UNIT FOUR

HUMAN BODY SYSTEMS AND HEALTH

Learning Outcomes:

At the end of this unit, you will be able to:

- list down the major organs that constitute the human body systems;
- explain the main functions of the major human body systems.
- list down the main diseases or disorders associated with the major human body systems;
- discuss the effects of diseases of the major human body systems;

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4.1 Integumentary System
4.2 Muscular System
4.3 Skeletal System
4.4 Digestive System
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4.6 Circulatory System
4.7 Reproductive System

Introduction

Human body parts must be keeping healthy by take care with different methods. In human there are different types of body systems with specific types of functions like that of integumentary systems, muscular systems, skeletal systems and so on. In this unit you will learn about the components, function and disease or disorders of some types of human body systems.

4.1 Integumentary Systems

At the end of this section, you will be able to:

- distinguish the major structural components of human integumentary system;
- describe the main functions of human integumentary sytem;
- explain, by giving examples, how structure and function are related;
- identify and discuss the main diseases or disorders associated with human integumentary system.

Key term:-
Wax:- substance produce in ear and prevent entrance of dust and pathogens in to ear.

Did you know?
Skin is body's largest and heaviest organ covers 1.5 to 2m2; composes 15% of body weight.

Activity 4.1:-
Identify and discuss on the parts of integumentary systems
- The teacher show for you the charts of integumentary systems.
- Then, present your observation results for the class mate

What are integumentary systems?

The integumentary systems are the organ of the body that forms a physical barrier between the external environment and the internal body part that it serves to protect and maintain. The integumentary system includes the skin, associated glands, hair, and nails.

4.1.1 Components of integumentary system

The integumentary systems are the human body systems that used to perform different types of functions such as protection and excretions. These systems have some components like skin, hair, nail, and glands.

Table 4.1: parts of integumentary systems and their functions

Parts	Functions
Skin	covers the internal parts of the body
Hair	keeps your skull warm,beauty in women
Nail	Protect inner part of finger and toe
Glands	Secret important substances

Key term:
Thermoregulation:- The process of temperature regulations in body.

Activity 4.2

Discuses on the layers of human skin

In groups discuss on skin layer and their functions

-and then present for the class mate.

1. Skin: -

The skin is the outer layer of the body that covers the internal parts of the body. Human skin has three major layers. These are:-

A. Upper layer

This layer is the outer most layer of the skin and called epidermis which is made up of dead cells. These used to reduce excess water loss, protect from light ray (UV light) and entry of disease causing microorganisms.

B. Middle layer

This layer is the dermis which containing blood vessel (which are responsible for thermoregulation), lymph vessel, sweat gland, sensory receptors and hair follicles.

C. Lower layer

This layer of skin also called hypodermis, which contains fatty tissue that used to store energy and act as an insulation layer that means protecting you from loss of excess heat.

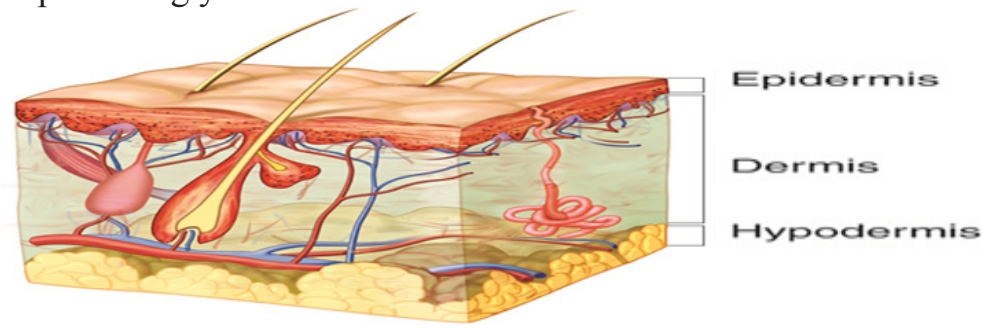


Figure 4.1 Layers of human skin

2.Hair: -

Haircome from follicles,which are simple organs made up of cell called epithelial cells. Hair is made up of different structures and layers. The outer layer of hair is shaft that made up of dead cell that turned in to keratin and binding materials.The hair shaft is formed from three layers.

A. Medulla: deepest layer of hair shaft, only seen in large and thick hairs.

B. Cortex: middle layer of hair shaft which provide strength, color and texture of hair fibre.

C. Cuticle: outer layer of hair shaft is thin and colorless. It serves as protection of the cortex. These hairs are used to help protect the skin, regulate body temperature, and lend itself to the evaporation and perspiration process.

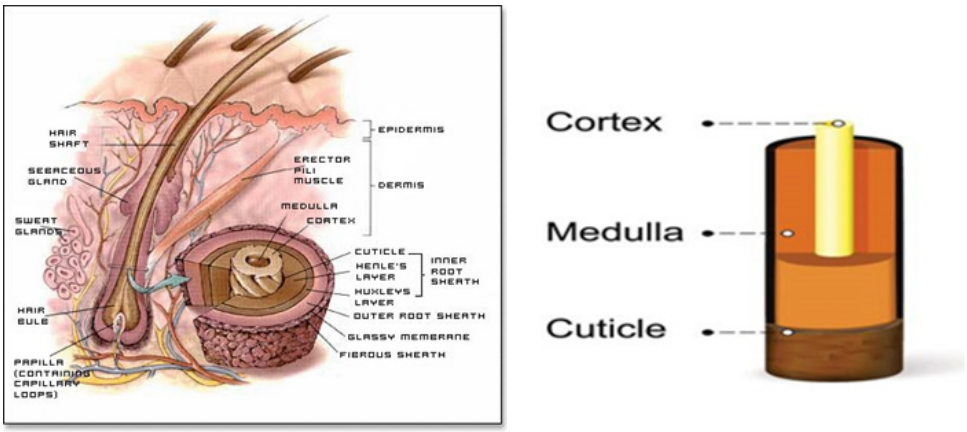


Figure 4.2 layers of hair shaft

3. Nail: It is the hard covering at the end of the finger or toe. Like other body parts, it consists of several parts including:

- **The nail plate:** The part of the nail that is visible.
- **The nail bed:** The skin that lies beneath the nail plate.
- **The cuticle:** The thin line of tissue that is located at the base of the nail and overlaps the nail plate.
- **The nail folds**: The folds of the skin located on the sides of the nail plate.
- **The lunula:** The white-colored half-moon-shaped area.
- **The matrix:** Part of the nail that is not visible, located underneath the cuticle, this is the area responsible for the growth of the fingernail.

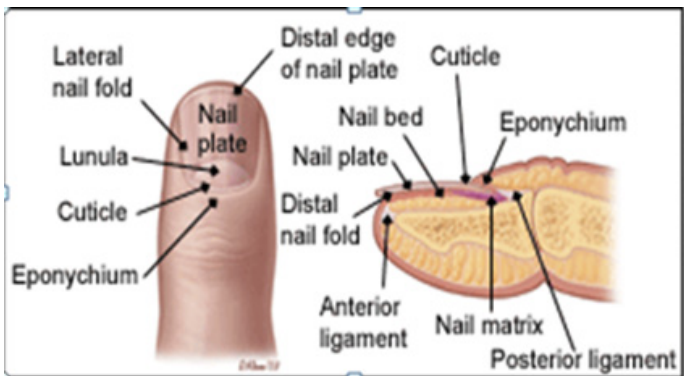


Figure 4.3 structures of human nail

4. Gland: is an organ that make one or more sustances such as hormone digestive juice, sweat, tear, saliva or milk. Integumentary systems have four types of exocrine glands, that secrete some type of substances outside the cell and body. These includes

- **Sudoriferous glands:** sweat glands that are hollow, cylindrical under skin, that excrete sweat through small opening at the skin surface.
- **Sebaceous glands:** very small tubular shaped glands in dermis which used to release oil in to the hair follicle to help lubricate and protect the hair shaft, keeping it from becoming hard and brittle.
- **Ceruminous glands:** located in ear canal and it produce ear wax (medically coined cerumen) for protections.
- **Mammary glands:** In female, the gland functions to produce breast
- milk after giving birth.

Key term:-
Exocrine gland:-a gland that release their secretion through ducts or openings.

Exercise 4.1

Part I:choose the best answer from the given alternatives

1. Which of the following is not parts of integumentary
   A/ hair B/ skin C/ glands D/ nail E/ kidney
2. The outer layer of the human body is _____
   A/ gland B/ skin C/ nail D/ all
3. The middle layer of the skin is _____
   A/ dermis B/ hypodermis C/ epidermis D/ endodermis
4. Layers of skin that made from dead cell are called _____
   A/ upper layer B/ lower layer C/ meddle layer D/ all
5. The outer layers of the hair is _____
   A/ medulla B/ cuticle C/ cortex D/ none

Part II: describe briefly

1. Briefly describe the structural components of the integumentary systems with their functions.
2. List the functions of the sweat glands.

4.1.2. Functions of Integumentary Systems

The skin is remarkably complex organ which carries out a number of important functions in your body. Some of these functions are, include serving as an enclosing barrier and providing environmental protection, regulating temperature, producing pigment and vitamin D, sensory perception and homeostasis. Besides the skin also contain many numbers of sense organ which are sense of touch, temperature, pressure and pain.

The primary function of human hair is to insulate the human body. It does this in two ways. First it serves as a physical barrier between external cold air and the skin, and in the second it also traps warm air in between the skin and the hair, keeping the body warmer. The nail used to protecting the upper end of each finger and toe of humans and most other organisms from injury and also used for sensation with sense of touch.Glands in the body are used to secret different chemicals. Some types of glands are used to excrete wastes, cooling down the body, release oil in to the hair follicle, produce ear wax for protections, and also used to produce breast milk for feeding the baby.

Activity 4.3

Brainstorming on the disease of the skin

Procedure:-

- make a groups and list skin diseases from you personal knowledge
- and then list them for the class mate students.

4.1.3. Major Skin Diseases and Disorders

Skin diseases are a broad range of conditions affecting the skin, and include diseases caused by bacterial infections, viral infections, fungal infections, allergic reactions, skin cancers, and parasites.

