Which are responsible for overcoming genetic dwarfism in plants. They are a group of hormones produced by certain fungus in plants. It promoted stem elongation to overcome the genetic dwarfism issue in the plants.

A photoreceptor cell is an image forming cell. They are a specialized type found in the retina which helps in vision. Rods and cones are the photoreceptor cells found in the eye.

Rod cells are highly sensitive to light and function in night vision. On the other hand, cone cells are capable of detecting a wide spectrum of light photons and are responsible for color vision.

Circulatory patterns are of two types- open or closed. Ope Circulatory system is formed in arthropods and mollusks and the closed Circulatory system present in annelids and chordates.



The coagulation cascade is a complex chemical process that uses as many as 10 different proteins that are called blood clotting factors or coagulation factors, which are found in plasma. Calcium ion plays a role in clotting which is why blood banks use a chelating agent to bind the calcium in donated blood so the blood will not clot in the body.

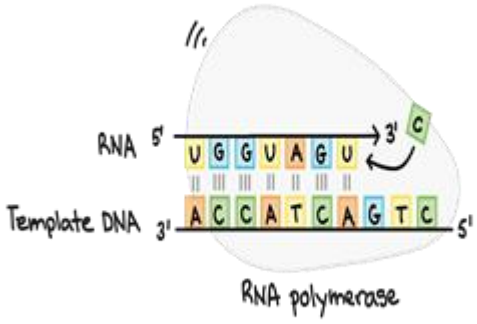
Both mosses and ferns are restricted to damp shady areas due to the need for water for the male gametes and to complete their reproductive cycle (Flowering plants have evolved to overcome this problem).

(thallose =a young shoot + phyton = plant), the plant body is not differentiated into true roots, stem, and leaves. These are non-vascular plants (without xylem and phloem); sex organs are generally unicellular and non-jacketed and no embryo formation in their life cycle.

Mumps is a viral infection that primarily affects saliva producing glands. it can cause swelling in one or both of these glands. Symptoms are- pain while chewing or swallowing, fever, headache, loss of appetite, etc.

Transcription is the first step in gene expression. It involves copying a gene's DNA sequence to make an RNA molecule.

The main enzyme involved in transcription is RNA polymerase, which uses a single-stranded DNA template to synthesize a complementary strand of RNA. Specifically, RNA polymerase builds an RNA strand in the 5' to 3' direction, adding each new nucleotide to the 3' end of the strand.



Transcription has three stages, i.e. initiation, elongation and termination.

Initiation: RNA polymerase binds together to a sequence of DNA called the promoter, which is found near the beginning of a gene. Every gene (or group of co-transcribed genes, in bacteria) possess its own promoter. Once got bound, RNA polymerase separates the DNA strands and providing the single-stranded template, which is needed for the transcription.

Elongation: In this one strand of the DNA, the template strand, acts as the template for RNA polymerase. As it "reads" that template one base at a time, the polymerase builds an RNA molecule out of the complementary nucleotides, making a chain that grows from 5' to 3'. The RNA transcript transfers the same information as the non-template (coding) strand of the DNA, but it includes the base uracil (U) instead of thymine (T).

Termination: Sequences called terminators signal that the RNA transcript is complete. Once they got transcribed, they result in the transcript to be released from the RNA polymerase. An example of the termination mechanism comprising the formation of a hairpin in the RNA

Viruses lie around our atmosphere all of the time just waiting for a host cell to come along with them. They can make entry through the eyes, nose, mouth or even breaks in the skin. Once they reach inside, they find a host cell to infect. For instance, Cold and Flu Viruses will attack the cells that line the respiratory or digestive tracts. The Human Immunodeficiency Virus (HIV), which results in AIDS, attacks the T-cells of the immune system. Nevertheless, of the type of host cell, viruses follow the same basic steps to replicate:

- A virus particle attaches itself to a host cell.

- The particle releases its genetic instructions inside the host cell.

• The injected genetic material recruits the host cell enzymes.

• The enzymes make a portion for more new virus particles.

• The new particles combine the parts into new viruses.

• The new particles get escape from the host cell.

All viruses possess some type of protein on the outside coat or envelope that "feels" or "recognizes" the proper host cell(s). This protein confiscates the virus to the membrane of the host cell. Some enveloped viruses can break down right through the cell membrane of the host because both the virus envelope and the cell membrane are made of lipids. Those viruses that are unable to enter the cell must inject their contents (genetic instructions, enzymes) into the host cell. Those viruses that break down into a cell simply release their contents once inside the host. In either case, the outcomes are the same.

During breathing time, we take air into our lungs via the nose and then release it. The taking in of the air rich in oxygen inside the body during breathing is known as inhalation and releasing out of the air rich in carbon dioxide is known as exhalation. Both the process takes place usually during breathing. Therefore, a breath signifies 'one inhalation plus one exhalation'.

Mechanism of breathing is as follows:

Lungs are attached to our nostrils (holes in the nose) along the nasal passage and windpipe. When we inhale air, it enters in our nostrils, passes along the nasal passage and windpipe, and reaches our lungs. Humans two lungs hang in an airtight space in our body called 'chest cavity'. On all sides of the chest cavity is the rib cage with sheets of muscles connecting the ribs, which encloses the lungs in it. At the bottom of the chest cavity is a curved sheet of muscle known as the diaphragm. Therefore, it makes the floor of the chest cavity. So, breathing includes the movement of the rib cage and the diaphragm.

This happens as follows:

Breathing in: When we breathe in/inhale, two things happen at the same time:

• The muscles between the ribs contract creating the rib cage to move upward and outward.

• The diaphragm gets contracts and moves downward.

All these movements result in increases space in the chest cavity and make it larger, and the air is inhaled in from outside into the lungs. As a result, the lungs get filled up with air and expand.

