Answer Key
Paper Code: 55857
Dated: 1.4.2019
Q. 1. A) Fill in the blanks:
(07)

1. Salts and minerals are conducted in plants by phloem vascular tissue
2. Tendon connects _muscle__ to bones in humans
3. Requirement of Ca for the growth of plant is _macro_ type of nutrient
4. The part of the neuron cell containing nucleus is called as__cyton__.
5. Lymphatic circulatory system in animals helps in __immune response
6. The process of loss of salts happens through the __guttation of the plant
7. Heart is an involuntary muscle of the animal tissues.

B) Match the columns:
(07)

Column A	**Column B**
a) Xylem	i) Invertebrates (c)
b) Phloem	ii) Na^+ ions (e)
c) Hydrostatic Skeleton	iii) Water Transport (a)
d) Pectoral Girdle	iv) Earthworm (f)
e) Proton Pump	v) Axial Skeleton (d)
f) Circular Muscles	vi) Stomata (g)
g) Transpiration	vii) Organic Solutes (b)

C) Define / Explain the following terms: (06)

1. Excretion: Excretion is the removal of metabolic waste from the body. In animal kingdom of metabolism there are several strategies used by organism to eliminate the waste product of metabolism.

2. Alcoholic fermentation: is the anaerobic pathway carried out by yeasts in which simple sugars are converted to ethanol and carbon dioxide.

3. Partial Pressure:In a mixture of gases, each constituent gas has a partial pressure which is the notional pressure of that constituent gas if it alone occupied the entire volume of the original mixture at the same temperature. The total pressure of an ideal gas mixture is the sum of the partial pressures of the gases in the mixture.

4. Ureotelism: Excretion of urea as an excretory product. Eg mammals

5. Respiratory Pigment: A respiratory pigment is a molecule, such as hemoglobin in humans and other vertebrates, that increases the oxygen-carrying capacity of the blood. The four most common invertebrate respiratory pigments are hemoglobin, hemocyanin, hemerythrin and chlorocruorin.

6. Osmoregulation: The maintenance of constant osmotic pressure in the fluids of an organism by the control of water and salt concentrations.

Q.2. A) Answer <u>any one</u> of the following: **(10)**

1. Discuss five kingdom classification with one suitable example of each

Ans.:

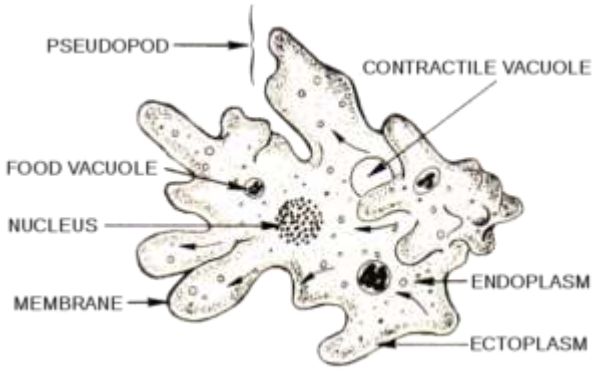
Distinguishing Features of the Five Kingdoms

Kingdom Monera

These organisms are prokaryotic and unicellular. They do not have a well-defined nucleus and also lack cell organelles. Some organisms show the presence of cell wall while there are others without a cell wall. Consequently, some organisms are <u>autotrophic and others are heterotrophic</u>. Examples include *Bacteria, Cyanobacteria, and Mycoplasma.*

Kingdom Protista

Organisms grouped under Kingdom Protista are all unicellular, but eukaryotic organisms. These are the simplest forms of eukaryotes that exhibit either autotrophic or heterotrophic mode of nutrition. Some organisms have appendages such as cilia or flagella or pseudopodia to move around. Some examples are *Diatoms, Protozoans like Amoeba, Paramoecium*



(Source: Wikipedia)

Kingdom Fungi

Heterotrophic, Multicellular and Eukaryotic organisms are grouped under Kingdom Fungi. Their mode of nutrition is saprophytic as they use decaying organic matter as food. They have cell walls, which are made up of a substance called Chitin. Fungi also form a symbiotic association with some blue-green algae. *Yeast, Mushroom, Aspergillus* are examples of Fungi.

Kingdom Plantae

These are Eukaryotic, Multicellular organisms with a cell wall that is made up of cellulose. They are autotrophs and synthesize their own food through the process of photosynthesis. This kingdom includes all plants.

Based on the body differentiation and presence or absence of specialized vascular tissue, Kingdom Plantae is divided into different divisions, namely Thallophyta, Bryophyta, Pteridophyta, Gymnosperms, and Angiosperms. Examples are *Spirogyra, Ferns, Pines, and Mango Plant* etc.

Kingdom Animalia

This Kingdom includes organisms that are Multicellular, Eukaryotic, without the presence of cell wall. They have a heterotrophic mode of nutrition. They also exhibit great diversity. Some organisms are simple while others have a complex body with specialized tissue differentiation and body organs.

The Animal Kingdom is divided into many phyla and classes. Some of the phyla are Porifera, Coelenterata, Arthropoda, Echinodermata, Chordata etc. Examples – *Hydra, Starfish, Earthworms, Monkeys, Birds* etc.