Skin disorders vary greatly in symptoms and severity. They can be temporary or permanent, and may be painless or painful. While most skin disorders are minor, others can indicate a more serious issue. There are many different types of skin disorders. Here is some list:

- **Acne:**

Commonly located on faces, neck, shoulders, chest, and upper back. May leave scars or darken the skin if untreated. Its symptoms are tips, large, solid, painful,lump under the skin. Caused by when the pores of your skin become blocked with oil, dead skin or bacteria



Figure 4.4 Acne

- **Rosacea:**

The skin condition rosacea is most commonly associated with redness. However, there are four sub types that cause other symptoms as well.

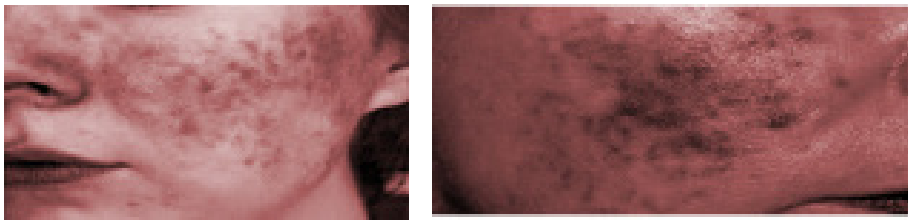


Figure 4.5 rosacea

- **Eczema:**

These are the range of persistent skin conditions. These includes dryness and recurring skin rashes that characterized by red ness, skin swelling, itching and dryness, crusting, cracking or bleeding etc.

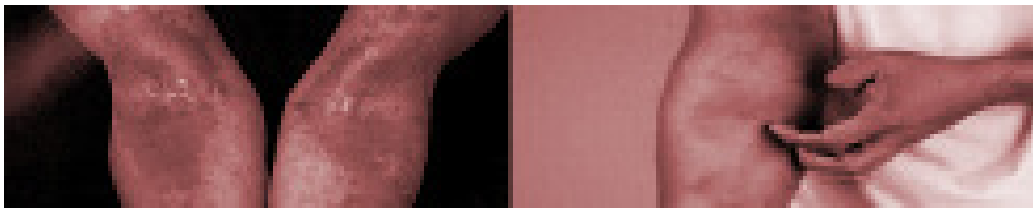


Figure 4.6 Eczema

- **Hives:**

Hives are itchy welts that are raised up from the normal layer of the skin. It is frequently caused by allergic reactions in the body but it also caused by outside factors such as stress, illnesses, or tight clothes.

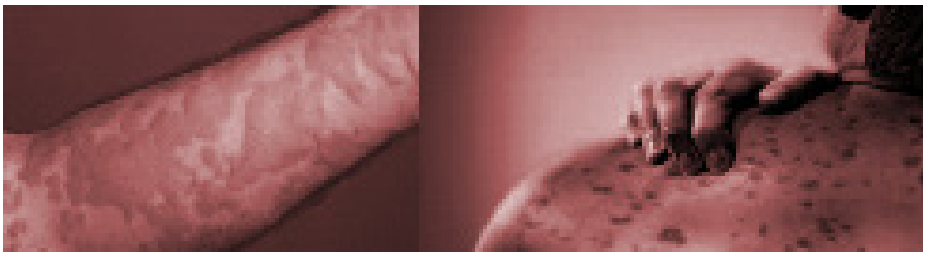


Figure 4.7 Hives

- **Warts:**

It typically occurred on humans' hands or feet but often in other locations. It caused by viral infections especially by human papilloma virus (HPV). They often go away on their own, though unsightly warts can be treated with liquid nitrogen or medicated creams.



Figure 4.8 Warts

- **Cold sore**:

A cold sore is a red, fluid-filled blister usually found near the mouth. The sore itself is painful or delicate. Other symptoms include itching or burning sensations on the site before the sore is visible. Cold sores are caused by the herpes simplex virus, and there is no known cure for the virus.



Figure 4.9 Cold sore

- **Carbuncle:**

When Staphylococcus aureus bacteria make their way into the hair follicles and cause an infection, a carbuncle is produced. This is a red, irritated lump underneath the skin. Carbuncles can be nearly any size, and the lump quickly fills with pus and becomes swollen. Other symptoms include tiredness, itching on the site of the lump, and fever. Carbuncles are treated with antibiotics and antibacterial washes.

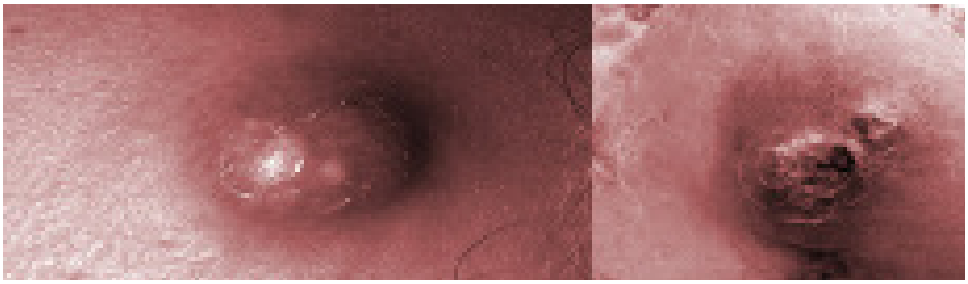


Figure 4.10 Carbuncle

- **Blister:**

A blister is a bubble of fluid under the skin. The clear, watery liquid inside a blister is called serum. If the blister remains unopened,serum can provide natural protection for the skin beneath it. Blisters exactly heal by

1. Wash hand and blister by soap warm water
2. Swap blister by iodine
3. Sterilize clean, sharp needle with rubbing alcohol etc.

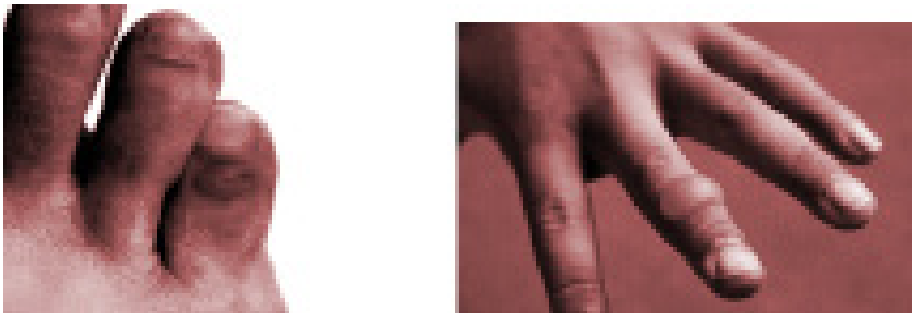


Figure 4.11 Blister

- **Actinic keratosis:**

An actinic keratosis is a rough, scaly patch on the skin that develops from years of sun exposure. It's often found on the face, lips, ears, forearms, scalp, neck or back of the hands.

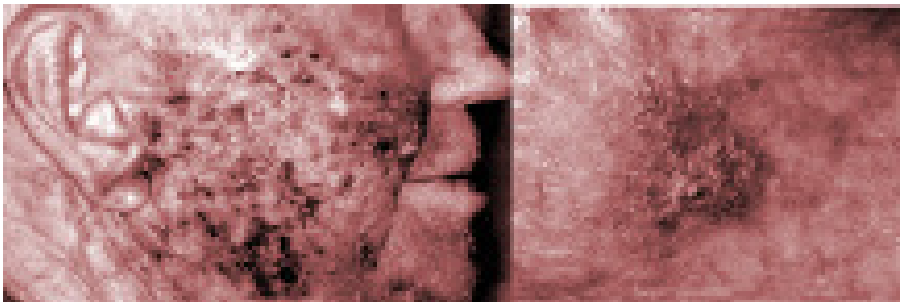


Figure 4.12 Actinic keratosis

- **Latex allergy:**

Latex allergy is a reaction to certain proteins found in natural rubber latex, a product made from the rubber tree. Latex allergy may cause itchy skin and hives or even anaphylaxis, a potentially life-threatening condition that can cause throat swelling and severe difficulty breathing.

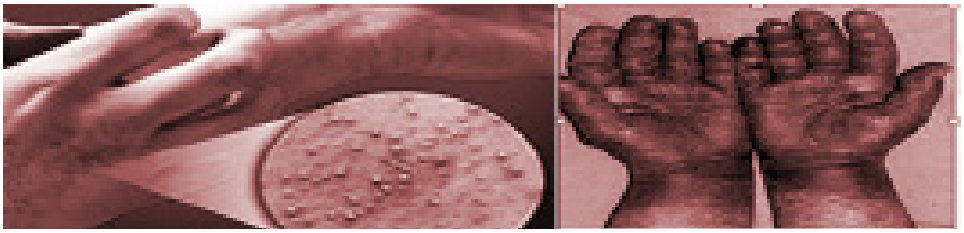


Figure 4.13 Latex allergy

- **Chickenpox:**

Chickenpox consists of an itchy, red rash that breaks out on the face, scalp, chest, back and, to a lesser extent, arms and legs. The spots quickly fill with a clear fluid, rupture and then turn crusty. Chickenpox is an infection caused by the varicella-zoster virus.



Figure 4.14:- Chickenpox

Exercise 4.2

Part: I: choose the best answer from the given alternative

1. Which of the following is outer layer of skin?
   A. lower B. hypodermis C. epidermis D. dermis
2. The outer layer of the body is called _____
   A. lung B. hair C. skin D. gland
3. Which one of the following is not used to prevent skin diseases?
   A. washing B. keep skin moist C. avoid smoking
   D. good sanitations E. none
4. ___is a skin disease and characterized by bubble of fluid under the skin
   A. hives B. rosacea C. cold sore D. blister

Activity 4.4:

1. Compare and contrast in your groups on the severity of different skin diseases.
2. What do you do, if your skin color is changed to redness?
3. How you take care about your skin?

4.2 Muscular System

At the end of this section, you will be able to:

- distinguish the major structural components of human muscular system;
- describe the main functions of human muscular system;
- identify and discuss the main diseases or disorders associated with human muscular system.

What are muscular systems?

Muscles are tissues that composed of cells that are called muscle fibers. Muscles can be used to perform different types of body movements like pumping blood, stability, posture, digestions, circulations, breathing air in and out etc. Muscular systems are the collection of systems.



