UNIT 18

ORGANISATION OF LIFE

Learning Objectives

8TNSP

After the completion of this lesson, students will be able to:

- understand the different levels of organization seen in the animal world.
- know about the structure of cells.
- understand the types of tissues.
- know about the structure of eye as an example for organ level of organization.
- understand the respiratory system as an example for system level of organization.
- understand the physiological functions of organizational setup with reference to homeostasis, diffusion, osmosis, osmoregulation, cellular respiration and metabolism.

Introduction

If you look around your sorrounding, you will be able to observe numerous varities of animals. There are animals like amoeba which cannot be seen by our naked eye. There are also animals like elephants and blue whale which are of huge size. The variations in animal are not only seen in size but also in the complexity of the cells, tissues and the body structure.

Based on the structural organization, organisms can be classified into prokaryotes and eukaryotes. In some organisms like bacteria, cyanobacteria and mycoplasma, the true nucleus is absent. These organisms are called prokaryotes. However, organisms like plants and animals have cells with a well-defined nucleus covered by membrane. These organisms are called eukaryotes. Some organisms have a single cell body and they are called as **unicellular organisms**. Eg. Yeasts and amoeba. Organisms such as plants, animals and human beings are made of a large number of cells and they are called **multicellular organisms**. In this lesson, let us learn about different levels of organizations of living organism with suitable example.

18.1 Biological Organisation

Biological organisation starts with submicroscopic molecular level and passes through microscopic cellular level and the microscopic or macroscopic organismic level. Finally it ends in ecosystem and the biosphere. Thus, biological organisation shows the hierarchy in organisation level from simple to more complex. The hierarchy in biological organisation reveals that atoms are the lowest unit at the submicroscopic level while the cells are the smallest unit at the microscopic level.

Atoms combine to form molecule which undergo chemical reaction to form organelles of the cells. Several organelles are contained in the cell. A group of cells which are similar and meant for a specific function constitutes a tissue. Several tissues together contributing to some specific function inside the body constitute an organ. Many organs acting together to perform a specific life process constitute an organ system. Several organ systems together constitute the organism. We see that several systems are present in an organism and they are required to perform diverse life process in

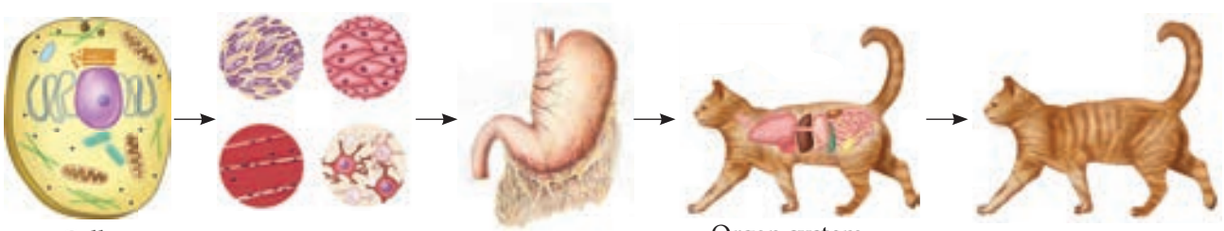


Figure 18.1 Different levels of organization

a multicellular organism. From lower organism to higher organism life has passed through simple to complex structural hierarchical level. The pictorial representation of biological organisation is shown in Figure 18.1.

18.2 Cells

Cell is the **structural and functional unit of life**. Cells are often called as 'building blocks of life'. The study of cells is called **cell biology**. Cells consist of cytoplasm enclosed within a membrane, which contains many biomolecules such as proteins and nucleic acids. Cells vary widely in shape and size. There is a central spherical **nucleus** and a variety of cytoplasmic living **cell organelles** like the endoplasmic reticulum, mitochondria. golgi bodies, centrioles, ribosomes, lysosomes, etc., present in an animal cell. Each cell organelle performs a specific function.

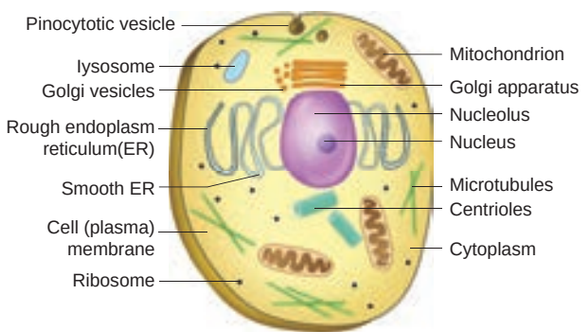


Figure 18.2 Animal cell

The size of cells varies in different animals and they which are measured in units of micron (μm). One micron is equal to 1/1000000 meter. The average cell size varies from 0.5 to 20 μm in diameter. The cells of bacteria are the smallest in size (1-2 μm). In human body, the smallest cell is red blood cells (7 μm in diameter) and the longest one is the nerve cell which reaches a length of about 90 - 100 cm. Human egg (Ovum) is 100 μm in size. Among multicellular animals, the largest cell is, egg of an ostrich. Mycoplasma with a diameter of 0.0001 mm is the smallest bacterium.