Breathing out: When we exhale/breathe out two things happen simultaneously:

• The muscles between the ribs relax, creating the rib cage to move downward and inward.

• The diaphragm gets relaxes and moves upward.

Due to these movements, the space in our chest cavity decreases which makes it smaller, which pushes air out from the lungs.

* There are two types of vitamins i.e fat soluble (A, D, E and K) and water soluble (B and C). It determines how vitamin acts within the body.

* Not all fat-soluble vitamin has coenzyme function only vitamin k shows such activity.

* Fat soluble vitamins released absorbed and transported with the help of fat in the body.

The complete process of nutrition is ingestion, digestion, absorption, assimilation, and defecation.

Ingestion- taking food into the mouth.

Digestion- conversion of non-absorbable food into an absorbable form.

Absorption- reaching of digested food into blood.

Assimilation- use of absorbed food in the body.

Defecation- undigested food reaches into the large intestine, which is excreted through the anus.

Unlike plant cells, Animals do not possess a cell wall. A plant cell is made up of cellulose. A cell wall is a rigid, semi-permeable protective layer which is an outward covering. It protects, supports and gives structure and is positioned next to the cell membrane. Major functions of the cell wall include-

* Support cell growth

* Withstand turgor pressure

* Regulate growth

* Protection against plant viruses

* Storage of carbohydrates

Phosphorus deficiency in plants can lead to the formation of dead tissues in the leaves, which is called necrotic spots and causes the dark green colour of leaves.

Potassium - Potassium is required for flower & fruit formation and also of thickening of cell walls. It is essential for the lengthening of stems. Mature leaves show browning and drying of the upper surface and puckering on the margins. Darkening appears between the leaf veins.

Magnesium - A plant having yellow leaves with dead spots, has a deficiency of Magnesium. Without a sufficient amount of Magnesium, the plant will start degrading chlorophyll in old leaves. The Magnesium deficient leaves show the advanced interveinal chlorosis. It is also having necrotic development in the highly chlorotic tissue.

Calcium causes blossom-end rot in plants. The condition is seen in the fruits of plants as a circular patch that is greenish-brown to black in colour.

Excessive secretion of aldosterone from an adrenal cortical tumour produces aldosteronism or Conn's syndrome. This disease is characterised by high plasma sodium, and low plasma potassium ions rise in blood volume and high blood pressure, kidney damage hence polyuria.

Hypersecretion of insulin results in the presence of excess glucose in the blood. This condition is known as hyperglycemia.

* Pellagra is a disease caused by lack of the Vitamin niacin (Vitamin B3).

* Symptoms include inflamed skin, diarrhea, demantia and sores in the mouth. Area of the skin exposed to either sunlight or function are typically affected first.

* Cause of Eczema is skin to become inflamed or irritated, the common type of eczema is atopic eczema and atopic dermatitis. Atopic means a group of disease which developed other allergic conditions.

* If silver builds up in a body over a long time that condition known as argyria, through eyes, skin, internal organs, nails… especially in that areas of body exposed to sunlight.

Autotrophic Mode of nutrition is the nutrition in which organisms make food themselves from the simple substance. As plants make their food, they are called autotrophs.

The mode of nutrition in which organisms take in nutrients from dead and decaying matter is called Saprotrophic Nutrition.

Heterotrophic Nutrition is the mode of nutrition in which organisms depend upon other organisms for food to survive.

A- Cerebrum, B- Medulla oblongata, C- Cerebellum, D- Cerebrospinal fluid

The cerebrum controls memory, learning, speech, and also coordinates sensory and motor inputs.

Medulla oblongata controls heart rate and breathing whereas the cerebellum helps in muscle coordination and body balance.

Cerebrospinal fluid surrounds the brain and spinal cord. It helps the brain and spinal cord from injury and also acts as nutrient delivery and waste removal system for the brain.

Non- infectious diseases are those which are not contagious means they are not caused by pathogens.

These diseases are caused by lifestyle problems, environmental toxins, genetic mutations. Few more examples are diabetes, hypertension and few immune system diseases.

The digestive glands in the human digestive system are found outside the digestive tract as well as within the tract.

Outside the digestive tract

i) Salivary glands: The main salivary glands are Parotid Submandibular or submaxillary and sublingual. They secrete saliva which contains salivary amylase.

ii) Liver: It is a large organ present on the right side just below the diaphragm. It secretes bile juice which emulsifies the fats and lipids.

iii) Pancreas: It is present near the duodenum. It secretes pancreatic juice which consists of enzymes like the pancreatic amylase, trypsin and lipase.

Within the digestive tract

i) Gastric glands: They are present along the stomach wall and secrete gastric juice. Gastric juice contains hydrochloric acid and enzymes like pepsin and rennin.

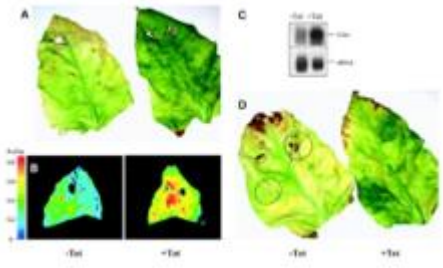
ii) Intestinal glands: They are present on the intestinal wall in the ileum region. They secrete intestinal juice that contains maltase, sucrose, lactase and Erepsin.

Phytochrome regulates the expression of many plant genes. In plants, light-sensing involves special molecules which are called photoreceptors, which are made up of a protein linked to the light-absorbing pigment that is called Chromophore. Photo tropism is a directional response that allows plants to grow towards, or in some cases away from, a source of light.

There are four primary external environmental cues that affect flowering in plants- photoperiod, temperature, irradiance, and stress. photoperiodism affects flowering by inducing the shoot to produce floral buds instead of lateral buds and leaves.