Figure 4.15 Muscular structures of human

4.2.1. Components of Muscular System

There are three distinct components of muscular systems these are skeletal muscles, cardiac or heart muscles, and smooth (non-striated) muscles

Skeletal muscle

What are skeletal muscles?

Skeletal muscles are the only muscles that can be consciously or voluntarily controlled. They are contracting the muscles causes' movement of those bones. E.g chewing, talking, facial expressions, drinking. They found attached to the end bone.

Smooth muscle

What are muscular muscles?

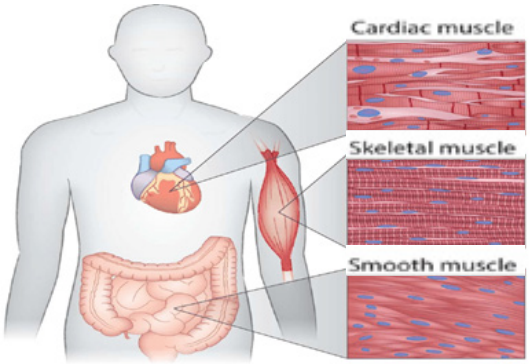
Smooth muscle lines the inside of vital organ blood vessels, eye, air-way and organs such as the stomach, digestive, reproductive, urinary tracts, and others. Smooth muscle acts involuntarily and cannot be consciously controlled.

Key term:
Auto rhythmic:- capable of contracting spontaneously without hormonal control.

Cardiac muscle

What are cardiac muscle?

Located only in the heart, cardiac muscle pumps blood around the body by involuntary action. They are auto rhythmic. Cardiac muscle stimulates its own contractions that form our heartbeat.



Did you know?
The muscles account for around 40 percent of a person's weight with the largest muscle in the body being the gluteus Maximus in the buttocks.

Figure 4.16 human muscle

Activity 4.5:
Discuss on the properties of muscle cell
Procedure: discuss in groups about the property of muscle cell
- Then present your results for the class

Exercise 4.3
Part I: describe briefly the following questions
1. Brainstorming and list on the structure and functions of muscle cell from previous class.
2. List some types and functions of your muscle from your previous class.
3. Identify special properties of muscle cell that allow movements.
4. Discuss and mention in your groups about muscle disease from your experiences.

4.2.2 Function of Muscular Systems

The muscular system consists of various types of muscle that each plays a crucial role in the function of the body. Muscles allow a person to move, speak, and chew. They control heartbeat, breathing, and digestion. All muscles cells can share the different types of properties for functions and used commonly by each muscles. Some of these properties are:-

- **Contractility:** is the ability of muscle cells to forcefully shorten. In order to contract or flex the angle of your joint is decrease then your elbow contract or shorten. Then your muscle can only pull but never push.
- **Extensibility:** is the power of the muscle to be stretched. In human body the extensibility of muscle is very high at the age of adults. But when the age goes up extensibility reduced and it is called spasticity.
- **Excitability:** is ability of muscle to give response to stimuli which come from motor neuron and hormone.
- **Elasticity:** it is the quality or state of being elastic and capability of strained body to recover its size and shape after deformations.

Activity 4.6:-

1. Discuses on the disorders of the muscle
2. What happen on the muscle when the age of human is increased?

Procedures: discuss in groups and present for class mate students.

- Explain briefly in your groups and present in class

4.2.3. Major Muscle Disease and Disorders

Muscle Disorders are the diseases that affect the human muscle system and their main manifestation is skeletal muscle weakness. They can be caused by different types of factors and make the muscle weak and reduction of its strengths. There are many disorders but some of these are:-

- **Muscular dystrophy**

A group of inherited diseases characterized by weakness and wasting away of muscle tissue, with or without the breakdown of nerve tissue. Its different types involving an eventual loss of strength, increasing disability, and possible deformity.

- **Muscle strains**

A muscle strain is an injury to a muscle or a tendon the fibrous tissue that connects muscles to bones. Sometimes called pulled muscles, strains commonly occur in the lower back and in the muscles at the back of the thigh (hamstrings).

Exercise 4.4:-

Part I: choose the best answer from the given alternatives

1. Muscle are tissue that composed of cells are called _____.
   A. long B. muscle fibers C. muscle fatigue D. all
2. One of the following is not common for all muscles.
   A. contractility B. excitability C. extensibility D. none

Part II: fill in the blank space

1. The quality of muscle being elastic is called _____
2. _____ is a type of muscle located on the hearts
3. The disease that infected muscle systems is called _____.

4.3. Skeletal System

AT the end of this section, you will be able to:

- distinguish the major structural components of human skeletal system;
- describe the main functions of human skeletal system;
- identify and discuss the main diseases or disorders associated with human skeletal system;

The skeletal system interacts with other systems by holding up your body and giving it support. The muscular system is what connects bones to bones, and the nervous system controls our movements.

4.3.1. Structural Components of Skeletal System

The skeletal system consists of components of bones and connective tissue, including cartilage, tendons, and ligaments. It's also called the musculoskeletal system.

A. Bone: It is mineralized connective tissue that contains collagen and other minerals like calcium phosphate and mineral crystal. Because of calcium phosphate the bones are firmness, compact or spongy, provide and protection of body's organ. They are made up of living cells and so called living organs. An adult human skeleton contains 206 bones.



Figure 4.17 human bone

Types of bone

Bones are a major component of the skeletal system. Based on their shape bones can be divided in to four major groups:-

1. **Long bones:** it is hard and compact, tubular filled with yellow bone marrow. E.g. Upper and lower limb, arm, leg, finger, and thigh bones.

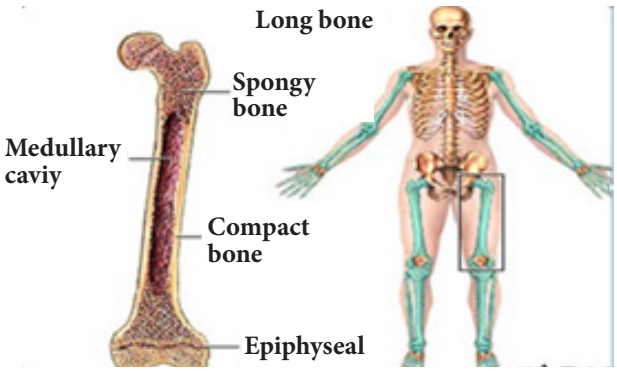


Figure 4.18 long bone

2. Short bone: are compact bones with chambers or partitions but without marrow. E.g wrist, finger, toes and ankle bone.

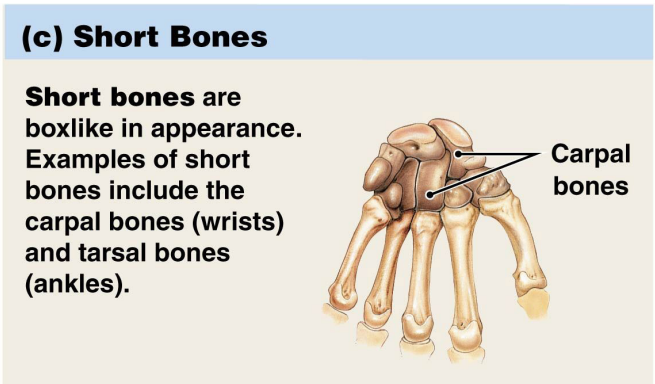


Figure 4.19 short bone

3.Flat bones: are thin, flat, compact and typically curved. They have no cavity or hollow.E.g ribs, sternum, cranial bone and scapula.

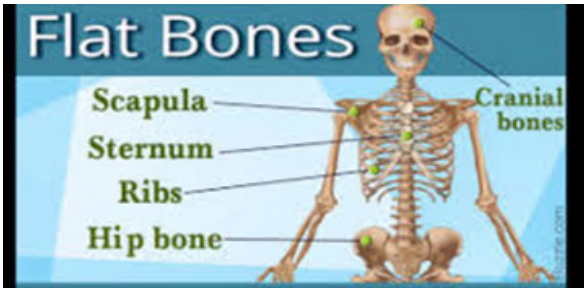


Figure 4.20 flat bone

4. Irregular bones: they are typically thin membranes which have nerves and blood vessels that nourish the bone. On their surface there are small holes for entry and exit of materials in to and out of bone.E.g hip bones, facial bones and vertebrae



Figure 4.21 irregular bone

Additionally bones are also divided into two major groups by based on their positions.

1.Axial skeleton: That divides the body into equal right and left regions. They include skull, hyoid, vertebral column, and thoracic cage.

• Skull: include bone of cranium, face, and ears (auditory ossicles).

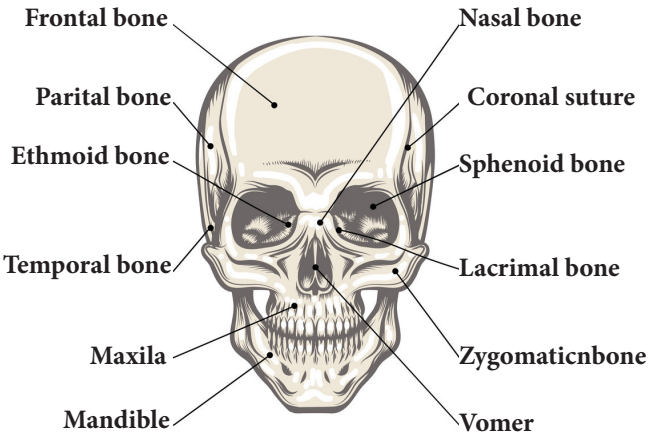


Figure 4.22 human skull

• Hyoid: U-shaped bone in neck between larynx and chin.

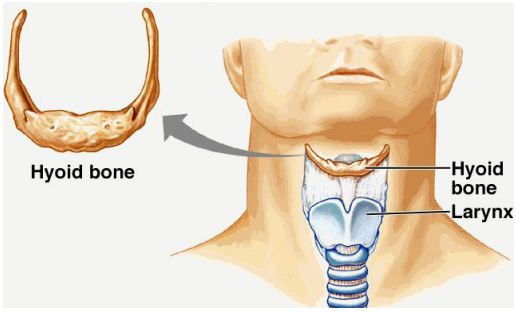


Figure 4.23 hyoid bone

• Vertebral column: Include spinal vertebrae.