DO YOU KNOW?

Our body is developed from a single cell called zygote. The zygote undergoes continuous mitotic division and forms the foetus consisting multitude of cells of different shape, size and content. Foetal cells gradually attain change in structure and function. This process is known as cell differentiation.

18.2.1 Shape of cells

Cells are of different shapes. Normally they are correlated with their functions. Some cells are oval or round, while certain others are elongated. Some are branched like the nerve cell or a neuron. Some of our white blood cells are amoeba like with irregular boundaries.

Activity 1

Boil a hen's egg and remove the shell. What do you observe? A white material surrounds the yellow part. White material is albumin which solidifies on boiling. The yellow part is yolk. It is a part of the single cell. You can observe this single cell without any magnifying devices.

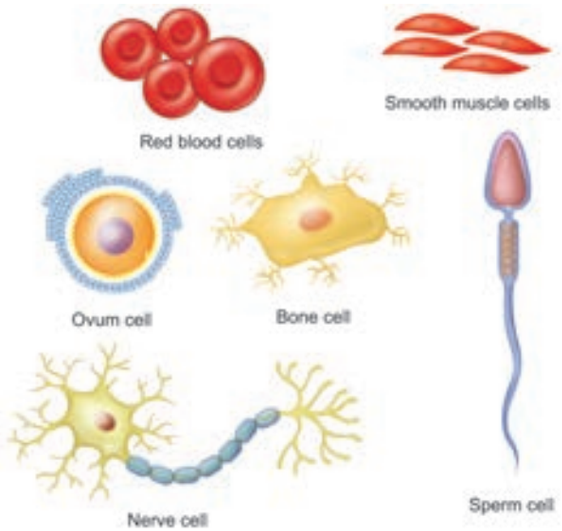


Figure 18.3 Shapes and sizes of some cells

18.3 Tissues

Tissues are groups of cells that have a similar structure and act together to perform a specific function. They are of two types: **simple tissues** and **complex tissues**. Simple tissues are made up of cells of same type or kind. E.g. Glandular tissue. Complex tissues are made up of different kind of tissues. E.g. Tissues of dry skin. Hence, simple tissue is homogeneous and complex tissue is heterogeneous.

18.3.1 Types of Tissues

Depending on the basis of their structure and function, tissues can be classified into four types:

1. **Epithelial** (Covering) tissue for protection.
2. **Muscular** (Contractile) tissue for movements and locomotion.
3. **Connective** (Supporting) tissue for binding different structures of body.
4. **Nervous** tissue for conduction of nerve impulses.

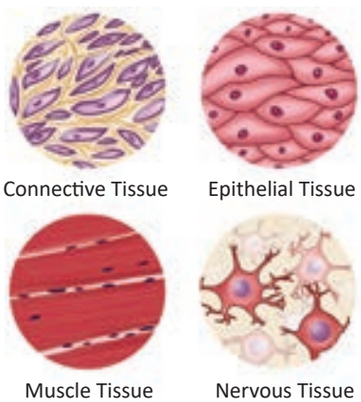


Figure 18.4 Types of animal tissues

All the complex organisms consist of only four basic types of tissues.

18.4 Organ

Organs are the structures made up of two or more types of tissues, organized to carry out a particular function. Example: Brain, heart, lungs, kidneys, liver etc., Each of them has specific functions.