Abscisic acid acts like a general plant growth inhibitor and an inhibitor of plant metabolism. ABA stimulates the closure of stomata in the epidermis and increases the tolerance of plants to various kinds of stresses. Hence, it is also known as the stress hormone.

Cytokinin helps in the reduction of leaf fall. it gives Richmond Lang effect by which the Senescence is delayed in plants, it is happening by the retardation in the destruction of chlorophyll.



Xanthium is a short-day plant. A short day plant is, that requires a long period of darkness, it is called a short day and long night plant. Short-day plants form flowers only when the length is less than about 12 hours.

Hypothalamus and thymus are not termed as an endocrine gland, but they are involved in the secretion of hormones. Hence they are part of the endocrine system. The hypothalamus plays an important role in controlling many body functions like the release of hormones from the pituitary gland, regulates body temperature, controls appetite.

The rest all are endocrine glands.

Anaerobic respiration in both glycolysis and fermentation takes place in the fluid portion of the cytoplasm whereas the huge amount of energy yield of aerobic respiration takes place in the mitochondria.

The part which is labelled 3 is the medulla oblongata.

The medulla oblongata is present in the lowest region of the brain. Some of its major functions are:

1. It mainly controls the body’s autonomic functions such as heartbeat, breathing, and digestion.

2. It plays a significant role in connecting the spinal cord, pons, and cerebral cortex.

3. It helps to maintain posture and control reflexes.

The large space behind the lens contains a thick, gel-like fluid. This is known as vitreous humor or vitreous gel. The chambers in front of the lens are filled with a clear, watery fluid, known as aqueous humor.

The function of these two fluids is to keep the shape of the eyeball intact. It presses against the inside of the eyeball.

The macula is located near the center of the retina at the back of the eyeball, It provides the sharp, detailed, central vision for focusing.

The sclera is the white part of the eye. It forms the supporting wall of the eyeball and is continuous with the clear cornea.

Presbyopia is commonly seen in older people where they cannot see near objects clearly as their lens loses flexibility. Few symptoms are difficulty reading small print, holding reading material far, headaches, and eyestrain.

Astigmatism is an eye defect where only some parts of an object are seen in the focus. This is due to the uneven curvature of the cornea. It can be corrected by using cylindrical lenses.

A cataract is cognition where the lens turns opaque and vision is lost. It can be corrected by using a convex lens.

Conjunctivitis or pink eye is an inflammation or infection of the transparent membrane (conjunctiva). This membrane lines the eyelid and covers the white part of the eyeball. The infection or swelling results in red or pink color of the eye.

A ganglion is a group of neuron cell bodies and glial cells found in the peripheral nervous system. They are supported by connective tissues. They function like a relay, where one nerve enters and other exits.

They are associated with sensory endings in the periphery, like in the skin, and reach out to the CNS through the dorsal nerve root.

Synapse is a structure that permits communication between the neurons. They pass an electrical or chemical signal to another neuron or the target effector cell.

Cyton is the central or cell body of a neuron that contains the nucleus.

The hypothalamus which is located in the forebrain plays a crucial role in many important functions like releasing hormones. regulating body temperature.

The two cerebral hemispheres are connected by white fibers, called the corpus callosum. They provide communication between the two halves.

On the other hand dura mater, arachnoid, and pia mater. The space under the arachnoid, the subarachnoid space, is filled with cerebrospinal fluid and contains blood vessels.

Thus both the assertion and reason statements are wrong.

The sarcolemma is a specialized cell membrane that surrounds striated muscle fiber cells. It is not present in nerve cells. It acts as a barrier between the extracellular and intracellular components of the muscle fiber.

Neurilemma or neurolemma or sheath of Schwann is the outermost nucleated cytoplasmic covering of Schwann cells that surrounds the axon of the neuron.

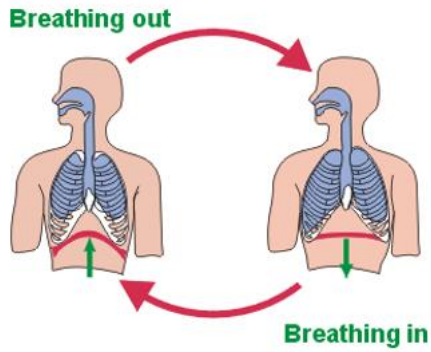
Axon and dendrites are part of nerve cells.

Some algae, fungi, and protozoans contain spores that are capable of swimming as they flagellate. These spores are known as zoospores. Water is essential for this mode of reproduction.

Megaspore, or large spore, is a type of spore that germinates into a female gametophyte, which produces egg cells. On the other hand, microspore develops into male gametophytes. It is found in heterosporous plants.

Aplanospores are non-flagellated spores.

All organisms respire to release energy to fuel their living processes. The energy is needed for growth, repair, and movement. Bi-products of respiration are water and carbon dioxide, they need to be excreted.



Dendrites – Dendron – Perikaryon – Nucleus – Axon – Axon endings

Dendrites are the end branches of dendrons. They receive nerve impulses from other neurons. Dendrons are the small branches given out by the perikaryon or soma, which is the cell body. The nucleus is present in the perikaryon which leads to the axon. Axon is the longest branch extending terminally from the perikaryon. Axon endings are bulb-like structures seen at the end of the axon.

Pulmonary respiration is an external process where the transfer of gas between respiratory organs such as lungs and blood in pulmonary capillaries takes place. It is also known as breathing. During this process, oxygen is inhaled from the air into the lungs and carbon dioxide is expelled from the lungs to the air. In external respiration, gas exchange takes place between the alveoli and the blood.

The exchange of gases between blood and tissue cells takes place in internal respiration.