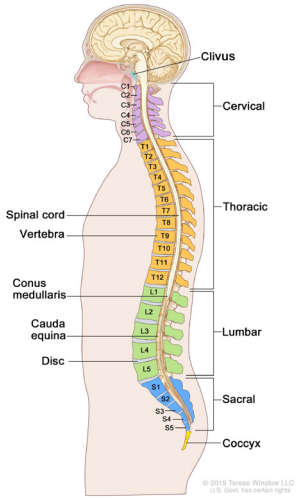


Figure 4.24 Vertebral column

- ***Thoracic cage:*** includes ribs and sternum (breast bone).

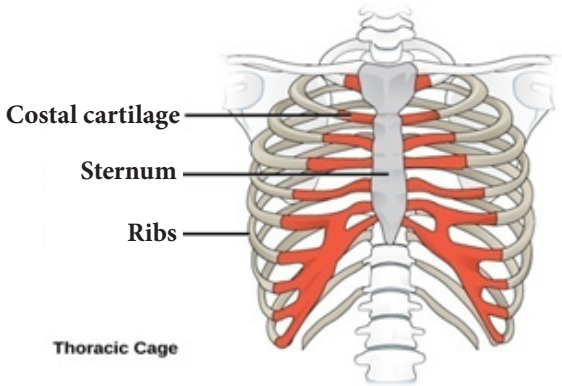


Figure 4.25 Thoracic cage

2. ***Appendicular Skeleton:*** It supports the limbs and connects them to the axial skeleton. It composed of bones of the upper and lower limbs, pectoral girdles, and the pelvic girdle. The main functions of this skeleton are body movements, protections of digestive, execratory and reproductive organ systems.

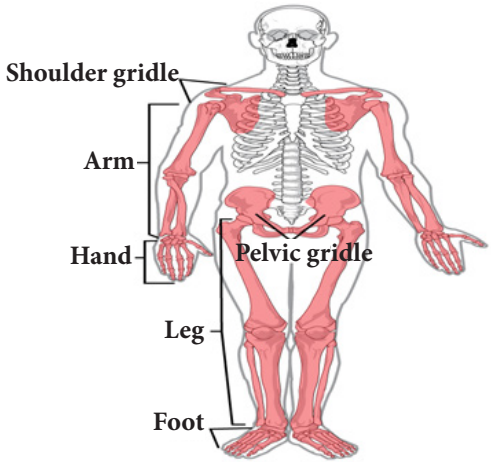


Figure 4.26 Appendicular skeleton

Major components of appendicular skeletons are:

- ***Shoulder bones:*** The shoulder bones are composed of clavicle and scapula. The clavicle or collar bone is connected to the sternum in front while the scapula bone is at the back. E.g pectoral girdle.



Figure 4.27 Pectoral girdle

- ***Limbs or appendage:*** The fore limbs are the front limbs that refer to the arms, the forearms and the hands. It consists of various types of bones such as Humerus (upper arms), Radius (inner lower arms), Ulna (outer lower arms), Carpals (wrists), and Metacarpals (hands) and Phalanges (fingers).

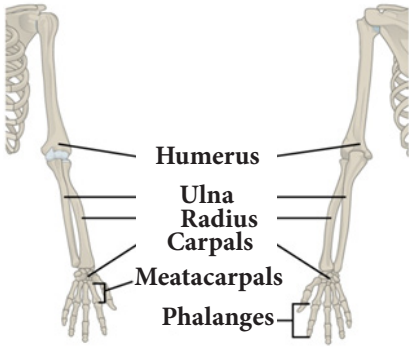


Figure 4.28 Limbs or appendage

- ***Hip bones:*** This bone also called hip girdle and composed of two hip bones. E.g pelvic girdle

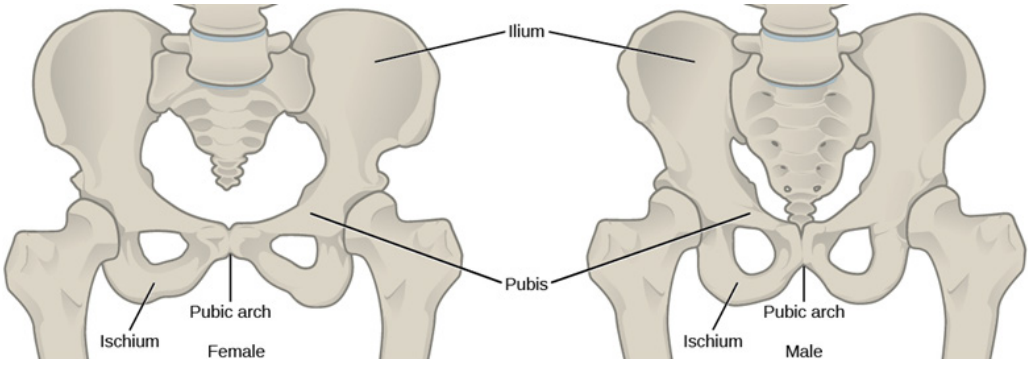


Figure 4.29 Pelvic girdle

- **Hind limbs:** The hind limbs are the back limbs or appendages and consist of different bones. These bones include: Femur (upper leg or thigh), Tibia and Fibula (lower legs or shin), Patella (kneecap) Tarsals (ankles), Metatarsals (feet), and Phalanges (toes). E.g lower limbs.

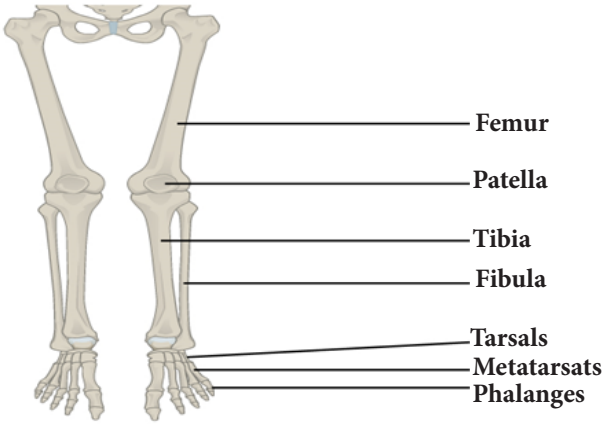


Figure 4.30 lower limb

B. Cartilage: Cartilage provides flexible and elasticity structures support for certain structures in adult humans, including the nose, trachea, and ears.

C.Tendon: It is a fibrous band of connective tissue that is bonded to bone and connects muscle to bone.

D.Ligament: It is stretchy and flexible band of tissue which held together at the joints or in between the bones of a joint and it is a firm rubbery tissue.

E. Joints: It is a site where two or more bones or other skeletal components are joined together. It has two main jobs, which are keep bone far apart and to hold bone in place as they move or rotate.

Types of joints

There are two different types of joints, namely immovable and movable joints.

1. **Immovable joints:** are fixed in place and do not move at all. E.g skull.
2. **Moving joints:** permits to move up and down or twist and bend in some directions. It grouped in to two. E.g hinge joint, ball and socket joints.

- **A hinge joint:** it looks like a hinge on a door which permit the movements front and back in a single direction. The joints that located on elbow, knee, fingers, and toes are the best examples.
- **A ball and socket joint:** it made from the round end of one bone that fitting into a cup shaped socket in another. These types of joints can permit movements in every directions. E.g. shoulder and hips joints

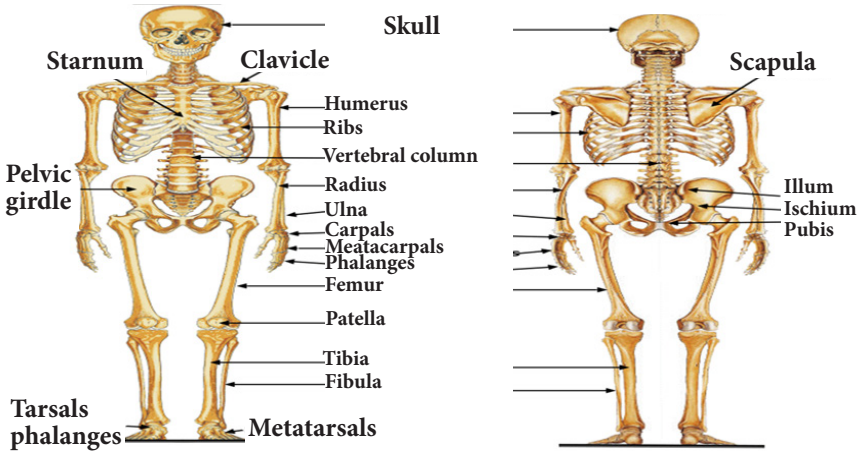


Figure:-4.31 human skeletal systems

4.3.2 Functions of Skeletal System

Human skeleton are extends throughout the body like other vertebrates which have spine for supporting the body, skull protecting the brain, and ribs protecting the organ of heart and lung. Some functions of skeleton systems for organisms are:-

Movements

The skeleton supports your body weight to help you stand and move. Joints, connective tissue and muscles work together to make your body parts mobile and transport from one place to the other places.

Produces blood cells

One of the components of skeleton, the bone contains bone marrow. They are site of blood cell formation (WBC and RBC) and occur in normal adult.

Protection and supports

The skeletal systems mainly protect and support the body of an organism. They also give the form and structure of the body.

Storage substance

It stores different types of minerals, like mineral salt, calcium, fats in bone marrow and calcium phosphate that is needed for blood clotting, nerve function, and muscle activity.

Activity 4.7:- briefly identify and explain the following questions

- Explain the role of the human skeletal system
- Labelle and identify bone of body parts from the chart when your teacher show for you.

4.3.3 Major Diseases of Skeletal System

There are a numbers of diseases which can affect the skeletal systems of human. Some of these are:-

- **Leukemia:** Leukemia is cancer of the body's blood-forming tissues, including the bone marrow and the lymphatic system.
- **Osteopenia,** osteitis, deformans and osteomalacia : similar to osteoporosis, these are other types of bones loss.
- **Osteoporosis:** Osteoporosis literally means 'porous bone'. It is a condition where bones become thin and lose their strength, as they become less dense and their quality is reduced.
- **Osteoarthritis:** is involving degradation of joints. Its symptom is joint pain, tenderness, stiffness, locking and sometimes an effusion.
- **Fracture:** is in which there is a break in the continuity of the bone. It may be a partial or complete break in the bone.