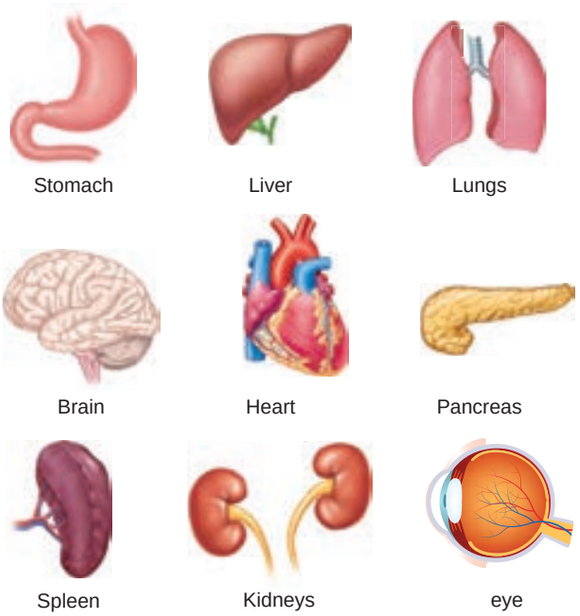


Figure 18.5 Organs present in human body

Most organs are made up of four types of tissues. For example, the intestine, is made of epithelial tissue as the inner lining, which helps in enzyme secretion and nutrient absorption. Epithelial tissue is covered by layers of muscle tissue, which help in peristaltic movements to move the food. The intestine is also supplied by blood tissue (connective tissue) which helps in transporting nutrients absorbed by the intestine, and is connected to the brain through the nerve tissue, which conveys instructions from the brain.

Now let us study in detail about the structure of an eye.

18.4.1 The eyes - Photoreceptor

The eye is one of the important sensory organs in the human body. It is composed of muscular tissue, connective tissue and neural tissue. It is mainly responsible **for vision, differentiation of color** (the human eye can differentiate approximately 10 – 12 million colors) and **maintaining the biological clock of the human body**. The human eye can be compared to a camera as both functions by gathering, focusing, and transmitting the light through the lens for creating an image of an object.

To understand more about our eye and how our eye functions, we need to look into the structure of the human eye.The human eyes are the most complicated sense organ in the human body, with several parts fixed together forming a spherical structure. Every part of the human eye is mainly responsible for a certain action. The structure of a human eye can be broadly classified into external structure and internal structure.

a. External structure of an Eye

The parts of the eye that are visible externally comprise of the external structure of the eye.

Sclera

It is a tough and thick white sheath that protects the inner parts of the eye. We know it as the **'white of the eye'.**

Conjunctiva

It is a thin transparent membrane that is spread across the sclera. It keeps the eyes moist and clear by secreting small amounts of mucus and tears.

Cornea

It is the transparent layer of membrane that is spread over the pupil and the iris. The main role of the cornea is to refract the light that enters the eyes.

Iris

It is a pigmented layer of tissues that make up the colored portion of the eye. Its primary function is to control the size of the pupil, depending on the amount of light entering it.

Pupil

It is the small opening located at the middle of the iris. It allows light to come in.

b. Internal structure of an Eye

The internal structure of the eye includes the following parts.

Lens

It is a transparent, biconvex, and an adjustable part of an eye, made up of protein. The lens with the help of the cornea refracts light which converges on the retina and creates images on it.

Retina

It is the layer present at the back of the eye where all the images are formed. The retina functions by converting the light rays into impulses and sending the signals to the brain through the optic nerve.

Optic nerve

It is located at the end of the eyes, behind the retina. The optic nerve is mainly responsible for carrying all the nerve impulses from the retina to the human brain.

Aqueous Humour

It is a watery fluid that is present in the area between the lens and the cornea. It is

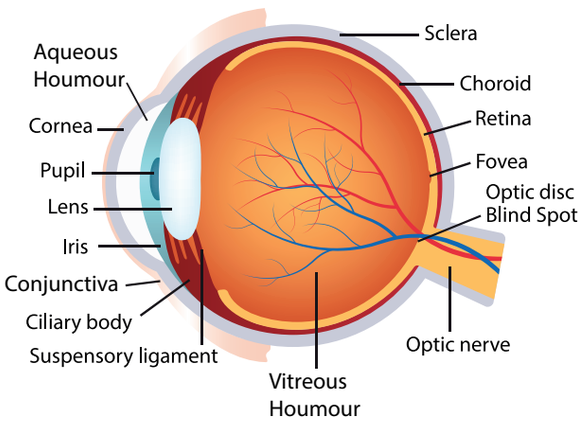


Figure 18.6 Structure of Human Eye

responsible for the nourishment of both the lens and the cornea.

Vitreous Humour

It is a semi-solid, transparent, jelly-like substance that covers the interior portion of the eyes. It plays an important role in maintaining the shape of the eye and also causes refraction of light before it reaches the retina.

18.5 Organ System

A group of organs form the organ system, and together they perform a particular function. The heart and the blood vessels together make the cardiovascular system. Organs such as nose, pharynx, trachea, lungs and diaphragm work together as the respiratory system. The mouth, oesophagus, stomach, duodenum, and the intestines together form the digestive system. Other examples of organ system include the endocrine system, integumentary system, muscular system, reproductive system, skeletal system, urinary system, immune system, etc. Let us see the respiratory system as an example for organ system elaborately.