2. Explain the 3 types of Nutritional apparatus in animals
Ans.:

1. Nutritional Apparatus in animals

There are 3 types of digestive systems seen in animals

a. Animals without digestive system, e.g. Amoeba

   Digestion in **amoeba** is intracellular taking place within the cell. The food taken in remains in a food vacuole or gastric vacuole formed by the cell membrane and small part of the cytoplasm. The vacuoles are transported deeper into the cells by cytoplasmic movements. Here they fuse with lysosomes that contain enzymes.

b. Animals with partial digestive system, e.g. Hydra

   In the **hydra**, food is trapped in the gastrovascular cavity. Enzymes or special molecules secreted by the **hydra**, break down prey for absorption. Fungi also use extracellular **digestion** and secrete enzymes to break down the substrate they grow on. Intracellular **digestion** takes place inside the cell.

c. Animals with complete digestive system, e.g. Humans and all large animals

   Humans show complete digestive system with digestive organs involved in specific sequence to digest food with mechanical , chemical ie hormonal and microbial actions

Diagrams are important

Q. 2. B) Answer any two of the following: (10)

1. Briefly explain the organs with their functions of Respiratory system in humans
   Ans.:
   Organs of respiratory system The main function of respiratory system is to allow gas exchange (oxygen and carbon dioxide) with different parts of the body. The different organs of the respiratory system are nose, pharynx, epiglottis, larynx, trachea, bronchi andlungs. These organs carry out the process of respiration.

   Function of each organ to be written briefly.

2. Explain the process of food digestion in Ruminants
   Ans.:

Food digestion in ruminants

The four parts of the stomach to be explained
A four-compartment stomach, which includes

- The rumen (paunch)
- The reticulum ("honeycomb")
- The omasum ("manyplies")
- The abomasum ("true stomach")

3. Explain what is Ascent of sap in plants
   Ans.:
   The **ascent of sap** in the xylem tissue of plants is the upward movement of water and minerals from the root to the crown. Xylem is a complex tissue consisting of living and non-living cells. The conducting cells in xylem are typically non-living and include, in various groups of plants, vessels members and tracheids.
   Explain Vital theory, root pressure theory with diagrams

4. What is 'Symbiotic nitrogen fixation', explain with a suitable example
   Ans.:

1. **Symbiotic nitrogen fixation**

   Nitrogen fixation is a process by which nitrogen in the Earth's atmosphere is converted into ammonia or related nitrogenous compounds. Atmospheric nitrogen, which is molecular dinitrogen, is relatively nonreactive and is metabolically useless to all but a few microorganisms.

   The best-studied example is the association between **legumes** and **bacteria** in the genus **Rhizobium**.Each of these is able to survive independently (soil nitrates must then be available to the legume), but life together is clearly beneficial to both. Only together can nitrogen fixation take place. A symbiotic relationship in which both partners benefits is called **mutualism**.

Q.3. A) Answer any one of the following: (10)
1. Explain the role of proton pump in transport in plants.

In plants,Proton pump helps in transport of the positively charged proton is typically electrogenic, i.e. it generates an electrical field across the membrane also called the membrane potential. Proton transport becomes electrogenic if not neutralized electrically by transport of either a corresponding negative charge in the same direction or a corresponding positive charge in the opposite direction.

The combined transmembrane gradient of protons and charges created by proton pumps is called an electrochemical gradient. An electrochemical gradient represents a store of energy (potential energy) that can be used to drive a multitude of biological processes such as ATP synthesis, nutrient uptake and action potential formation.

In cell respiration, the proton pump uses energy to transport protons from the matrix of the mitochondrion to the inter-membrane space.[1] It is an active pump that generates a proton concentration gradient across the inner mitochondrial membrane because there are more protons outside the matrix than inside. The difference in pH and electric charge (ignoring differences in buffer capacity) creates an electrochemical potential difference that works similar to that of a battery or energy storing unit for the cell.[2] The process could also be seen as analogous to cycling uphill or charging a battery for later use, as it produces potential energy. The proton pump does not create energy, but forms a gradient that stores energy for later use.

Adenosine triphosphate (ATP) driven proton pumps (also referred to as proton ATPases or H^+-ATPases) are proton pumps driven by the hydrolysis of adenosine triphosphate (ATP). Three classes of proton ATPases are found in nature. In a single cell (for example those of fungi and plants), representatives from all three groups of proton ATPases may be present.

P-type proton ATPase

The plasma membrane H^+-ATPase is a single subunit P-type ATPase found in the plasma membrane of plants, fungi, protists and many prokaryotes.

The plasma membrane H^+-ATPase creates the electrochemical gradients in the plasma membrane of plants, fungi, protists, and many prokaryotes. Here, proton gradients are used to drive secondary transport processes. As such, it is essential for the uptake of most metabolites, and also for responses to the environment (e.g., movement of leaves in plants).

F-type proton ATPase

The F-type proton ATPase is a multisubunit enzyme of the F-type (also referred to as ATP synthase or F_OF_1 ATPase). It is found in the mitochondrial inner membrane where is functions as a proton transport-driven ATP synthase.

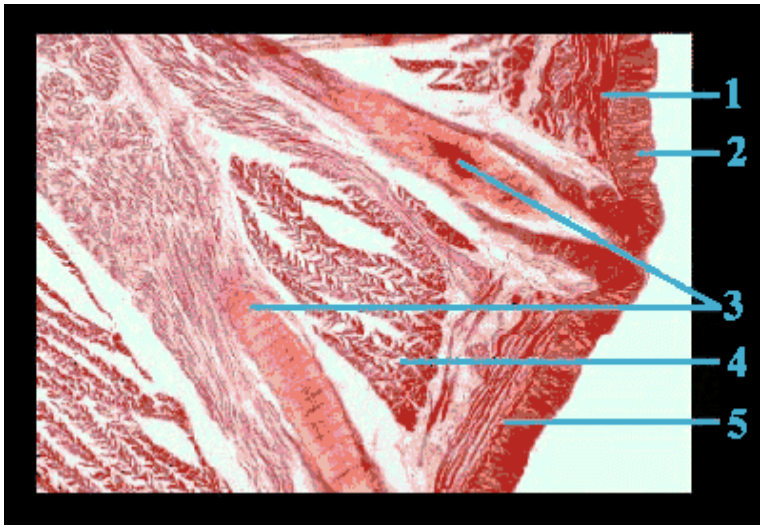
In mitochondria, reducing equivalents provided by electron transfer or photosynthesis power this translocation of protons. For example, the translocation of protons by cytochrome c oxidase is powered by reducing equivalents provided by reduced cytochrome c. ATP itself powers this transport in the plasma membrane proton ATPase and in the ATPase proton pumps of other cellular membranes.