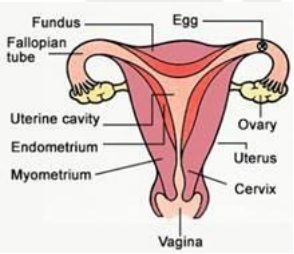
A person identified as the first to become infected with any disease in an outbreak. The disease they have can either viral or bacterial, and it is usually the least mutated form of illness.

Masca is a genus of flies. It includes Musca domestica as well as Musca autumnalis. It is part of the family Muscidae. The mango tree belongs to the genus Mangifera that is a species of 30 tropical fruiting trees. Homo is the genus which includes modern human and their close relatives. Wheat belongs to the genus Triticum, for which there are 10 species. The most economically important species, T. aestivum, has five subspecies.

Different mRNA within the same cell has distinct lifetimes, in bacterial cell individual mRNA can survive from seconds to more than an hour. However, the lifetime average between 1 and 2 minutes.

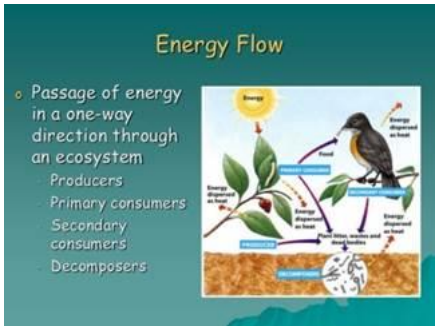
Carnauba waxes are such type of hard wax. It can produce a glossy finish. It is used in automobile waxes, shoe polishes, dental floss, food product, floor, and furniture waxes especially when mixed with beeswax and with turpentine.

The ovaries produce the egg cell, which is called the ova or oocytes. Then, the oocytes are transported to the fallopian tube where fertilization by a sperm may occur. The major function of the uterus is to retain a Nourish of embryo or fetus. Furthermore, it helps to push out the baby during birth through muscle contraction. The fallopian tube is also called oviduct or uterine tube, located in the female abdominal cavity, which transports male sperm cells to the egg and provides a suitable environment for fertilization. Cervical mucus filters out sperm with poor morphology and motility and as such, only a minority of ejaculated sperm actually enter the cervix.



Gastric juice has pepsin, lipase, and rennin in it. Pepsin is secreted as pepsinogen in an inert form that is activated by hydrochloric acid. Lipase helps to break the presence of fat in the body into fatty acids. Rennin is a proteolytic enzyme that helps in the coagulation of milk.

Free energy has always unidirectional or one-way passage in an ecosystem i.e., from solar radiation- producers- herbivorous- carnivores. This energy can not travel in the reverse direction. The only source of energy is sunlight. With the help of producers energy gets trapped then it flows from herbivores to carnivores to carnivores or consumers at a different trophic level.

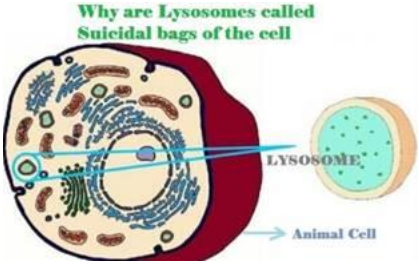


A flame cell is a specialized excretory cell which is found in the simplest freshwater invertebrates, including flatworms, rotifers, and nemerteans- these are the simplest animal to have dedicated excretory systems. Flame cells function like a kidney, removing waste material. Flatworms have an excretory system that consists of two tubules. The cells in the tubules are called flame cells.

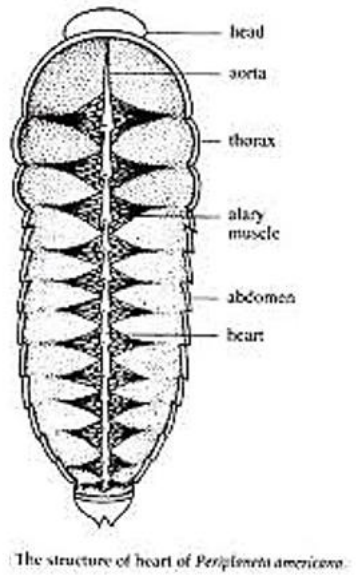
mRNA stands for Messenger ribonucleic acid. It is single-stranded RNA molecules that are complementary to one of the DNA strands of a gene in the cell which carries codes from the DNA in the nucleus to the sites of protein synthesis in the cytoplasm.

Advanced organisms are complex and have acquired new features morphologically and anatomically by evolution from simpler organisms to better adapt to the changing environmental condition. Advanced organisms are more recent organisms. They are also known as higher organisms because they possess several specializations.

The lysosomes are known as suicidal bags of a cell because when the cell gets damaged, the lysosome may burst and the enzymes digest their cell. We can also say that they possess a different kind of hydrolases on the release of these enzymes, which causes the death of a cell.



The blood of Cockroach is called hemolymph. Their blood is not red because they do not use hemoglobin to carry oxygen. They use a system of pipes known as tracheae to bring oxygen and remove carbon dioxide from their tissues.



The structure of heart of *Periplaneta americana*

photorespiration is also known as the oxidative photosynthetic carbon cycle, photorespiration is the process of light-dependent uptake of molecular oxygen concurrent with the release of carbon dioxide from organic compounds.

When we exhale, we breathe out mostly carbon dioxide. The air we exhaled is 4% to 5% by volume of carbon dioxide, about a 100 fold increase over the inhaled amount. Exhalation is the flow of breath out of an organism.

O negative is the universal blood type. Group O blood can be donated to persons with any other blood group and hence O group individuals are known as universal donors.