Exercise 4.5

Part I: choose the best answer from the given alternatives

1. How many numbers of bones are found in adult human?
   A. 126 B. 80 C. 206 D. 106
2. Which of the following is not examples of axial skeleton
   A. skull B. hyoid C. thoracic D. none
3. _____ is a joint that fix in place and do not move.
   A. movable joint B. immovable joint C. ligaments D. all

Part II:Match descriptions in column B with the items in column A.

"A"	" B"
1. Irregular bone	A. filled with yellow bone marrow
2. Flat bone	B. finger, toes, wrist
3. Long bone	C. have blood vessel and nerve
4. Short bone	D. cranium, scapula, ribs

Part III: fill in the blank space

1. Shoulder bone composed of _____and _____
2. _____ run through your body from front to back and divide the body into equal right and left regions.

Part VI: briefly describe

1. During which stage of development that we tend to have less total number of bones? Why?

Activities 4.8:- briefly identifies and explain the following questions

1.What are the differences between axial and appendicular skeletons?
2. Discuss and report on some roles of bone of lower extremities.
3. Reason out, why joints are important at articulations of two or more bones?
4. List and discuss many skeletal system diseases.

4.4. Digestive System

At the end of this section, you will be able to:

- distinguish the major structural components of human digestive system;
- describe the main functions of human digestive system;
- identify and discuss the main diseases or disorders associated with human digestive system.

What does it mean digestions?

Digestion is the process in which the larger, complex, hard and insoluble food substances are changed into smaller, simpler, easier and soluble by the action of the digestive organs.

Such types of food molecules are can be easily usable by the body cells. In the activity of digestion there are the involvements of different digestive enzymes and digestive organs.

4.4.1. Structural Components of Digestive System

The digestive system is an organ system which is made up of the alimentary canal or several organs including the mouth, esophagus, stomach, small intestine, large intestines, and anus. It also has associated organs such as salivary glands, liver and pancreas. The two types of digestion are physical and chemical digestions. Physical digestion includes cutting and gridding food molecules in mouth by teeth.

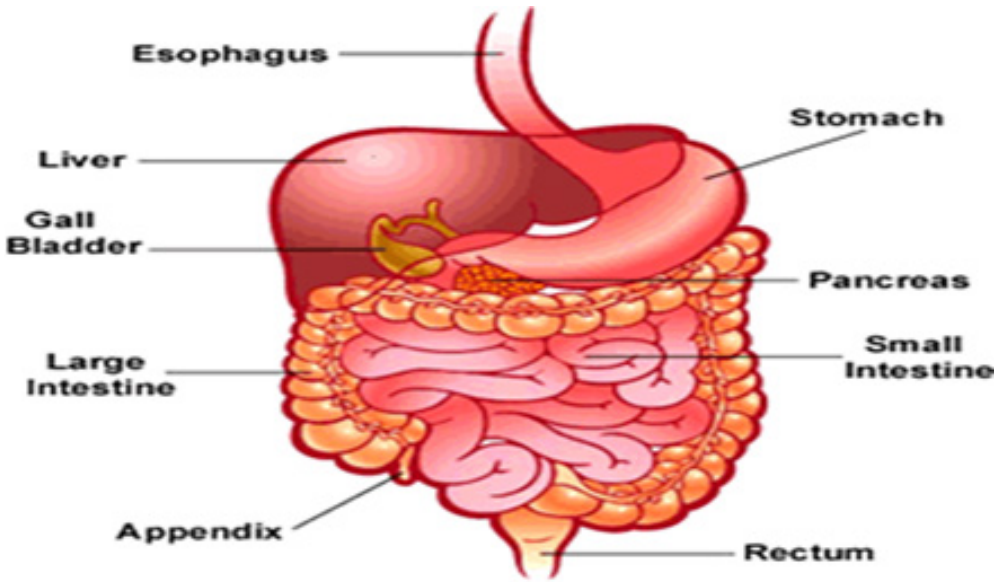
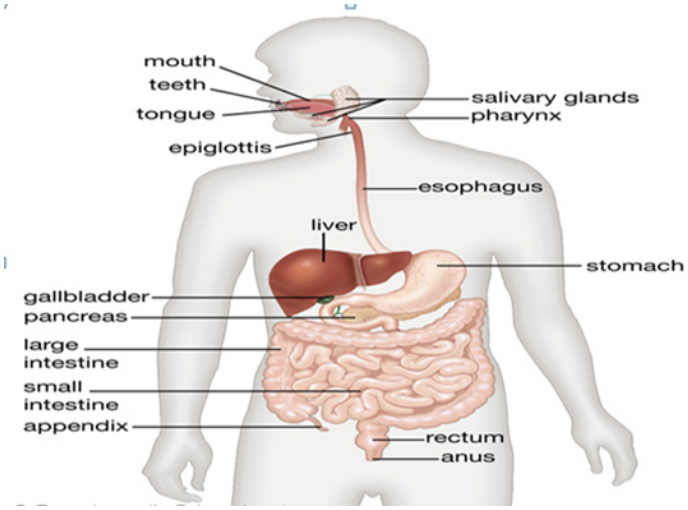


Figure:-4.32 Human digestive systems

4.4.2. Functions of Digestive System

The major function of digestive system is the breakdown of food molecules in to smaller and usable forms. The muscular contraction and relaxation of wall of alimentary canal produce movements of digested food along in one direction.



Key words:
Alimentary canal:-the whole passage along which food passes through the body from mouth to anus during digestion.

Figure 4.33 human digestive organs

Mouth

It is the first anterior opening parts of the gut which contains teeth. In mouth both types of digestion physical (mechanical) and chemical digestion occurs.

Teeth

Teeth of humans and other animals are hard structures that grow from jaw bone. They are used to bite and chew food. Each tooth consists of crown, neck and root.

The true human teeth are made up of three layers these are

1. **Enamel:** the outer layers, white and hardest substances in the body.
2. **Dentine:** isthe living layer under the tooth enamel.
3. **Pulp cavity:** it is the central parts of the teeth. It contains the living tissue with blood vessels and nerves which supply the living tooth with nutrients

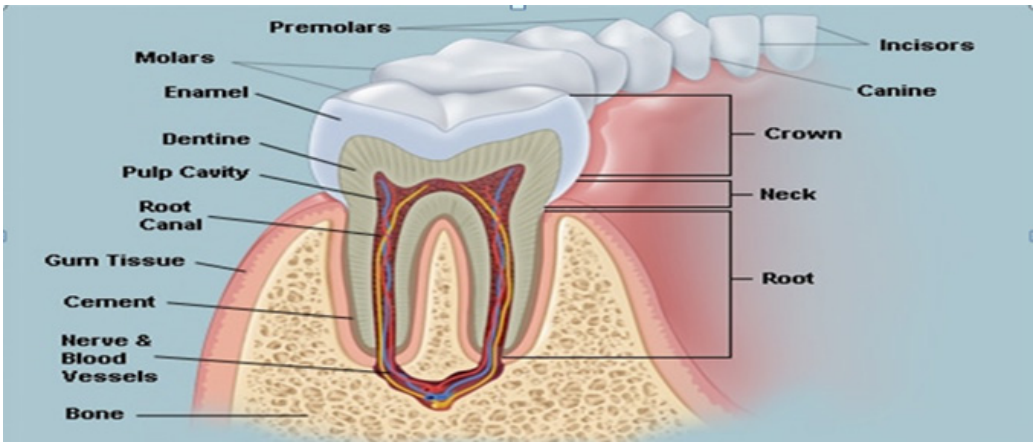


Figure 4.34 human teeth structure

Mammals have two sets of teeth in their life. In human the first set has 20 teeth is called milk teeth. These milk teeth are appear first but loose and fall out when a child is about 6 years old and replaced by the second or permanent teeth which is not replaced when once decay or loose. The permanent teeth set have 28 teeth. When person is around 20 – 25 years old, four additional back teeth grow called wisdom teeth. This development and arrangement of teeth is known as dentition.

Types of teeth

Human have four types of teeth. These are:

1. **Incisors (I):** chisel shaped and frontal teeth with sharp edge. They are four on each jaw and used for biting, cutting and grinding food.
2. **Canines (C):** is long, sharp, pointed edge and located beside incisors. They are two on each jaw. Used to tear, piercing food and it is prominent in predator organisms like lion.
3. **Premolars (P):** located behindcanines with relatively flat edge. They are four in each jaw. Used for chewing, crushing, or grinding food.
4. **Molars (M):** with wider and stronger ridges having depressions. There are six in each jaw. Their function is similar to premolars.

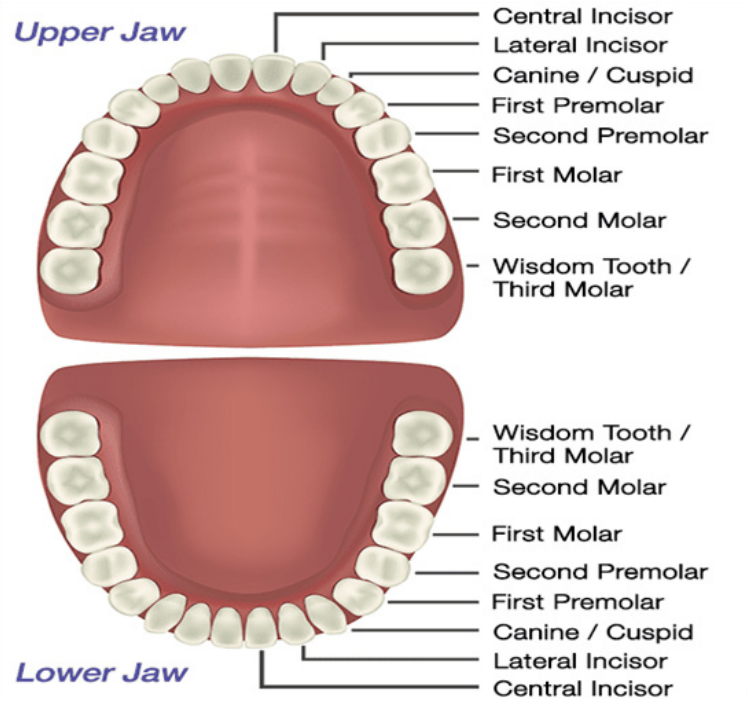


Figure 4.35 types of human teeth

Dental formula is the representing of the number, type and arrangement of teeth. It shows the number and type of teeth in one half of the upper and lower jaws. Because of these the teeth on the upper jaw are listed above the lower jaw. They listed as:- incisors (I), canines (C), premolar (P) and molar (M). Therefore the dental formula of adult human is:

I= 2/2, C= 1/1, P= 2/2, M= 3/3

Therefore, the total number of teeth in a given mammal can be calculated. First add the number of teeth in upper and lower jaws, and then multiply each jaw by two. Finally, sum up the product.