The F_oF_1 ATP synthase of mitochondria, in contrast, usually conduct protons from high to low concentration across the membrane while drawing energy from this flow to synthesize ATP. Protons translocate across the inner mitochondrial membrane via proton wire. This series of conformational changes, channeled through the a and b subunits of the F_O particle, drives a series of conformational changes in the stalk connecting the F_O to the F_1 subunit. This process effectively couples the translocation of protons to the mechanical motion between the Loose, Tight, and Open states of F_1 necessary to phosphorylate ADP.

CF_1 ATP ligase of chloroplasts correspond to the human F_OF_1 ATP synthase in plants.

2. Describe the role of muscles during locomotion in earthworm. Add a note on endoskeleton.

The earthworm has two muscles which it uses for locomotion, both of which run the whole length of the worm's body. These two muscles are circular muscles and longitudinal muscles (Musurca). The longitudinal muscles are the inner layer of the muscular series and cradle the coelom, the innards of the earthworm (Noble). When the circular muscles are contracted, the diameter of the body is reduced, making the worm thin. When the longitudinal muscles are contracted, the length of the body is reduced, making the worm short. So, if an earthworm is short and thin, which is a common reaction, both types of their muscles are contracted. Obviously, if the whole muscle, circular or longitudinal, contracted all at once, the worm would not move but just alter its size and shape. The contractions of an earthworm's muscles resembles a wave, contracting and relaxing a few segments at a time. The process is similar to the digestive process of peristalsis, but instead of squeezing along a bolus of food, the muscular peristalsis of an earthworm moves the whole organism.



1) circular muscle layer 2) cuticle 3) setae 4) longitudinal muscles 5) epidermis

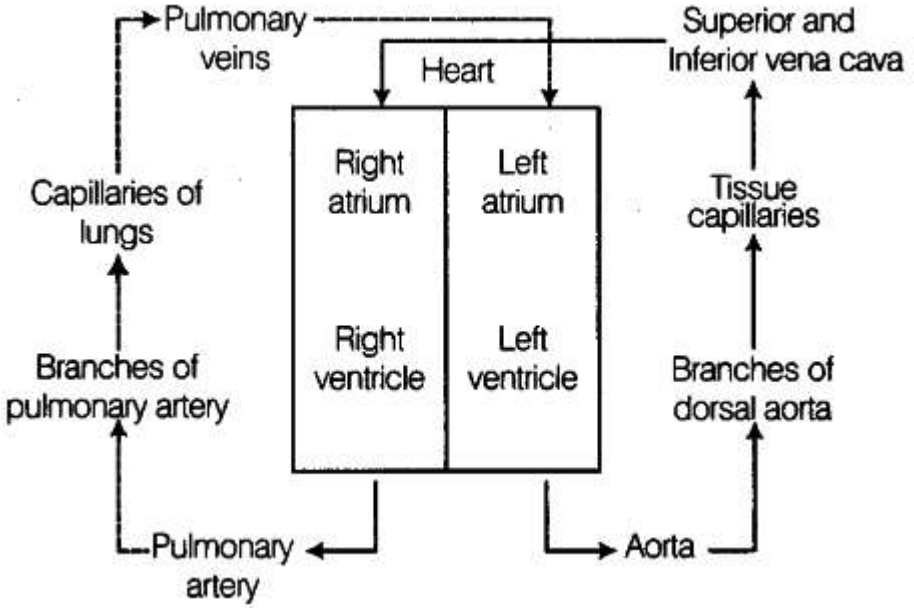
Traction is achieved through bristle-like hairs called setae which are distributed among the worm's segments. If you ever noticed that a worm feels somewhat prickly, you are feeling the setae. The setae are imbedded in the earthworm's longitudinal muscles (Noble). Therefore when the longitudinal muscle is contracted and relaxed the distance between the setae of different segments fluctuates. To move, an earthworm elongates its body and anchors its anterior with its setae and pulls the rest of its body forward. Few soft-bodied organisms have such an effective mean of movement.

Endoskeleton:

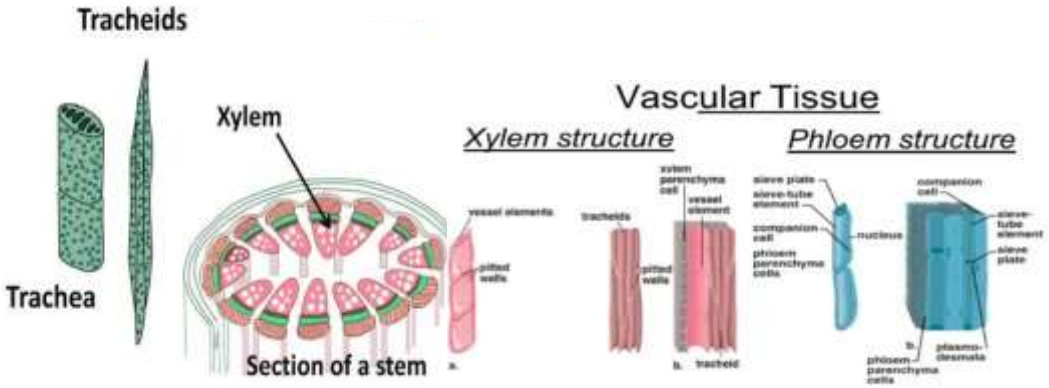
An endoskeleton is a skeleton that is on the inside of a body. The endoskeleton develops within the skin or in the deeper body tissues. The vertebrate endoskeleton is basically made up of two types of tissues (bone and cartilage). During early embryonic development the endoskeleton is composed of notochord and cartilage. The notochord in most vertebrates is replaced by the vertebral column and cartilage is replaced by bone in most adults. In three phyla and one subclass of animals, endoskeletons of various complexity are found: Chordata, Echinodermata, Porifera, and Coleoidea. An endoskeleton may function purely for support (as in the case of sponges), but often serves as an attachment site for muscle and a mechanism for transmitting muscular forces. A true endoskeleton is derived from mesodermal tissue. Such a skeleton is present in echinoderms and chordates.

Q. 3. B) Answer <u>any two</u> of the following: **(10)**

1. Schematically represent Double circulation



2. Sketch and Label the Sugar & Water conducting cells.



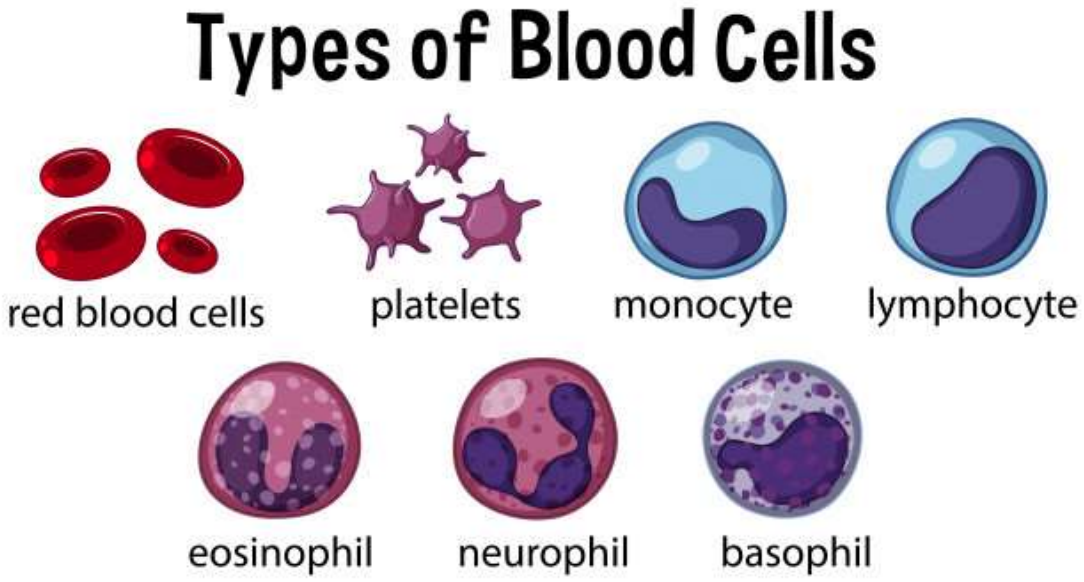
3. 3.Explain the hydrostatic skeleton.

A hydrostatic skeleton or hydroskeleton is a structure found in many soft-bodied animals consisting of a fluid-filled cavity, the coelom, surrounded by muscles.

The pressure of the fluid and action of the surrounding circular, longitudinal, or helical muscles are used to change an organism's shape and produce movement, such as burrowing or swimming.

They alternately contract and expand their body segments along their length. Some examples are soft-bodied animals such as sea anemones and earthworms. Hydrostatic skeletons have a role in the locomotion of echinoderms (starfish and sea urchins), cnidarians(jellyfish), annelids (earthworms), nematodes, and other invertebrates. They have some similarities to muscular hydrostats.

4. Enlist the cell types of the circulatory fluid in humans.



Q.4. A) Answer <u>any one</u> of the following: (10)

1. Give a comparative account of the organs involved in excretion and osmoregulation in animals.
2. Mention an account of gaseous exchange in mammals. How is it different with that of fish?

Q. 4. B) Answer <u>any two</u> of the following: (10)

1. Describe the excretory organ in protozoans and sponges.

Ans: <u>Diverse</u> mechanisms have evolved that enable the various animal species to inhabit a wide range of <u>environments</u>. In animals whose bodies consist of a single layer of cells, waste disposal is accomplished principally by <u>diffusion</u> from the site of waste production to the outside <u>environment</u>. This method is efficient when the distances over which wastes diffuse are relatively short, when there is a high surface area to volume relationship, and when the rate of waste production is relatively low. In more complex animals, however, waste elimination by diffusion through the body wall to the exterior is less efficient because individual cells are farther removed from the exterior surface of the organism. The presence of specialized mechanisms of elimination in higher animals enables wastes to be rapidly transported to the exterior surface of the body (see below <u>Vertebrate excretory systems</u>).

<u>Sponges</u>

Phylogenetically, the sponges (phylum Porifera) are the simplest of animals. They are multicellular and composed of specialized cells, arranged in a single layer, for the maintenance of life processes. Elimination in these aquatic animals proceeds by diffusion of gaseous wastes into the surrounding <u>water</u> and by the ejection of solid wastes and indigestible material from the digestive cells into the streams of water that constantly flow through the animal.