18.5.1 The Respiratory System

Our respiratory system consists of organs like trachea, bronchus and lungs which are responsible for exchange of air between the atmosphere and the blood. Let us see the organs of the respiratory system in detail.

The nose

We inhale air through the nostrils, which lead to the nasal cavity. The inner surface of this cavity is lined with cilia and mucous producing cells, which make it sticky and moist. The cilia and mucous trap dust and germs to prevent them from going deeper into the respiratory tract. The blood vessels in the nose help to warm the inhaled air.

The windpipe

After passing through the nasal cavity, the air enters the pharynx. Then it goes into the trachea or the windpipe which is an elastic tube extending down the length of the neck and partly into the chest cavity. Between the pharynx and the trachea lies a small air passage called the larynx commonly known as the **voice box**. The larynx has fold of tissue which vibrate with the passage of air to produce sound.

Bronchi

The trachea divides into two branches called **bronchi (Singular: bronchus)**. Each bronchus leads to a lung, where it divides and redivides to finally form air passages called bronchioles.

Lungs

The lungs are the organs present in the chest cavity that allow our body to exchange gases (oxygen and carbon dioxide). The lungs are two spongy elastic bags, on each side of the thoracic cavity. The thoracic cavity is bound dorsally by the vertebral column and ventrally by the sternum, laterally by the ribs and on the lower side by the dome shaped diaphragm. The left lung is slightly smaller than the right lung (allows room for the heart). Within the lungs, each bronchiole leads to a bunch of air sacs called alveoli (Singular: Alveolus).

On an average, an adult human being at rest breathes in and out 15 – 18 times in a minute. During heavy exercise, breathing rate can increase upto 25 times per minute.

Smoking damages lungs. Smoking is also linked to cancer. It must be avoided.

When you sneeze, you should cover your nose so that the foreign particles you expel are not inhaled by others.

Alveoli

Alveoli are tiny air sacs in the lungs that are located at the end of bronchial tubes, which is microscopic in nature. It is meant for the exchange of oxygen and carbon dioxide.

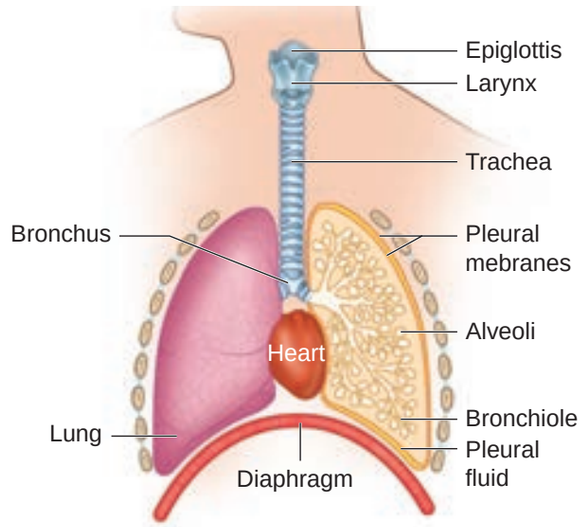


Figure 18.7 Human respiratory system

18.5.2 Mechanism of Breathing

Inspiration (Inhalation)

The process of taking air into the lungs is called **inspiration** or inhalation. During inspiration, the sternum is pushed up and outward and the diaphragm is pulled down. This increases the volume of the thoracic cavity and thus the pressure decreases. The air outside the body flows into the lungs. Here exchange of gases takes place between the air and the blood.

Expiration (Exhalation)

The process of expelling air from the lungs is called **expiration or exhalation.** Upon exhalation, the lungs recoil to force the air out of the lungs. The inter costal muscles relax, returning the chest wall to its original position. During exhalation, the diaphragm also relaxes, moving higher into the thoracic cavity. This increases the pressure within the thoracic cavity relative to the environment. Air rushes out of the lungs due to the pressure gradient. This movement of air out of the lungs is a passive event.

Exchange of gases in the Alveoli

The content of oxygen in the inhaled air in alveoli is more than the blood flowing through the capillaries. So, the oxygen moves into the blood by simple **diffusion**. **Haemoglobin** in the blood combines with **oxygen** to form **oxyhaemoglobin**. The blood carrying oxygen reaches the heart through blood vessels. The heart pumps it to all the tissues in the body. The tissues release carbon dioxide which is carried back to alveoli by the blood. Carbon dioxide diffuses from the blood to the air in the alveoli and is sent out of the body when the air is exhaled.