Recipient	Donor							
My Blood Type	O-	O+	A-	A+	B-	B+	AB-	AB+
O-	●							
O+	●	●						
A-	●		●					
A+	●	●	●	●				
B-	●				●			
B+	●	●			●	●		
AB-	●		●		●		●	
AB+	●	●	●	●	●	●	●	●

Monocots, also known as monocotyledons, are a class of the flowering plants, or angiosperms. Monocots are named as mono due to the presence of a single **cotyledon**, or seed leaf, within the seed. The first green blade emerging from the seed upon germination is the cotyledon, which contains sugars and other nutrients for growth until the leaf can photosynthesize.

Pteridophytes (pteron= feather, phyton= plant), i.e. plants with feather-like leaves. These are the first vascular land plant and thus also known as **vascular cryptogams.** They are also called **snake of the plant kingdom.** They are represented by about 400 living and fossils genera and some 10,500 species. Mostly pteridophytes are terrestrial, growing in moist and shady places. Some members are aquatic like Azolla, Marsilea, Salvinia, usually occurring in permanent ponds. A few forms of pteridophytes are xerophytic like Equisetum.

Azolla is known as the smallest pteridophyte, whereas orchids are the plant having the smallest seed. PPLO or mycoplasma gallisepticum is known as the smallest cell. Also, Lodoicea is the plant with the biggest fruit.

Usually, sex-linked genes in male heterogametic animals are present on the X- chromosome. But in some animals, it may present on the Y chromosome. This produces visible effects on the phenotype of the organism.

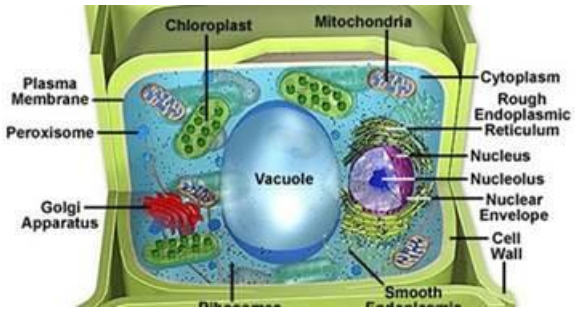
In higher animals like mammals, Y linkage is very rare. On the other hand, X linkage is quite common in all mammals. The mammalian X chromosome contains a larger number of genes with major effects on phenotype.

Each ribosome is composed of two subunits: Small (30S) and large (50S). These subunits are bound to each other. They are composed of long strands of RNA.

The large subunit (50S) makes new bonds. It contains the active site of the ribosome to create the new peptide bonds when proteins are synthesized.

The small ribosomal subunit (30S) binds mRNA and initiates protein synthesis.

In plant cells, vacuole which typically takes up most of the room (about 80% or more) in the cell. The vacuole holds a huge amount of food or water. Vacuoles are cytoplasmic organelles, performing functions like- storage, digestion, ingestion, etc.



Sclerenchyma is support tissues composed of hard woody cells. Mature sclerenchyma cells are usually dead cells. They are elongated cells with secondary walls of lignin deposits. They are found in leaves and fruits and constitute the hard shell of nuts and outer covering of many seeds.

Collenchyma are living cells with minute intercellular gaps. Its cell wall is made up of pectin and cellulose.

A bacteriophage is a virus that attacks and infects bacterial cells. They contain DNA (label 2) as genetic material. Label 1 is a capsid, which is the protein shell of a virus. It encloses its genetic material and is made up of capsomeres.

During the angiosperm life cycle, the sporophyte produces two types of spores, microspores, and megaspores. They eventually give rise to male gametophytes and female gametophytes. The female gametophyte is referred to as an embryo sac which develops into an ovule resulting in an egg.

There is no mixing of oxygenated and deoxygenated blood in the mammals as they have a very efficient circulatory system. It has two atria and ventricles to receive CO_2 and O_2 rich blood respectively. Also, valves are present in the heart which allows the movement of blood in one direction and prevents the backflow. But the valves in the heart have no role in the prevention of mixing of deoxygenated and oxygenated blood.

The ciliated columnar epithelium is found in the bronchioles of the respiratory tract where mucous and air are pushed away so that the respiratory tract is clear. It is also found in fallopian tubes, the uterus, and the central canal of the spinal cord.

Rennin enzyme is a protein-digesting enzyme. It is found in cud-chewing animals especially young calves, lambs. It is present in the abomasum (fourth stomach chamber). A commercial form of rennin, rennet, is used in manufacturing cheese.

Total lung capacity (TLC) is a measurement of the total amount of air that the lung can hold. It can be calculated by adding the residual volume, expiratory reserve volume, tidal volume, and inspiratory reserve volume.

The inspiratory capacity (IC) is the amount of air that can be inhaled after the end of a normal expiration. It is the sum of the tidal volume and inspiratory reserve volume.

Vital capacity (VC) measures the maximum amount of air that can be inhaled or exhaled during a complete respiratory cycle.

Tidal volume (TV) is the amount of air that is inhaled and exhaled during a normal breath.

The eye defect shown in the figure is Hypermetropia where the image is formed beyond the retina. This defect is caused due to the greater focal length of the lens and when the eyeball becomes smaller. It can be corrected by using a convex lens of suitable focal length.

DTaP vaccine can prevent diphtheria, tetanus, and pertussis.

Diphtheria can lead to difficulty breathing, heart failure, paralysis, or death.

Tetanus (T) causes a painful stiffening of the muscles and leads to serious health problems.

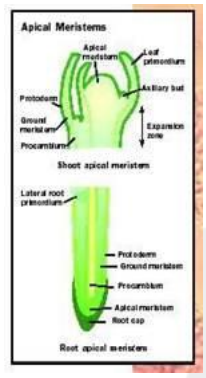
Pertussis (aP), or “whooping cough,” can cause uncontrollable, violent coughing. It is very dangerous in babies and young children, causing pneumonia, brain damage, or death.