Stomach

The stomach is a muscular bag that produces enzymes like pepsin for protein digestion. It also produces another solution which is called hydrochloric acid.

Small intestine

The first section of small intestine which is called duodenum is used to join the food with two liquids: bile and pancreatic enzymes.

Bile is made by the liver cells and stored in gall bladder until it is needed. This bile has two important jobs.

1. Neutralize the acid from stomach and make the semi digested food alkaline.
2. Emulsifies the fats in the food, which means breakdown of fat in to smaller droplets.

The small intestine has much finger like projection which called villi for absorption of digested food in to blood vessels.

Where is the digestion end products go next?

Digestion end product of protein is amino acids and butter (fat) is fatty acids and glycerol entering in to small intestine to store for short times and absorptions in to blood.

Large intestine

It is parts of alimentary canal between small intestine and anus.

Its main function is absorption of water and formation of faeces.

Undigested food substances are unusable by cells and removed out through anus which is the last part of gut. This type of process is

Key term:

Defecation:- removal of wastes from body parts (egestion).

Exercise 4.6:- Answer the following questions

1. In your groups record and Labelle the various parts of alimentary canal from the chart when your teacher show you.
2. Brainstorming on how food move through alimentary canal and discuss in groups.
3. Students look their friend's teeth and determine their function, types and numbers.
4. Briefly discuss on parts of alimentary canal.
5. Students observe on associated glands of alimentary canal and their functions from the charts.

4.4.3. Major Diseases of Digestive System

The organs of digestive systems are can be affected by disease causing pathogens. There are a numbers of disease and some of them are:-

Constipations

If the faeces in the large intestine stay too long, too much water absorption will take place and it cause constipations. The most common causes are lack of fiber food (roughage) and not drinking of enough water.

Prevention

- Eating food which has more roughage gives the gut muscle work on.
- Drinking sufficient amount of water.

Key term:-

Roughage:-fibrous indigestible material in vegetable foodstuffs which aids the passage of food and waste products through the gut

Diarrhea

It is also called watery faeces. It caused by an infectious of the gut and then the gut more contracts strongly and hardly than the usual. It can cause dehydration.

Prevention

- Treat patients by giving enough water salt to replace the loss fluid.
- Stool examination and early treatment by the proper medicines.

Hemorrhoids

Are swollen veins in your lower rectum.Internal hemorrhoids are usually painless, but tend to bleed. External hemorrhoids may cause pain. Hemorrhoids also called piles are swollen veins in your anus and lower rectum.

Prevention

- To prevent hemorrhoids and reduce symptoms of hemorrhoids,eat high-fiber foods. Eat more fruits, vegetables and whole grains, drink plenty of fluids and do regular exercise.

Gastritis

Is an inflammation, irritation, or erosion of the lining of the stomach. It can occur suddenly (acute) or gradually (chronic).

Prevention

Gastritis can be prevented by avoiding known trigger foods,quitting smoking, managing and reducing stress, avoiding alcohol, maintaining a healthy weight, avoiding abuse of over-the-counter pain medications.

Key term:
Chronic:-happening or existing frequently or most of the time.
Acute:-very serious, strong, sensitive or dangerous.

Peptic ulcer disease

Peptic ulcer disease is a condition in which painful sores or ulcers develop in the lining of the stomach or the first part of the small intestine. Normally, a thick layer of mucus protects the stomach lining from the effect of its digestive juices.

Prevention

In order to prevent peptic ulcer it is recommendable to avoid tobacco products and alcohol. Don't ignore your ulcer symptoms. Protect yourself from infections by washing hands regularly and consuming foods that have been cooked thoroughly.

Exercise 4.7:

Part I:-Choose the best answer from the given alternatives

1. One organism have I=3/3 C=2/2 P=3/3 M=2/2. Then what is the total number of teeth? A. 34 B. 38 C. 40 D. 30
2. Which one is a chemical produced in stomach?
   A. bile B. HCl C. HS2O D. amylase
3. Removing of acid from stomach is called _____
   A/ emulsification B/ acidification C/ neutralization D/ all

Part II:- Explain briefly the following questions

1. Where does digestion start in human?
2. What will be undigested food molecules?
3. What types of digestion take place in stomach? Why?
4. List and discuss on digestive system diseases in your groups from your personal experiences.

1. Give assignments to draw diagrams of human alimentary canal and label each part.

4.5 Respiratory System

At the end of this section, you will be able to:

- distinguish the major structural components of human respiratory system;
- describe the main functions of human respiratory system;
- identify and discuss the main diseases or disorders associated with human respiratory system.

What are respirations?

In single cell and small living organisms like amoeba and paramecium, oxygen diffuse from the air or water in to the cell. In other ways carbon dioxide diffuse out of the cell. But in larger organisms like human, diffusion of oxygen from air is enough. Breathing is a process of bring oxygen into organism's body (inhalation) and removal of the waste carbon dianoxide (exhalation)from the body to the environments.

Key term:
Inhalation:- taking oxygen into the body.
Exhalation:-removal of carbon dioxide out of body.

4.5.1. Structural Components of Respiratory System

The human respiratory systems have well developed and adapted structures for breathing of air. They have nose with large surface area, good blood supply, lots of hair and mucus. Each structures of nose have specific functions like:-

The hair: filter out dust particles and pathogens from inhaled air.

The large surface area: used to moist the air and increases the humidity of the air.

The mucus: filter inhaled air and collects bacteria and dust particles.

Good blood supply: helps to warm the air that we inhale into the body.

Organs of breathing includes: nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli, lung etc. The trachea which is one part of the respiratory organs has series of incomplete rings of cartilage (which are C shaped) that used to support it and hold it open. They are incomplete so that you can swallow your food

Key term:
Cellular respiration:- combination of food and oxygen inside the body

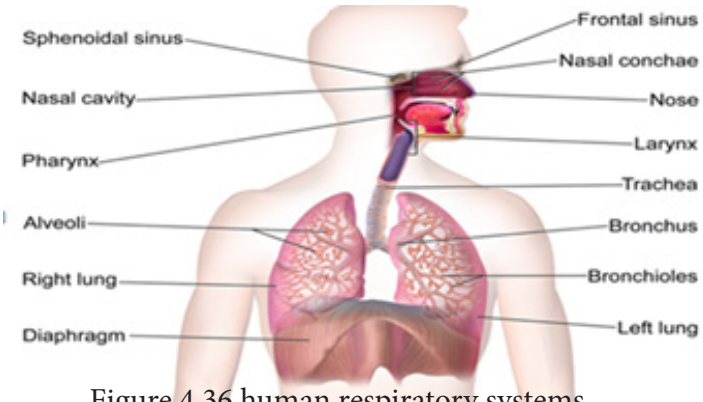


Figure 4.36 human respiratory systems

4.5.2. Functions of Respiratory System

Respiration is the process by which a body gets and uses oxygen and releases carbon dioxide and water. Respiration is divided into two parts. The first part is breathing which involves inhaling and exhaling. The second part is cellular respiration, which involves chemical reactions or burning of food by oxygen that release energy from food.

Pharynx- is the membrane-lined cavity behind the nose and mouth, connecting them to the esophagus.

Larynx- the hollow muscular organ forming an air passage to the lungs and holding the vocal cords in humans and other mammals.

Trachea- a large membranous tube reinforced by rings of cartilage, extending from the larynx to the bronchial tubes.

Bronchus- any of the major air passages of the lungs that diverge from the windpipe or trachea.

Bronchioles: are smaller tubes branching from each bronchus in the lung.

Alveoli- are any of the many tiny air sacs in the lungs where the exchange of oxygen and carbon dioxide takes place.

Lung- is to provide a place where oxygen can reach the blood and carbon dioxide be removed. The shape of the lung can be controlled by the relaxation and contraction of the diaphragm and intercostal muscle.

Activity 4.9:

1. Observe and record various labeled parts of respiratory tract.
2. Discuss on parts of respiratory systems and present for class mate students.
3. Discuss on roles of hair, cartilaginous rings of trachea and alveoli.
4. List and discuss on respiratory disease from your personal experiences in groups.
5. Give students an assignment to draw a diagram of human respiratory tract, label with the major parts, and submit it individually.

4.5.3 Major Diseases of Respiratory System

Respiratory diseases range from mild and self-limiting, such as the common cold, influenza, and pharyngitis to life-threatening diseases such as bacterial pneumonia, pulmonary embolism, tuberculosis, acute asthma, lung cancer, and severe acute respiratory syndromes, such as COVID-19.

Asthma- it is the chronic lung disease or disorders that are marked by recurring episodes of airway obstruction manifested by labored breathing. It accompanied especially by wheezing and coughing and by a sense of constriction in the chest and that is triggered by hyper reactivity to various stimuli.

Sinusitis- it is a pain full swelling of the tissues inside the sinus or nose. It can be due to infections, allergies, or autoimmune problems. It is also an inflammation of the mucous membrane that lines the Para nasal sinuses.

Influenza- Influenza is a viral infection that attacks your respiratory system your nose, throat and lungs. Influenza is commonly called the flu, but it's not the same as stomach "flu" viruses that cause diarrhea and vomiting.

Chronic obstructive pulmonary disease, or COPD:- refers to a group of diseases that cause airflow blockage and breathing-related problems. It includes emphysema and chronic bronchitis. Mainly it can be caused by smoking cigarette.

Bronchitis- Bronchitis is an inflammation of the lining of your bronchial tubes, which carry air to and from your lungs.