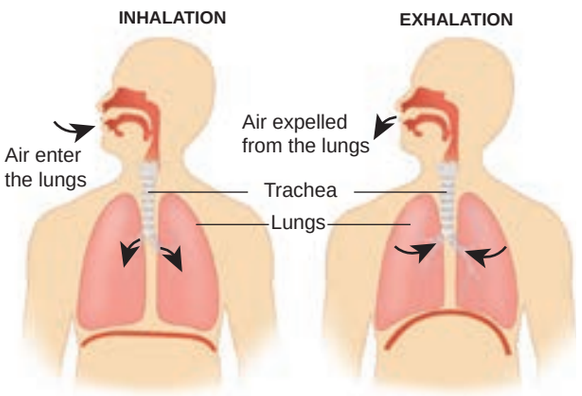


Figure 18.8 Inhalation and Exhalation

Table 18.1 Difference between inhalation and exhalation

Inhalation	Exhalation
The muscles of the diaphragm contract.	The muscles of the diaphragm relax.
The diaphragm goes downward.	The diaphragm goes upward.
The ribs move upwards and outwards.	The ribs move downwards.
The volume of thoracic (chest) cavity increases.	The volume of thoracic (chest) cavity decreases.
Air enters the lungs through the nose.	Air goes out of the lungs through the nose.

Activity 2

Stand erect and wave your hands in side wards. Take a deep breath and feel your rib movements. Then run some 100 metres and observe the rib movements. Discuss in the class room about what you observed.

Activity 3

Constructing a model of lungs.

Materials required

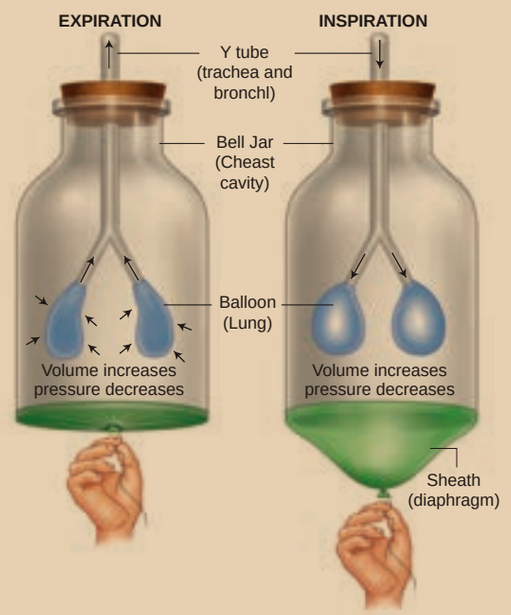
Y shaped tube, a large balloon, two small balloons, a one litre plastic bottle, cork.

Method of Construction

Cut off the plastic bottle in the middle. Fix two small balloons in both the ends of the Y-tube. Make a hole in the cork and fix the y-tube. Make a small hole in the cork and fix the y-tube through the hole as shown in the picture. Cut a large balloon into two halves and fix one half tightly around the open part of the bottle.

Method of Working

Hold the large balloon in the middle and pull it slowly downwards as shown in the picture. Observe the change in the balloons inside the bottle. Now leave the balloon free.



18.6 Physiological Processes

The ways in which biomolecules, cells, tissues, organs and organs systems work together to accomplish the complex goal of sustaining life are called physiological processes. Let us study about some of them here.

18.6.1 Homeostasis

Homeostasis is a property of human biological system where the **self-regulating** process tends to maintain the balance for the survival. The regulation takes place in a defined internal environment. Mammals are capable of maintaining constant body temperature despite the changes in the external temperature. Behavioural and physiological responses are the two important regulating mechanisms that maintain the stability of homeostasis.

In simple terms, it could be referred as a balance in a system to maintain a stable internal environment for the survival of the animal. If the homeostasis regulates successfully, life continues or if unsuccessful, death or disaster occurs.

All the processes of integration and co-ordination of function are mediated by nervous and hormonal system. The liver, kidney, and brain (hypothalamus), autonomic nervous system and the endocrine system help to maintain homeostasis.

Maintenance of body fluid concentrations, body temperature are done by various bio-physical and bio-chemical methods. Human beings are warm blooded in nature i.e, they maintain their body temperature as constant. When the body temperature raises sweat is produced to bring the temperature down. When the body temperature lowers heat is produced by the muscular work by shivering. This is an example for homeostasis.

The control of blood glucose level is another example in which insulin hormone is secreted whenever the blood glucose level raises and glucagon hormone is secreted whenever the blood glucose level reduces.

18.6.2 Diffusion

Diffusion is the movement of particles from an area of **higher concentration to lower concentration**. The overall effect is to equalize concentration throughout the medium.

Examples for diffusion include, perfume filling a whole room and the movement of small molecules across a cell membrane. One of the simplest demonstrations of diffusion is adding a drop of ink to water.