It should be given to children in 5 doses of DTaP 2 months, 4 months, 6 months, 15–18 months, and 4–6 years.

Bacteria is a type of biological cell. They are the prokaryotic, unicellular organism. Mutualism occurs when an organism of both species benefit

from their association. In this relationship, plants get their pollen carried from flower to flower and animal pollination like a bee, butterfly, etc.

The apical meristem is the growth region in plants found within the root tips and the tips of new shoots and leaves. An apical meristem is a group of cells that retain the ability to continue division, forming new cells continuously as the plant grows.

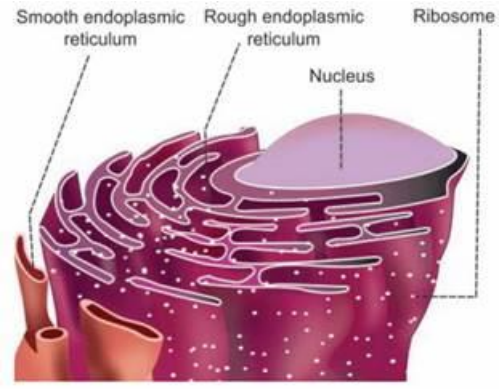


All mollusks have evolved a closed circulatory system which is not dependent on diffusion for blood to reach tissues throughout the body. The closed circulatory system allows more efficient pinpointing of blood.

Early prophase is part of the stages in mitosis. In Early prophase, the mitotic spindle starts to form, the nucleolus disappears and the chromosomes start to condense. The cell starts to break down some structure and build others up in Early prophase.

There are two types of Endoplasmic reticulum- Smooth and Rough.

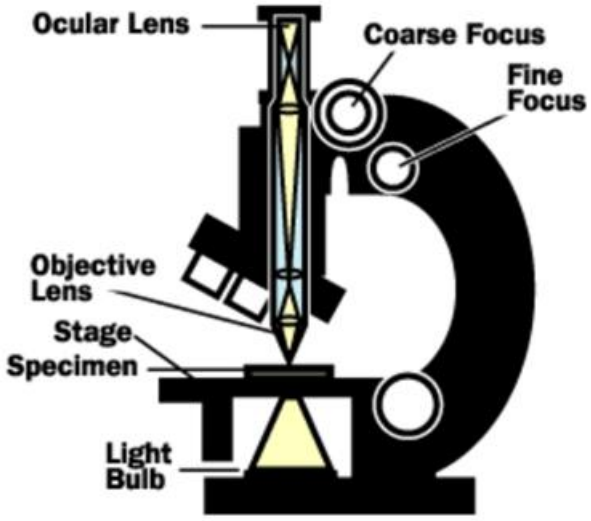
The smooth Endoplasmic reticulum is where lipid synthesis takes place, and organelle handles toxic substances within the cell. Rough Endoplasmic reticulum is known for its rough appearance due to the ribosome attached to its folds.



Probiotics are edible milk preparations that contain useful active bacteria, like *Lactobacillus, Acidophilus, Lactobacillus casei, Bifidobacterium bifidum*, etc. They maintain the balance of microbial flora of the alimentary gut. These bacteria are very useful for the intestine as they help in the process of metabolism. For a person who is suffering from diarrhea or is under antibiotic treatment, they are of great use as antibiotics kill both beneficial and harmful bacteria present in our body. Hence these probiotics aid in the digestion process.

Saccharomyces is a yeast used in alcohol fermentation.

The compound microscope consists of two converging lenses used to view very small objects at short distances. One of the lenses which are closest to the object is called the Objective. It is used to enlarge and invert the object into a 'real' image. The other lens is closest to the eye called the Eyepiece or Ocular, It acts as a simple magnifier and used to view the image formed by the objective. This is a converging lens placed in front of the eye that increases the size of the image formed by the retina.



DNA fingerprinting or DNA typing or DNA profiling or genetic fingerprinting or genotyping or identity testing is a method of isolating and identifying variable elements present within the base-pair sequence of DNA.

The following are the steps involved in DNA fingerprinting:

Step 1: Isolating the DNA.

Step 2: Digesting the DNA with the help of restriction endonuclease enzymes.

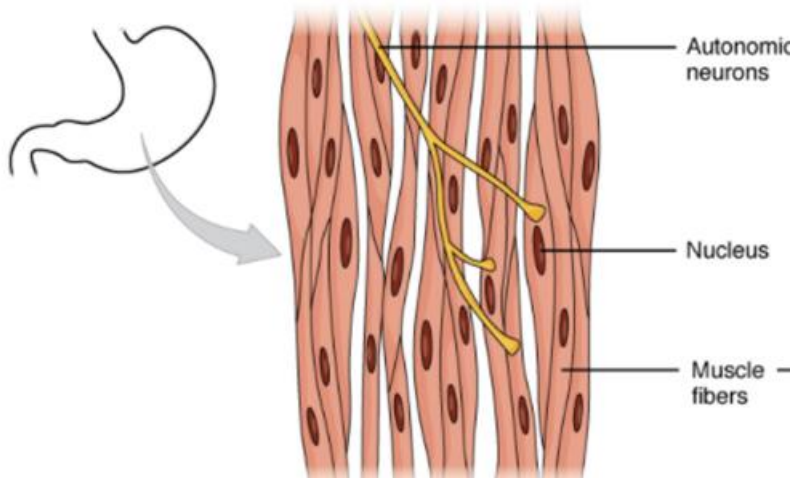
Step 3: Separating the digested fragments as per the fragment size by the process of electrophoresis.

Step 4: Blotting the separated fragments onto synthetic membranes like nylon.

Step 5: Hybridising the fragments using labeled VNTR probes.

Step 6: Analysing the hybrid fragments using autoradiography.