<u>Cnidarians</u>

The jellyfishes, coral animals, ctenophores, and comb jellies have a <u>rudimentary</u> canallike cavity in their two-layered bodies for the ingestion, <u>digestion</u>, and egestion of food and wastes. Gaseous wastes are eliminated by diffusion, and solid wastes in dissolved or undissolved form pass out through an opening in the body wall that serves the dual purposes of food intake and waste elimination.

Flatworms

Flatworm bodies consist of three layers of cells, and in this aquatic group elimination is similar to that of the less complex animals. Food and solid wastes enter and leave through a common opening in the well-developed digestive tract, which consists of a mouth, pharynx, and gastrovascular cavity.

Nemertine worms

The digestive and excretory system of the aquatic proboscis worms is more efficient than that of lower animals in that a well-defined mouth, intestine, and excretory opening (anus) permit the one-way flow of food and waste through the animal. Egested food and nitrogenous wastes, which are secreted into the intestine, are passed along it to the anus by peristaltic waves of the smooth muscle lining the intestinal walls. The efficiency of waste elimination is increased by the presence of a well-defined circulatory system, which enhances the carriage of wastes to the intestine.

Nematodes

An additional excretory structure has evolved in the roundworms. Excretory canals located on both sides of the intestine facilitate waste disposal by carriage of material to an excretory pore in the body wall.

Other invertebrates

In invertebrates, increasing structural complexity is accompanied by more efficient waste-disposal mechanisms. In the phylum Mollusca (clams, snails, oysters, mollusks, octopuses, and squids), gills add another more efficient channel for waste disposal. A heart increases the rate of flow in the circulatory system and speeds the transport of wastes to the gills. An excretory, kidneylike organ removes metabolic wastes from the circulation and body fluid prior to excretion. All basic mechanisms of excretion are thus present in relatively simple animals. As invertebrates become more specialized and complex, as in the arthropods (insects, crabs, and other joint-legged animals) and annelids (segmented worms), adaptations in excretion methods allow survival in nonaquatic environments.

Vertebrates

Though the wastes produced by vertebrates differ little qualitatively from those of higher invertebrates, increased structural complexity and body size, in combination with environmental adaptations, require more specific waste-disposal mechanisms in order to maintain a constant internal environment. The presence of highly efficient, water-retaining kidneys, for example, permits vertebrates to inhabit arid, hot regions of the earth. It seems proper, within the vertebrate group, to consider elimination schemes as variations of mechanisms common to all higher animals but which enable animals to inhabit widely diversified environments.

2. Explain respiration in cockroach.

Ans: Respiratory Structure in Cockroach:

Spiracles:

Ten pairs of spiracles or stigmata are present on the lateral side of the body. The largest first pair is present on the mesothorax. The second pair is on the metathorax and the rest eight pairs are on the first eight abdominal segments. Each spiracle is oval in shape and bounded by an annular sclerite having a filtering apparatus formed by the bristles to eliminate dust particles from the inflowing air.

The spiracles in mesothorax have two lips — a rigid anterior lip and a movable posterior lip. In metathorax, the lips of the spiracles are united ventrally. In abdomen, the spiracles have no lips. The thoracic spiracles open directly within the segmental trachea, but the abdominal spiracles open first within the dilated part of the trachea — the atrium, from which originate the segmental tracheae.

Tracheae:

In Blatella, the haemocoel contains a network of elastic, closed air tubes or tracheae. Three longitudinal tracheal trunks are present on each side of the abdominal cavity.

The dorsal and ventral trunks are present near the middle line, while the lateral trunk is present on the lateral side of the abdominal cavity (Fig. 2.53) Each lateral trunk is divided into two parts — the anterior part is present between mesothoracic, metathoracic and the first abdominal spiracle, while the posterior part extends from the second abdominal spiracle to the eighth abdominal spiracle.

Each dorsal and ventral tracheal trunk originates from a trachea arising from the first abdominal spiracle. They extend up to the segmental branch arising from the eighth abdominal spiracle. Six tracheae originate from each mesothoracic spiracle which supply to the head, prothorax and mesothorax. From the remaining spiracles three segmental tracheae are given out on each side (Fig. 2.53).

The longitudinal trunks and the segmental tracheae are swollen at several places and are known as air sacs (Fig. 2.54). Large tracheae are internally supported by spiral ring of chitin, called taenidia or intima (Fig. 2.55), which prevent the tracheal tubes from collapsing. In addition, chitinous fibrils of 10 to 30 nm thickness and an epicuticle of lipoprotein, line the lumen of the tracheae.