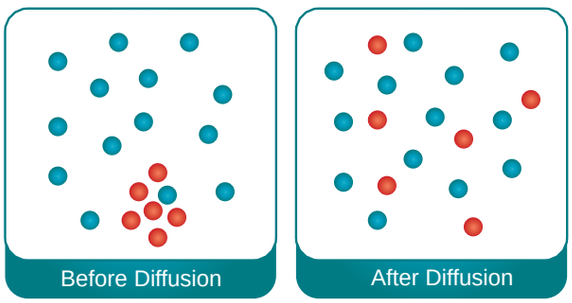


Figure 18.9 Diffusion of gases

What will happen when an incense stick is lit up in a room? How do we feel? The fragrance spreads over the entire room. The movement of molecules or ions is from a region of higher concentration to region of lower concentration. You can smell incense stick after lighting because the smoke diffuses in the air and makes its way to your nose. Let us think of the following. How does the smell spread in the entire room? Does the smell spread uniformly in the entire room? Can you give any other examples?

There are other processes in which substances move in liquid medium. For an example when a tea pack is immersed in a cup of hot water the tea powder particles disperse in to water by diffusion.

Figure 18.10 Diffusion through liquid medium

DO YOU KNOW?

The mixing of foodstuffs and digestive juices in the gut occurs by diffusion. Exchange of respiratory gases (Oxygen and Carbon dioxide) between blood and tissue fluids between tissue fluid and cells also occurs by diffusion.

18.6.3 Osmosis

Osmosis is the movement of solvent particles across a semipermeable membrane from a dilute solution into a concentrated solution. The solvent moves to dilute the concentrated solution and equalize the concentration on both sides of the membrane.

The movement of liquids in and out of cells is dependent on the concentration of the solution surrounding it. There are three types of situations in which this could vary.

Isotonic

Here the concentration of external and internal solution of the organism are the same.

Hypotonic

Here the external solution concentration is less compared to the concentration of the inner solution of an organism. In this case water will rush into the organism.

Hypertonic

Here the external solution concentration is greater than the concentration of the inner solution of an organism. In this case the water will rush out of the organism.

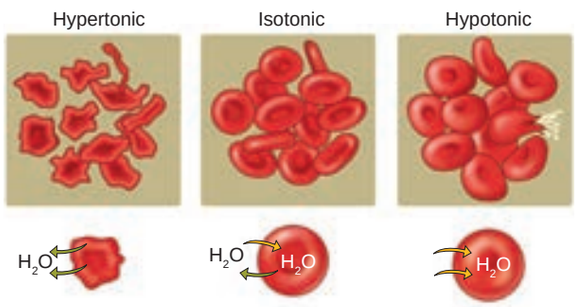


Figure 18.11 Osmosis in red blood cells

18.6.4 Osmoregulation

The term osmoregulation was coined by **Hober** in 1902. Osmoregulation is the process by which an organism regulates the water balance in its body and maintains the homeostasis of the body. It includes controlling excess water loss or gain and maintaining the fluid balance and the osmotic concentration, that is, the concentration of electrolytes. It ensures that the fluids in the body do not get too diluted or concentrated.

Organisms are divided into two types based on osmoregulation. They are Osmoconformers and Osmoregulator.

Osmoconformers

These organisms try to maintain the osmolality of their body matching with their surroundings. Most of the invertebrates, marine organisms are osmoconformers.

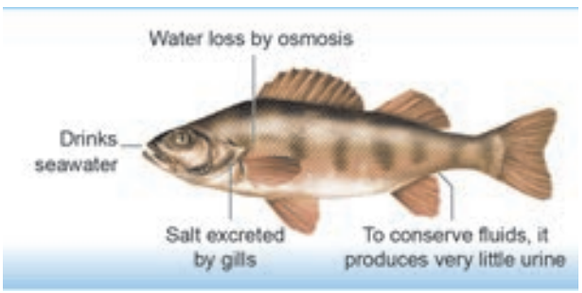


Figure 18.13 Osmoregulation by a marine fish

Osmoregulators

These organisms maintain their internal osmolality, which can be extremely different from that of the surrounding environment, through physiological processes

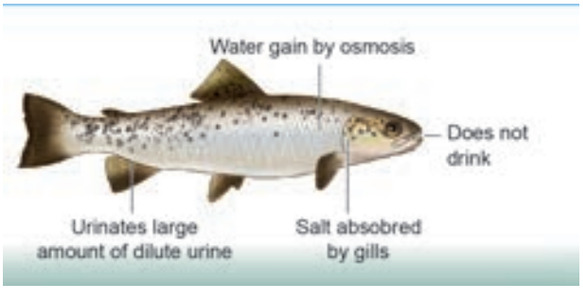


Figure 18.14 Osmoregulation by a freshwater fish

18.6.5 Cellular respiration

Cellular respiration is the process by which organisms break down glucose into a form that the cell can use as energy. This energy is then made available to living cells in the form of **ATP**. Cellular respiration takes place in the cytoplasm and mitochondria of the cells. The cellular respiration is classified into two types: **aerobic** respiration and **anaerobic** respiration.

a. Aerobic respiration

In this type of respiration, the food substances are completely oxidized into H_2O and CO_2 with the release of energy. It requires atmospheric oxygen and all higher organisms respire aerobically. This reaction releases a large amount of energy.