Smooth muscles do not have striations. They are present in the walls of hollow organs like the urinary bladder, uterus, stomach, intestines, and the walls of arteries and veins of the circulatory system, and the tracts of the respiratory, urinary, and reproductive systems.



In the digestive system, the process of peristalsis begins in the esophagus when a bolus of food is swallowed. The strong wave-like motions of the smooth muscle in the esophagus carry the food to the stomach, where it is churned into a liquid mixture called chyme.

Photosynthetic pigments of Rhodophyta are chlorophylls a and d.

Chlorophyll D is one of the rarer forms of photosynthetic pigment and is only found in species of red algae and cyanobacteria. This chlorophyll helps the algae and other photosynthetic organisms living in deep water where not much other light can penetrate. Red algae are red due to phycoerythrin.

Golden rice is a genetically modified variety of rice which is used as a fortified food in areas with a shortage of dietary vitamin A. It contains a precursor of pro-vitamin A, beta-carotene, which has been introduced into the rice through genetic engineering.

The rice plant produces beta- carotene pigment only in its leaves as it helps in the process of photosynthesis. Since beta-carotene is a precursor of pro-vitamin A, it is introduced into the rice variety to overcome the shortage of dietary vitamin A.

It is one of the simple and less expensive alternatives to vitamin supplements.

Rheumatic heart disease is a chronic heart condition and is very common in children. This disease is commonly found in developing countries with areas of poverty.

It is an inflammatory disease affecting the joints, heart, and central nervous system. The heart valve, pericardium, and endocardium get damaged due to the inflammation caused by rheumatic disease.

The most common symptoms are strep throat and fever, chest pain, excess fatigue, thumping sensation in the chest, swollen ankles.

Antibiotics are used for the treatment of strep throat and prevent rheumatic fever. Medicines that are helpful for blood thinning to prevent heart stroke.

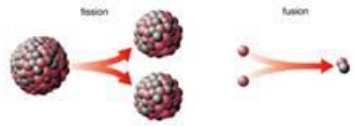
Surgery is required for repairing heart valves.

In the above experiment, the first step is to de-starch the plant. The plant is then kept in the bell jar along with potassium hydroxide in a watch-glass. Potassium hydroxide solution absorbs the carbon dioxide gas from the air present in the glass bottle. The bell jar is kept in sunlight for a few hours and then tested for starch. It will show negative results as the plant fails to get CO_2 to perform photosynthesis as it was absorbed by potassium hydroxide.

Fungi belong to their kingdom of eukaryotic organisms classified in the eukaryote domain. Plants, animals, algae, and fungi all are eukaryotes because they don't have chlorophyll and vascular tissue and line by decomposing and absorbing organic matter from living or dead sources. Fungi are heterotrophic because they cannot produce their food, fungi can be single-celled or very complex multicellular organisms. The cell wall of fungi is mainly composed of Chitin.

Malpighian corpuscles is a structure for filtering blood in the vertebrate kidneys which is formed from the bowman's capsule with its associated glomerulus. The **henle's loop** is critical to the ability of the kidney to concentrated urine. The high concentration of salt in the medullary fluid is believed to be achieved in the loop by a process of countercurrent exchange multiplication. The **urine** flows out of the nephron tubule into a collecting duct then passes out of the kidney through the renal pelvis, into the ureter, and then down to the bladder. The **urinary bladder** is a urine storage organ that is a part of the urinary tract.

Bacteria mainly reproduce by **Binary fission**. In this binary fission process the bacterium, which is a single cell, divides into two identical daughter cells, it begins When the DNA of the bacterium divides into two. **Fragmentation** is a type of asexual reproduction where an organism upon maturation breaks down into pieces and each fragment grows into a new organism. **Sporulation** refers to the formation of spores from vegetative cells during unfavorable environmental conditions. **Budding** is the process where a new organism is developed from a small part of the parent's body.

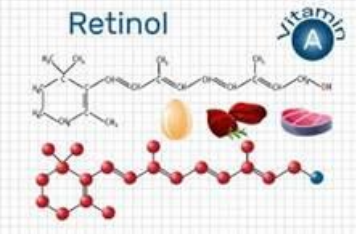


Cholera bacillus is a gram-negative, comma-shaped bacterium. Robert Koch(1843-1910) German bacteriologist discovered the bacteria which causes Anthrax, septicemia, Cholera, and tuberculosis. Robert Koch is also known as the father of bacteriology. **Ronald Ross** is famous for being the discoverer of mosquito transmission of malaria. **Louise's posture** is known for inventing the process which bears his name pasteurization. The nucleus of a cell was discovered by **Robert Brown**.

Diarrhoea in the traveler is caused by protozoan parasites. Diarrhea is a symptom of a bowel infection. It is loose and watery stool during a bowel movement. Fungal infection examples are athlete's foot, jock itch, ringworm. Viral diseases are the common cold, smallpox, hepatitis. Some examples of bacterial diseases are Cholera, leprosy, plague, syphilis.

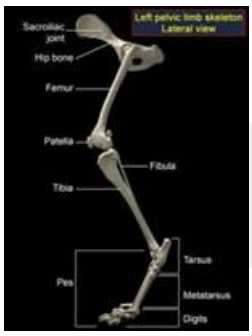
The study of the visceral organ is called **splanchnology** i.e digestive, urinary, reproductive, and respiratory systems. Viscera are the soft organs of the body. These organs differ in structure and development but they are United for the performance of a common function. Arthrology is the study of anatomy function, dysfunction and treatment of joints and articulations. Anthropology is a study of humanity. Angiology is the study about the circulatory system and of the lymphatic system.

Retinol is also called vitamin A1 alcohol, it is a vitamin in the vitamin A family and used as a dietary supplements. Vitamin D is also known as calciferol that is made by the skin when exposed to sunlight. Vitamin C also known as ascorbic acid found in various foods. The chemical name of vitamin B is thiamine.