Exercise 4.8

Part I: Choose the best answer from the given alternatives

1. Which of the following is used to filter inhaled air
   A. mucus B. blood C. hair D. A& C
2. Breathing through nose is better than breathing through_____
   A. lung B. trachea C. mouth D. esophagus
3. One of the following is parts of respiratory organs
   A. large intestine B. stomach C. bronchi D.liver
4. Large membrane tube reinforced by ring of cartilage is _____
   A. larynx B. trachea C. pharynx D. alveoli
5. Millions of air sacs in lung are called _____
   A. alveoli B. bronchus C. blood vessel D. all

Part II:- Explain briefly the following questions

1. What are the functions of alveoli in respiration?
2. Discus in your groups on how the human lung gets oxygen and carbon dioxide and present for other groups.
3. List the respiratory disease and their causes.
4. Discuss in detail about the transmission of COVID 19 and present the results for the class mate.

4.6 Circulatory System

At the end of this section, you will be able to:

- distinguish the major structural components of human circulatory system;
- describe the main functions of human circulatory system;
- identify and discuss the main diseases or disorders associated with human circulatory system.

What is a circulatory system?

Circulatory system is the systems of transports substances in the body of an organism. Mainly these systems are used to transport air, food, mineral, vitamin,

and other liquid materials and solutions between cells in the body. They also used to transport the waste materials in order to remove in to the outside.

4.6.1. Components of Circulatory System

The blood can flow from the organ heart to the other body parts by blood vessel. The contraction and relaxation of the heart muscle can pump blood from heart to different body part. In human being there are two different types of blood circulation systems which are so called double circulations. These are:-

1. **Systematic circulations:** blood flows between hearts and other body parts.
2. **Pulmonary circulations:** the blood flows between only heart and lungs.

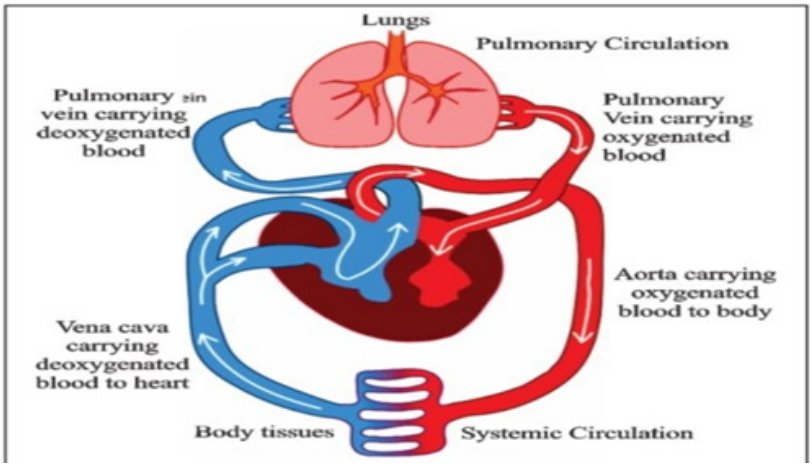


Figure 4.37 double circulatory systems

4.6.2. Functions of Circulatory System

Blood circulation systems consist of the three elements that are: heart, blood vessel and blood. In circulation systems the left side of the heart is always pump oxygenated blood while the right side of the heart receives the deoxygenated blood.

A/ Heart

It is the muscular blood pumping organ which made from involuntary muscles which is called cardiac muscle. Heart has four chambers.

1. Right atrium: upper parts of the heart and carry deoxygenated blood to lung. It has thin wall.
2. Left atrium:it is also the upper parts of the heart. It used to receive oxygenated blood from lung and pump to left ventricle.
3. Right ventricle: lower chamber and pumps deoxygenated blood in to the lung.
4. Left ventricles: it pumps the blood at long distance of the body because of these it has thicker and muscular walls.

Inside the heart the oxygenated and deoxygenated blood cannot be mixes together because the heart chamber can be separated by valves. Valves are the structures that used to prevent the back flow of the blood.

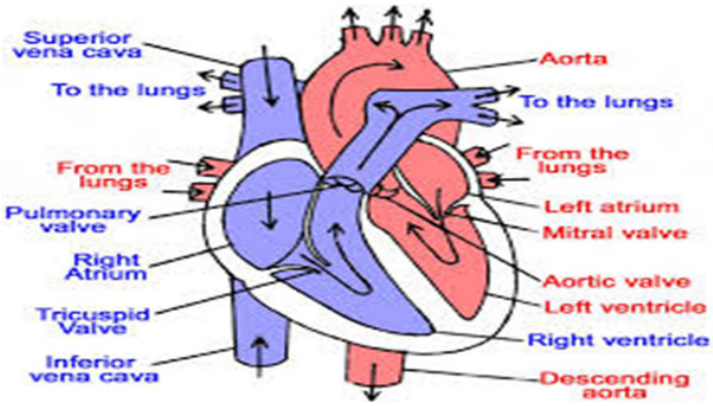


Figure 4.38 parts of human circulatory systems

Pathway of oxygenated blood flow:- lung ⟶ pulmonary vein left atrium ⟶ left ventricle ⟶ aorta ⟶ body tissue. Deoxygenated blood:- body ⟶ venacava ⟶ right atrum right ventricle ⟶ pulmonary artery ⟶ lung.

B/ Blood vessel

They are the pathway through which transportation of substances take place in the body. Based on their functions there are three major groups of blood vessels.

1. **Artery:** used to carry blood away from the heart in to different body parts. They have thick and elastic wall. Except pulmonary artery and umbilical artery all artery carry oxygenated blood.

2. **Vein:** used to return the blood back to the heart. Most of them carry deoxygenated blood except pulmonary vein and umbilical vein.
3. **Capillaries:** used to connect artery and vein and carry blood to the tissues and cells. They are narrow and thin wall blood vessel.

C/ Blood

The blood is one of the three elements of circulations. It is a fluid tissue that used to carry nutrients, respiratory gases, metabolic wastes and other substances. Blood made from 45% solid and 55% liquid which is called plasma. The liquid parts of the blood plasma are composed of 90% water and the remaining 10% is dissolved substances such as amino acid and glucose. The solid part of the blood is made from the three types of blood cell.

1. ***Red blood cells (erythrocytes):*** are disc shape, non-nucleated, and used to transport oxygen and carbon dioxide in human body. They are smaller and 6.2-8.2 μm in diameters. Have red pigmented substances called hemoglobin which carry oxygen in the blood.
2. ***White blood cells (leucocytes):*** are colorless, irregular shaped and nucleated. These cells are 12-17 μm in diameters larger than RBC. They used to prevent the body from disease causing pathogens.
3. ***Platelets (thrombocytes):*** are colorless and non-nucleated. They have 2-3μm in diameter and have biconvex shape. They are important for inciating the blood clotting when blood vessel is cut or damage.

4.6.3 Major Diseases of Circulatory System

There are different types of disease or disorders which affect the human circulation systems. Some of the diseases are:

1. **Hypertensions:** it is also called high blood pressures. It caused by age, obesity, high salt consumption, drug addiction, stress, kidney problem, diabetes, etc.

But it can treat by: less consumption of salt and fat, regular exercise, avoiding the use of drugs, regularly checkup in nearest clinic etc.

2. **Heart attack:-** occurs when blood stops flowing to a part of the heart and the heart muscle is injured because of not receiving enough oxygen.
3. **Strokes:-** A stroke occurs when the blood supply to part of your brain is interrupted or reduced, preventing brain tissue from getting oxygen.
4. **Heart failure:-** is a chronic, progressive condition in which the heart muscle is unable to pump enough blood to meet the body's needs for blood and oxygen.

Exercise 4.9:

Part I:- choose the correct one among the given four alternatives for the following quastion

1. Which chamber of heart pump blood to the body
   A. left atrium B. left ventricle C. right atrium D. right ventricle
2. In pulmonary circulation blood flow from _____ to _____
   A. body to heart B. lung to heart C. lung to kidney
   D. heart to lung E. B&D
3. Which blood vessels carry oxygenated blood from heart to body
   A. platelets B. vein C. artery D. all
4. The only vein that carry oxygenated blood is called _____
   A. umbilical vein B. large vein C. pulmonary vein D. A&C

Part II: describe briefly

1. What are the functions of blood circulations?
2. List elements of blood circulation, with their functions.
3. describe parts of circulatory systems
4. Explain types of blood cell, heart chamber and reason of partitions.
5. Discuss the role of heart, blood vessel, blood and blood cells.
6. Eexplain the circulatory diseases.

4.7 Reproductive System

At the end of this section, you will be able to:

- distinguish the major structural components of human reproductive system;
- distinguish between the primary and secondary sexual characteristics;
- describe the main functions of human reproductive system;
- identify secondary sexual characteristics of males and females;
- explain the concept of menstruation and menstrual cycle;
- identify and discuss the main diseases or disorders associated with human reproductive system;

What is reproduction?

The unicellular organisms have no reproductive organs as they are made up of one cell. They are smaller in size than the smallest animal and plant cell. However, most types of multicellular organisms that reproduce sexually have distinct male and female reproductive organs. In this topic you will learn about human reproductive systems and its function.

4.7.1. Male and Female Reproductive Organs

The reproductive cells of human produced by male and female gonads, respectively, are sperm cells and egg cells. When these sperm cells and egg cells unite together during sexual intercourse they produce offspring.

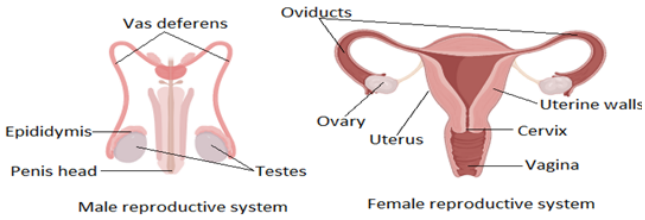


Figure 4.39 male and female reproductive organ

A. Male reproductive organ

The human male reproductive system consists of the testes and other sex organs like penis, scrotum, vas deferens, urethra, prostate glands, and Cowper's glands.

Key term:-

Graafian follicle:-are ovarian follicles rounded enclosures for the developing ova in the cortex near the surface of the ovary.