Glucose + Oxygen → Carbon dioxide + Water + Energy

b. Anaerobic respiration

In this type of respiration, partial oxidation of food takes place and the organisms release energy in the absence of oxygen. This type of respiration occurs in organisms like yeast. Ethyl alcohol or lactic acid and carbon dioxide are the by-products of this process. This reaction releases very little energy because glucose is not completely oxidized.

Table 18.2 Differences between aerobic and anaerobic respiration

Aerobic	Anaerobic
Aerobic respiration takes place in the presence of oxygen.	Anaerobic respiration takes place in the absence of oxygen.
The end products of aerobic respiration are carbon dioxide and water.	The end products of anaerobic respiration are CO_2 and ethanol or lactic acid.
Common in all higher plants and animals.	Common in certain micro organisms and human muscle cell.

For example, yeast cells convert glucose into carbon dioxide and ethanol, with the release of energy, without using oxygen.

Glucose → Ethanol + Carbon dioxide + Energy

18.6.6 Metabolism

Metabolism is the sum of chemical reactions by which living organisms sustain their life. Metabolism consists of anabolism (the buildup of substances) and catabolism (the breakdown of substances). The term metabolism is commonly used to refer specifically to the breakdown of food and its transformation into energy, cellular products and waste elimination.

More to know

Aerobic respiration releases 19 times more energy than anaerobic respiration from the same amount of glucose.

In aerobic respiration each glucose molecules produce 36 ATPs.

a. Anabolism

Anabolism or constructive metabolism, is all about building and storing. It supports the growth of new cells, the maintenance of body tissues, and the storage of energy for use in the future. During anabolism, small molecules are changed into larger, more complex molecules of carbohydrate, protein, and fat.

Example

Glucose → Glycogen and other sugars

Amino acids → Enzymes, hormones, proteins

Fatty acids → Cholesterol and other steroids

b. Catabolism

Catabolism or destructive metabolism, is the process that produces the energy required for all activity in the cells. In this process, cells break down large molecules (mostly carbohydrates and fats) to release energy. This energy release provides fuel for anabolism, heats the body, and enables the muscles to contract and the body to move. As complex chemical units are broken down into more simple substances, the waste products released in the process of catabolism are removed from the body through the skin, kidneys, lungs, and intestines.

Example

Carbohydrates → Glucose

Glucose → CO_2, Water and Heat

Protein → Amino acid

The repeated anabolism and catabolism reactions maintain the homeostatic condition in the organism. The metabolic process is the cause for maintaining ionic balance in the body. It is also responsible for movement, growth, development, maintenance and repair of the cells, tissues and the human body. These metabolic reactions occur in different organs of living species.

More to know

Basal metabolism refers to the minimum energy required to maintain the normal activities of the body during complete rest in a warm atmosphere, 12 – 18 hours after the intake of food

Points to Remember

- Cell is the basic structural and functional unit of living organisms. All living organisms are made up of cells.
- Cells vary in shapes and size. The size of a cell is measured in micrometers (μm).
- Cells are combined together to form tissues. The tissues are combined together to form organs. Many organs are combined together to form the organ system.
- The sense organ eye is concerned with vision.
- Respiration is the process in which energy is released while food is oxidised. It consists of external respiration and internal respiration (cellular respiration).

- There are two types of respiration depending upon the availability of oxygen. They are aerobic respiration and anaerobic respiration.
- Selective permeability of plasma membrane enables the cell to maintain homeostasis.
- Diffusion involves movement of molecules from the region of their higher concentration to the region of their lower concentration which can occur without a semi permeable membrane.
- Osmosis involves movement of solvent molecules from the region of their higher concentration to the region of their lower concentration which can take place through a semi permeable membrane.
- Homeostasis is the maintenance of a constant internal environment of the body.
- Metabolism involves release and utilisation of energy or energy exchange within the organisms. It can be divided into two categories namely anabolism and catabolism.
- The repeated anabolic and catabolic reactions in the metabolic process maintain the homeostatic condition of the body.