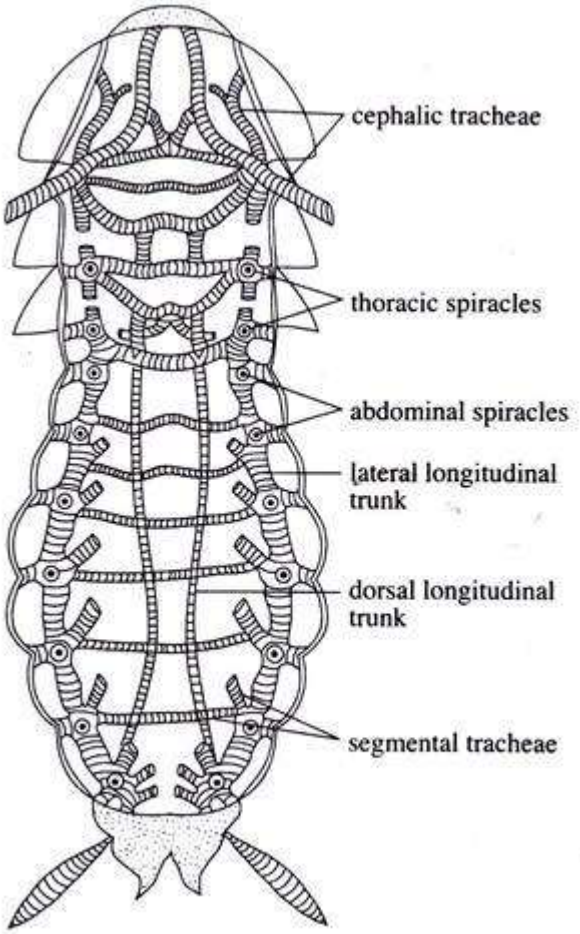


Fig. 2.53 • Tracheal system of *Blatella* (Dorsal view).

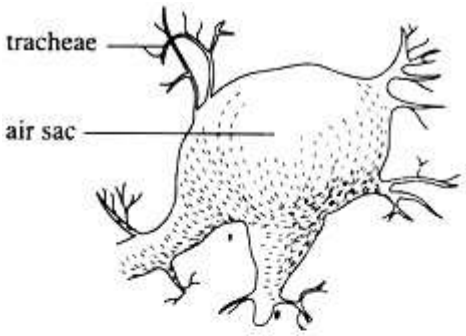


Fig. 2.54 : Air sac of cockroach.

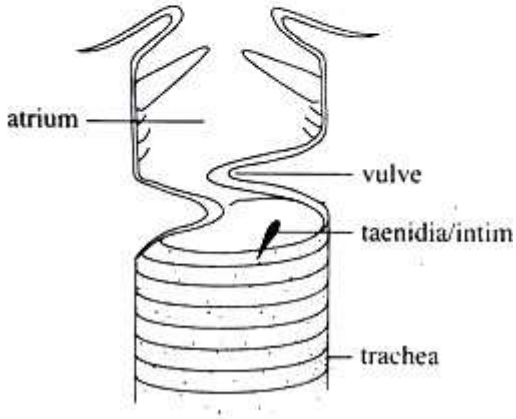


Fig. 2.55 : Junction of atrium and trachea.

Tracheoles:

The branched tracheae anastomose and penetrate to all parts of the body of cockroach. The ultimate finer branches of tracheae are called tracheoles which come in direct contact with the individual cell (Fig. 2.56). They have a diameter of only 1 micron. Their walls are very thin and devoid of taenidia and other chitinous structures.

Instead, they are lined by a protein called trachein. The opening of each tracheole within the tissue is immersed within the body fluid which conveys respiratory gases to the cells. Thus, the elaborate tracheal system carries oxygen directly to all body cells.

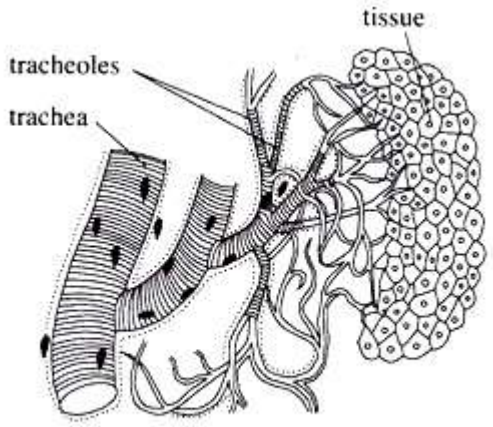


Fig. 2.56 : Branching of tracheae within the tissue of cockroach.

Mechanism of Respiration in Cockroach:

Alternate contraction and relaxation of the abdominal targo-sternal muscles bring about changes in the diameter of the tracheae, so that air is forced in and out of the tracheal tubes through the spiracles. According to one view, during intake of air, the muscles relax to open the anterior four pairs of spiracles, through which air rushes in and reaches up to the intracellular spaces through the tracheoles.

During expiration, the abdominal muscles contract to drive the air out of tracheal space through the last six pairs of spiracles. According to another view, air flows in and out through all spiracles and probably there is no direct circulation of air along the longitudinal tracheal trunks.

The oxygen from the air dissolves in the fluid of the tracheoles and diffuses inwards to the tissues, in exchange for the carbon dioxide formed in them. During increased metabolism (at the time of flight), the amount of fluid in the tracheole is reduced by osmotic movement of water to the surrounding tissues.

This exposes more of the surface walls of the tracheoles to oxygen, causing increased oxygen supply to the tissues.

The working of spiracles is under the control of central nervous system. Cockroaches can close all the spiracles and may suspend its respiration for a considerable period of time. The opening aid closure of the spiracles depends upon the carbon dioxide concentration. The width of the spiracular opening increases with the rise of temperature from 20° to 32°C.

In cockroaches, blood takes no part in respiration, and the oxygen bearing fluid of the tracheoles serves in internal respiration, like that of lymph in vertebrates. In these insects more than 10% gaseous exchange can occur through body surface.

3. Define respiration. List the problems associated with water breathing.

Respiration a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide from the oxidation of complex organic substances.

Most aquatic animals need to obtain O_2 from the surrounding water in order to carry on cellular respiration. As we have seen, the amount of O_2 in water is limited, and both O_2 solubility and demand are correlated with temperature. At most, there is only about 15 mg of O_2 per liter of water. In order to carry out the chemical reactions needed to maintain life and reproduce, aquatic organisms must be able to efficiently extract that 15 mg of O_2 from the water.