Iodine plays an important role in the regulation of thyroid function. It is needed for the production of thyroid hormone. The body does not make iodine therefore it is an essential part of the diet. Thyroxine is produced by attaching iodine atoms to the ring structures. Insulin is a hormone produced by the pancreas. Adrenaline is normally produced by adrenal glands. Testosterone is a hormone produced in men by testicles.

Each Hind limbs consist of 30 bones- 1 femur, 1 patella, 1tibia, 1 tibula, 7 tarsals, 5 metatarsals and 14 phalangers. The hindlimb of any animal are much stronger, it is attached to the posterior part of the body.

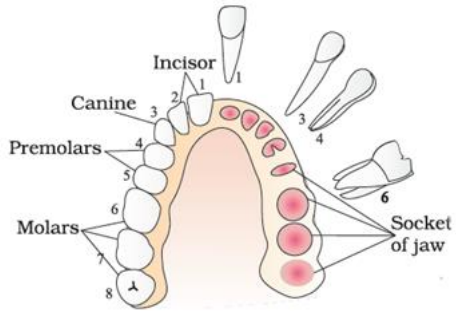


Only 1.5 % of oxygen in the blood is dissolved directly into the blood itself. 98.5% oxygen is bound to a protein called hemoglobin and carried to the tissue. Oxygen is transported with the assistance of red blood cells each molecule of hemoglobin binds 4 oxygen molecules. Oxyhaemoglobin forms.

The lateral meristem helps in increasing the width and girth. It is responsible for the plant's lateral growth that is growing in a thickness of cambium and cork cambium. The apical meristem is called a growing tip, and the function is to trigger new cells' growth. The function of the intercalary meristem is they are capable of cell division. They allow for the rapid growth and regrowth of many monocots. Permanent meristem, they are completely grown and have lost the ability of division.

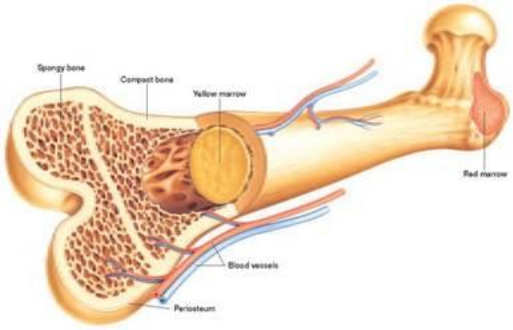
The cell wall of fungi is composed mainly of Chitin, Glucans, and glycoproteins. Each individual branched structure is known as a hypha. The cell wall of bacteria is composed of peptidoglycan; it is also called murein. Hemicellulose is found in the plant cell wall. It is a branched polymer of pentose and hexose sugar. Pectin is a cell wall component that is made up of acidic sugar-containing backbones with neutral sugar-containing side chains.

All the premolars are absent in primary dentition and III molars too. Only twenty teeth are deciduous, which are replaced by succedaneous teeth as the child grows to further teeth viz. Incisors are the front teeth present in mammals. Canine teeth set next to the incisors. Canine has a sharp, pointy surface for tearing food. Molar teeth are large and flat at the back of the mouth.



Bone marrow is the spongy tissue inside bones that produces 200 billion new blood cells every day, along with the white blood cells and platelets. It contains mesenchymal and hematopoietic stem cells. The function of the lungs is removing carbon dioxide from the blood and adding oxygen

to it. The heart is a pump, and the heart sends blood throughout our bodies and carrying oxygen to every cell. The function of the brain is like a big computer. Brain processes information that is received from the senses and body and sends messages back to the body.



Lateral roots are produced from the cells in the pericycle, the layer of cells surrounding the central vascular cylinder. It forms cell layers- the outer cell layers of the primary root, and a second root meristem. The pericycle is a unique tissue, there are three functions of the pericycle - initiation of lateral roots, initiation of the vascular cambium, and initiation of the cork cambium.

The **cork cambium** is a lateral meristem. It is responsible for secondary growth and replaces the epidermis in roots and stems. It produces a tough protective material.

The endodermis is the single layer of plant cells, it is located between the cortex and the vascular (xylem and phloem) tissues. **The cortex** is the outer layer of the root and stem.

In the presence of water, light, chlorophyll, and CO2, the formation of carbohydrates in plants called Photosynthesis. The terrestrial plant takes carbon dioxide from the atmosphere and aquatic plants use carbon dioxide mixed in water. Green parts of the plant are due to chlorophyll. Chlorophyll is a photoreceptor molecule, which traps the sunlight. Chlorophyll absorbs the violet-blue and red colors of the lights. A light reaction occurs in Grana and a dark reaction occurs in the stroma chloroplast of the cell.

The generative cell may divide to form two sperm cells before the developing male gametophyte. The pollen grain germinates into a pollen tube. The generative nucleus divides into two sperm nuclei after that it penetrates the micropyle of an ovule and releases its two sperm into the 8-nucleate embryo sac. From which one sperm fuses with the egg nucleus to form a zygote during double fertilization.

In cell glucose 6-phosphate is formed from glucose by phosphorylation and it is catalyzed by the enzyme hexokinase. In this reaction, one equivalent of ATP is consumed in glycolysis. Glucose-6-phosphate is utilized for the synthesis and storage of glycogen. Its metabolism is enhanced to pyruvate. The glycolytic pathway due to the action of regulatory enzymes.

Phenylketonuria is also known as PKU. This disease shows the accumulation of phenylalanine. It is an inherited disorder that causes an amino acid called phenylalanine in the body. Phenylketonuria is caused by a defect in the gene. It also causes mental retardation, behavioral and movement problems, and also delayed development. It creates the enzyme needed to break down phenylalanine.