GLOSSARY

Alveoli	Tiny air sacs of the lungs which allow for rapid gaseous exchange.
Eukaryotic	An organism having cells each with a distinct nucleus within which the genetic material is contained.
Organelles	Specialized structures within a cell that perform a specific function.
Micron	Small unit of measurement that measures length which is one thousand of a millimetre.
Haemoglobin	Iron containing red pigment of red blood cells of vertebrates, which gives red colour to blood.
Prokaryotic	Typically unicellular microorganism that lack a distinct nucleus and membrane bound organelles.
Diaphragm	The muscle that separates the chest (muscle) cavity from the abdomen.
Pleura	Protective covering of the lungs.
Metabolism	The sum of all chemical reactions by which living organisms sustain their life.

TEXTBOOK EXERCISES

TLA8U

I. Choose the best answer.

1. _____ is tough and thick white sheath that protects the inner parts of the eye.
   a) Sclera b) Conjunctiva
   c) Cornea d) Iris
2. _____ cells are specialised cells that can be transformed into any kind of cells.
   a) Nerve b) Stem c) Heart d) Bone
3. Maintenance of constant internal environment of the body is known as _____.
   a) homeostasis b) homeophytes
   c) homeokinesis d) homeophilics
4. In the absence of oxygen, glucose is broken down in to _____.
   a) lactic acid b) citric acid
   c) acetic acid d) nitric acid

5. The process of air passing in and out the lungs is called _____.

   a) inhalation b) exhalation

   c) breathing d) None of these

6. Osmosis is the movement of water molecules from _____.

   a) higher concentration to a region of lower concentration.

   b) lower concentration to a region of higher concentration.

   c) Both of these d) None of these

7. The erythrocyte is placed in _____ solution which has lesser concentration of solutes and greater concentration of water than in the cytoplasm.

   a) hypotonic b) hypertonic

   c) neutral d) acidic

II. Fill in the blanks.

1. _____ is the structural and functional unit of living organisms.
2. The largest cell is egg of an _____.
3. _____ is a good example for anaerobic respiration.
4. _____ nerve is located at the end of the eyes behind the retina.
5. The size of the cells are measured in units of _____

III. Match the following.

Carbohydrates	CO_2, Water and Heat
Glucose	Amino acid
Protein	Glucose
Amino acids	Cholesterol and other steroid
Fatty acids	Enzymes, hormone, protein

IV. State true or false. If false, correct the statement.

1) In hypotonic condition, concentration of the external and the internal solution of the organism are same .
2) Diffusion is the movement of particles from an area of lower concentration to higher concentration .
3) Human beings are warm blooded in nature.
4) The larynx has fold of tissue which vibrate with the passage of air to produce sound.
5) Aqueous humour plays an important role in maintaining the shape of the eye.

V. Answer very briefly.

1. What is cell differentiation?
2. State different types of tissues.
3. Mention the function of 'Alveoli'.
4. Name the processes by which air enters and comes out of our lungs.
5. Differentiate osmoconformers and osmoregulators.
6. Define - Metabolism.

VI. Answer briefly.

1. Define - Prokaryotic cell.
2. Tabulate the differences between aerobic and anaerobic respiration.
3. Why the human eye is compared with camera?
4. Which organ and organ system help to maintain homeostasis?

VII. Answer in detail.

1. Draw the struture of human eye and label its parts.
2. Explain osmosis with an example.
3. Differentiate between inhalation and exhalation.
4. List out the different types of metabolism with an example.
5. Explain the mechanism of breathing.

VIII. Higher Order Thinking Questions.

1. Why do we need instant energy? Does glucose give that energy? Explain.
2. How are we preparing pickles? What are the steps involved in that?

IX. Value based questions.

1. Dr. Usha is a pulmonologist (Doctor for respiratory diseases). One day, a school student named Arjun, met her with respiratory problems. After diagnosis, the doctor advised him to go to playground daily and play football or basketball. She also advised him to do *pranayamam* in the morning.
   a) Why did the doctor advise him to go to the playground?
   b) What is the use of *pranayamam*?
2. Explain why you are not able to breathe normally when you are in closed and crowded places?
3. Shylesh is a school going kid studying standard VIII. He is crazy about playing video games in mobile phones. After couple of months, his eyes turned red and he felt severe pain in his eyes. His science teacher enquired about this and advised his parents to take him to an eye doctor.
   i) How does excessive usage of mobile phone affect our eyes?
   ii) What are the values shown by the teacher?

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2. http://www.biologyreference.com/Gr-Hi/History-of-Biology-Cell-Theory-and-Cell-Structure.html
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Concept Map