The primary method of O_2 transport is simple diffusion. Since all molecules are always in motion (except at 0 K), they will tend to move randomly. If they are highly concentrated in one spot, they will be least likely to move towards that spot, as opposed to moving to any of the other spots in the environment. If you divide a card deck into the red cards and the black cards, and randomly move two cards from each deck into the other, you are more likely to move red cards into the black pile, and black cards into the red pile, than you are to move red cards into the red pile or black cards into the black pile, at least until there are about equal numbers of red and black cards in both piles.

Because the speed with which O_2 molecules move in water at normal temperatures is fixed, we can make some estimates over the distances at which simple diffusion can take place in both water and body fluids; that distance appears to be about 1 mm. If a cell is no more than 1 mm from water with sufficient O_2, then no special adaptations are needed for obtaining O_2. If the O_2 concentration of the water is low, or if the cell is greater than 2mm in diameter, or if the organism is multicellular, with some cells buried inside the body, then special measures are necessary.

5. **Differentiate between Aerobic respiration and anaerobic respiration**
6. Aerobic denotes the term ‘in the presence of oxygen’ while the word anaerobicdenotes the ‘absence of oxygen’. So the respiration which occurs in the presence of oxygen is called as aerobic respiration, on the other hand, respiration occurring in the absence of oxygen is known anaerobic respiration.

7. So accordingly the chemical reaction involving the breakdown of the nutrient molecule with the aim of producing energy is called respiration. Thus the energy required by the body to perform well which is produced by the chemical reaction. This process takes place in the mitochondria or in the cytoplasm of the cell either aerobically or anaerobically.

8. Comparison Chart

BASIS FOR COMPARISON	AEROBIC RESPIRATION	ANAEROBIC RESPIRATION

BASIS FOR COMPARISON	AEROBIC RESPIRATION	ANAEROBIC RESPIRATION
Definition	The breakdown of glucose in the presence of oxygen to produce more amount of energy is called as aerobic respiration.	The breakdown of glucose in the absence of oxygen to produce energy is called as anaerobic respiration.
Chemical Equation	Glucose + Oxygen gives Carbon dioxide +water + energy	Glucose gives Lactic acid + energy
It occurs in	The cytoplasm to mitochondria.	Takes place in cytoplasm only.
Energy produced	The high amount of energy is produced.	Less amount of energy produced.
Number of ATP released	38 ATP.	2 ATP.
Final product is	Carbon dioxide and water.	Lactic acid (animal cells), carbon dioxide and ethanol (plant cell).
It requires	Oxygen and glucose to produce energy.	It does not require oxygen but uses glucose to produce energy.
It involves	1. Glycolysis - also called Embden-Meyerhof-Parnas(EMP) pathway. 2. The respiratory chain (electron transport and oxidative phosphorylation). 3. The tricarboxylic acid cycle (TCA), also known as the citric acid cycle or Krebs cycle.	1. Glycolysis. 2. Fermentation
Process of combustion	Complete	Incomplete.
Type of process	It is a long process for the production of energy.	It is a fast process in comparison to aerobic respiration.

BASIS FOR COMPARISON	AEROBIC RESPIRATION	ANAEROBIC RESPIRATION
Examples	Aerobic respiration occurs in many plants and animals (eukaryotes).	Anaerobic respiration occurs in human muscle cells (eukaryotes), bacteria, yeast (prokaryotes), etc.

Q.5. Answer <u>any four</u> of the following: **(20)**

1. Hormonal control in human digestion

Ans.:

Hormones control the different **digestive** enzymes that are secreted in the stomach and the intestine during the process of **digestion** and absorption. ... The**hormone** somatostatin stops the release of stomach acid.

Different action can be shown by a flow chart with the diagram

2. Unicellularity and Multicellularity

Ans.:

. Unicellularity and multicellularity

unicellular organisms include eukaryotes and prokaryotes
2.multicellular organisms include eukaryotic cells only.

Examples of unicellular are bacteria, few celled organisms like volvox and sponges and unicellular eukaryotes and all other multicellular animals like humans, plants etc.

Advantages of multicellularity (also limitations of unicellularity):

1. Single cell in unicellular has to perform all the physiological needs. One should never expect specialisation in any of these processes like nutrition, digestion, respiration, osmoregulation, excretion, reproduction, thus compromising in their adaptive value.
2. There is no division of labour. A multicellular organism has an effectively longer lifespan than a unicellular organism in general and since it has multiple cells, it can perform more functions than a unicellular organism. They can do lots of other things that a unicellular organism cannot because it has more cells to complete more jobs.
3. Unicellulars are largely at the mercy of the existing environment due to the fact that they have either none or very limited ability for homeostasis. So in varied conditions, any shift from the optimum environment, they just survive without much effort to spend in reproduction. Moreover, they have limited ability to modify local environment or the ability to escape from them.

4. Write a note o role of exercise in cardiac health

Regular physical activity is beneficial for cardiovascular health. Frequent exercise is robustly associated with a decrease in cardiovascular mortality as well as the risk of

developing cardiovascular disease. Physically active individuals have lower blood pressure, higher insulin sensitivity, and a more favorable plasma lipoprotein profile. Animal models of exercise show that repeated physical activity suppresses atherogenesis and increases the availability of vasodilatory mediators such as nitric oxide. Exercise has also been found to have beneficial effects on the heart. Acutely, exercise increases cardiac output and blood pressure, but individuals adapted to exercise show lower resting heart rate and cardiac hypertrophy. Both cardiac and vascular changes have been linked to a variety of changes in tissue metabolism and signaling, although our understanding of the contribution of the underlying mechanisms remains incomplete. Even though moderate levels of exercise have been found to be consistently associated with a reduction in cardiovascular disease risk, there is evidence to suggest that continuously high levels of exercise (e.g., marathon running) could have detrimental effects on cardiovascular health.

5. Discuss the role of Stomata in plants.

Stomata are tiny openings or pores in plant tissue that allow for gas exchange. Stomata are typically found in plant leaves but can also be found in some stems. Specialized cells known as guard cells surround stomata and function to open and close stomatal pores. Stomata allow a plant to take in carbon dioxide, which is needed for photosynthesis. They also help to reduce water loss by closing when conditions are hot or dry. Stomata look like tiny mouths which open and close as they assist in transpiration.

Plants that reside on land typically have thousands of stomata on the surfaces of their leaves. The majority of stomata are located on the underside of plant leaves reducing their exposure to heat and air current. In aquatic plants, stomata are located on the upper surface of the leaves. A stoma (singular for stomata) is surrounded by two types of specialized plant cells that differ from other plant epidermal cells. These cells are called guard cells and subsidiary cells.

Guard cells are large crescent-shaped cells, two of which surround a stoma and are connected to at both ends. These cells enlarge and contract to open and close stomatal pores. Guard cells also contain chloroplasts, the light capturing organelles in plants.

Subsidiary cells, also called accessory cells, surround and support guard cells. They act as a buffer between guard cells and epidermal cells, protecting epidermal cells against guard cell expansion. Subsidiary cells of different plant types exist in various shapes and sizes. They are also arranged differently with respect to their positioning around guard cells.

The two main functions of stomata are to allow for the uptake of carbon dioxide and to limit the loss of water due to evaporation. In many plants, stomata remain open during the day and closed at night. Stomata are open during the day because this is when photosynthesis typically occurs. In photosynthesis, plants use carbon dioxide, water, and sunlight to produce glucose, water, and oxygen. Glucose is used as a food source, while oxygen and water vapor escape through open stomata into the surrounding environment. Carbon dioxide needed for photosynthesis is obtained through open plant stomata. At night, when sunlight is no longer available and

photosynthesis is not occurring, stomata close. This closure prevents water from escaping through open pores.

5. Why the deamination of Amino acids is essential in body.

Ans: In the human body, deamination takes place in the liver. Deamination is the process by which amino acids are broken down when too much protein has been taken in. The amino group is removed from the amino acid and converted to ammonia. The rest of the amino acid is made up of mostly carbon and hydrogen, and is recycled or oxidized for energy. Ammonia is toxic to the human system, and enzymes convert it to urea or uric acid by addition of carbon dioxide molecules (which is not considered a deamination process) in the urea cycle, which also takes place in the liver. Urea and uric acid can safely diffuse into the blood and then be excreted in urine.

6. Partial pressure of Oxygen.

The partial pressure is defined as the pressure of a single gas component in a mixture of gases. It corresponds to the total pressure which the single gas component would exert if it alone occupied the whole volume.

- Pi is the **partial pressure** of gas i
- χi is the **mole fraction** of gas i in the mixture
- Ptotal is the **total pressure** of the mixture

Now, you know that you have a sample of air at a **total pressure** of 1 atm and that 21% of all the molecules of gas that make up this sample are molecules of oxygen gas.

In order to be able to calculate the partial pressure of oxygen gas, you need to figure out the **mole fraction** of oxygen gas in the sample. The mole fraction of oxygen gas is calculated by dividing the number of moles of oxygen gas by the **total number of moles** of gas present in the sample.

$\chi O2 = \text{moles of } O2 \text{total moles of gas} \quad (*)$

As you know, **Avogadro's constant** allows you to convert the number of molecules to *moles*.

Avogadro's constant

$1 \text{ mole gas} = 6.022 \cdot 1023 \text{ molecules gas}$

So, let's assume that this sample contains N **molecules** of gas. Since 21% of these molecules are molecules of oxygen gas, you can say that this sample contains

$N\text{molecules gas} \cdot 21 \text{ molecules } O2100\text{molecules gas} = (21 \cdot N100) \text{ molecules } O2$

This means that the number of moles of oxygen gas present in the sample is equal to

$(21 \cdot N100)\text{molecules } O2 \cdot 1 \text{ mole } O26.022 \cdot 1023\text{molecules } O2 = (0.21 \cdot N6.022 \cdot 1023) \text{ moles } O2$

Similarly, the total number of moles of gas present in the sample will be

$N \text{ molecules gas} \cdot 1 \text{ mole gas} 6.022 \cdot 1023\text{molecules gas} = (N6.022 \cdot 1023) \text{ moles gas}$

Plug this into equation (*) to find the mole fraction of oxygen gas in the sample.

$\chi O2 = 0.21 \cdot N6.022 \cdot 1023 \text{ molesN} 6.022 \cdot 1023 \text{ moles}$

This gets you

$\chi O2 = 0.21 \cdot N6.022 \cdot 1023 \cdot 6.022 \cdot 1023N$

$\chi O2 = 0.21$

As you can see, the **mole fraction** of oxygen gas **does not** depend on the number of molecules of gas present in the sample, it only depends on the concentration of the sample!

You can thus say that the partial pressure of oxygen gas in air at 1 atm is

$PO2 - - = 0.21 \cdot 1 \text{ atm} = 0.21 \text{ atm} - - - -$

I'll leave the answer rounded to two **sig figs**, but keep in mind that you have one significant figure for the total pressure of the sample, which means that you *should* report the answer as

$PO2 = 0.2 \text{ atm}$

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