4.7.2 Functions of Male Reproductive Structures

- ***Testes:*** are two male reproductive glands. In addition to sperm cells, testes produce the sex hormone, testosterone.
- ***Penis:*** is an erectile cylindrical organ for sexual intercourse during which it ejaculates semen (sperm cells and fluid).
- ***Scrotum:*** a sac-like structure on the lower end of the penis.
- ***Epididymis*** It stores sperm cells for maturation.
- ***Vas deferens or (sperm ducts):*** is a long tube extending from each epididymis to the urethra for transportation of sperm cells and fluid.
- ***Sperm:*** is a mass of male reproductive cells produced by the testis.

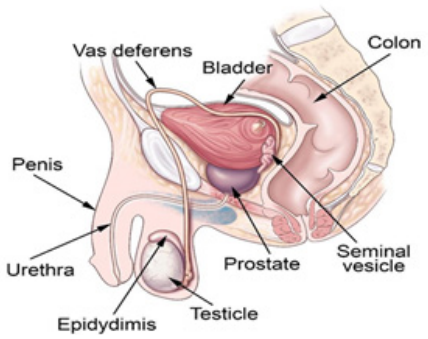


Figure 4.40 Male reproductive organ

B. Female reproductive organ

It consists of ovary and other structures such as vagina, uterus, fallopian tube, cervix, clitoris, and vulva.

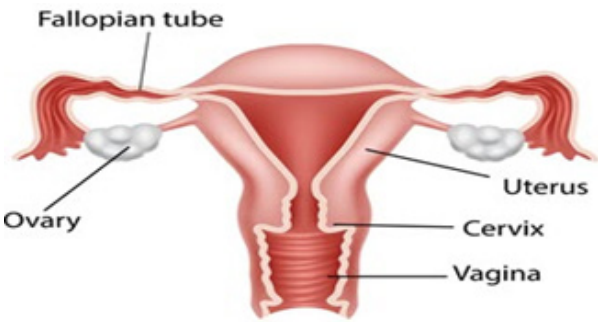


Figure 4.41 Female reproductive organ

4.7.3 Function of Female Reproductive Structures

- ***Ovaries:*** are two female reproductive glands made up of follicle cells, called graafian follicle to produce ova or egg cells and sex hormones.
- ***Vagina:*** used for sexual intercourse and serves as birth canal.
- ***Fallopian tube (oviduct):*** is a narrow tube from the ovary to uterus for movement of an egg and fertilization. It is a site for fertilization.
- ***Uterus (womb):*** is wide muscular tube for implantation of the fertilized egg and development of an embryo. It is a site for pregnancy.
- ***Cervix:*** is a ring of muscles at the lower end of the uterus. It opens at the time of menstruation and child birth.
- ***Clitoris:*** an erectile and sensitive tissue like a penis.
- ***Vulva:*** is the external genital of the female reproductive system.

Key term:-
Ejaculates:- release of sperm from male during sex.

Activity 4.10:-
Discuss on the importance of reproduction in human and other organisms.
Procedures:- make a groups in your class and discuss briefly and present your results in the class

The Primary and Secondary Sexual Characteristics

Primary and secondary sexual characteristics are physical traits that make males and females look and behave differently from each other in certain species, including humans. Primary sexual characteristics are those that are present at birth. Primary sexual characteristics are being of maleness and femaleness. Secondary sexual characteristics appear during puberty.

Secondary Sexual Characteristics

When the boy and girl are reach at puberty age the follicle stimulating hormone (FSH) from the pituitary gland stimulates the testis and ovary to produce male sex hormone testosterone and female sex hormone estrogen. These two hormones can promote the development of secondary sexual characteristics of male and female.

Secondary sexual characteristics of male

Puberty in boys usually begins somewhere between the age of 9 and 15 years old because it control by chemical change in body. The pituitary glands in human brain start to produce increasing amount of FSH. In turn it stimulate the male gonad or testis to begin developing and producing the male sex hormone testosterone. The rising of this hormone trigger many changes that affect body during puberty, and cause the development of secondary sexual characteristics.Some of these secondary sexual

- Whole body undergoes the adolescence growth spurt and become tall.
- Growth of pubic hair, body hair, and facial hair.
- Larynx enlarges and cause voice deepens.
- Shoulder and chest broaden.
- Penis enlarges & its skin of penis and scrotum becomes darken.
- Testis begins to produce sperm cell.
- Developed more muscles.
- Adolescents become more questioning and independents.
- Look beyond their family.
- Feel young and insecure, confused and angry.

Key term:

Testosterone: male sex hormone produces during puberty.

Secondary sexual characteristics of female

Female also have gonad which is called ovary. Ovaries are the two female gonads located in the abdomen. It is associated with fallopian tube (oviduct) and uterus but not directly attached to them.

The girls go in to puberty stage in between the age of 8-14. FSH from pituitary stimulates ovaries to become active and producing female sex hormone which is called oestrogen. When oestrogen level rise in female body, all kind of change take place and female secondary sexual characteristics develop. Some of these characteristics are:-

- Developments in height and whole body structure.
- Hair grow around pubic and armpits.
- Breast developments.
- Widening of hips.
- Voice becomes thinner.
- Egg matured and start of menstruations.
- Feeling of independent and questioning.

Key term:

Estrogen and Progesterone:-female sex hormone produced during puberty.

Activity 4.11:

1. Briefly explain the difference between primary and secondary sexual characteristics with example.
2. Observe and label parts of reproductive systems of both sexs from the charts when your teachers show you and create a table then list this organ with their functions and present for class mate students.
3. Students Discuss on bodily changes then compare and contrast in male and female.

4.7.4 Menstruation

What does it means menstruation?

The menstrual cycle is a sequence of events which takes place approximately every four weeks throughout the fertile life of women, which is from the age of puberty to around 50 years of age. At puberty stage of female the FSH hormone from pituitary gland in brain start the ova to develop. FSH also make ovary to produce female hormone oestrogen. In turn it stimulates the uterus to build up thick, spongy lining with enough of blood vessel ready to support a pregnancy. About 14 days before the ova start ripening, one of them burst out of its follicle. This process is called ovulation.

After ovulation the hormone level begin to reduce. The remaining of follicle forms the corpus luteum (yellow body) which secret hormone called progesterone. Progesterone keeps the thick,

spongy wall and makes more blood vessels, ready to receive fertilized ovum. If pregnancy does not occur about ten days after ovulation, oestrogen and progesterone level decrease blood vessel which built on uterus wall close down and discharged through vagina in the form of blood which is called menstruation. After around the age of 50 years the women stop ovulation and menstruation cycle. This phenomenon is called menopause.

Key terms:

Menopause:- stopping of menstruation and ovulation in female.

Ovulation:- movements of egg from ovary to fallopian tubes.

Activity 4.12:

1. Discuss in your groups about the concepts of menstruation and menstrual cycle.
2. Make a group then list and discuss many reproductive diseases from your personal experiences and present in the class.

4.7.5 Reproductive Health

What is reproductive health?

Reproductive health is the physical, mental, and social health status of an individual related to reproductive system at all stages of life. Due to lack of knowledge, there are a number of reproductive health problems in our country.

These problems mainly affect the reproductive health of women. The problems include female genital mutilation, early marriage, rape, illegal abortion and sexually transmitted infections.

Activity 4.13

1. Discus on how you prevent STDs.
2. Briefly describe the impacts of HIV on the society and community
   Procedures:- list the discussion and then present in class.

Key term:-

Rape:- is a type of sexual assault usually involving sexual intercourse.

Female genital mutilation:-partial or total removal of female external

Sexually transmitted diseases are the disease that can be transmitted from infectious person to healthy person during sexual contacts. Some of these diseases are:

HIV/AIDS

HIV (Human Immunodeficiency Virus) is the virus that causes the disease AIDS or Acquired Immune Deficiency Syndrome. So far, for this disease, caused by HIV and those damages the immune system white blood cell specially T-cell, there is no cure or vaccine. Basically, the high-risk groups include homosexual men and women, intravenous drug users, sex workers, and hemophiliacs; as well as the sexual partners of persons in these groups. HIV virus mainly transmitted from infected to healthy person by four ways. These are during breast milk, sharing of contaminated needles, unprotected sexual intercourse and from infected mother to baby during birth.

Prevention

Biological knowledge is quite important for controlling the spread of HIV/AIDS. Producing vaccine, creating awareness in the community about the issues related to responsible sexual behavior. The most effective method is

abstain from sex befor marriage are the use of ABC rules that are:

A =abstain from sex
B =be faithful to one sexual partner
C =condomise

Gonorrhea

Gonorrhea are the other types of STDs and caused by bacterium which called Neisseria gonorrhea. These bacteria are found on mucus area of body such as vagina, penis, throat and rectum. It transmitted during unsafe sexual intercourse.

Symptoms

The symptoms are may appear after a week and it is burning sensation during urination and yellowish discharges from reproductive organ. If pregnant women are not treated, gonorrhea transmitted to her bay and cause blindness.

Preventions

At the early stage it can be treated by the use of antibiotics. Remove sexual intercourse after infected until completely treatment. But the effective prevention methods are the respect of ABC methods.

Chancroids

It is a disease which caused by Hemophilus ducreyi bacteria. Chancroid is the most common types of disease for men. It increased risk of HIV/ AIDS.

Symptoms

Its symptoms are occurs in two stages of first and second stage. These are ulcer elation on reproductive organs, bleeding and painful of ulcers, swollen gland filled with pus, and may cause of loss of penis or groin.

Prevention

In first stage it prevented by the use of antibiotics but in addition to this it prevented by: good sanitation mechanisms, accepting and using of ABC rules, appropriate use of drugs which are prescribed and check up in clinic.

Syphilis

It is one of the most too dangerous STDs. It caused by bacterium called Treponema palladium. It is common for the adult age of human. It transmitted by unsafe sexual intercourse. It also transmitted from mother to her fetus.

Symptoms

The symptoms of syphilis have different stages. At the first stage, there is painless sore on penis, vagina, mouth and rectum. At the second stage, tiredness, fever, sore on throat, headaches, loss of appetite, etc. Finally change to irreversible problems, like illness of skin, bone, brain, and other organ.

Preventions

The prevention methods of syphilis are the same as to the other prevention methods of sexually transmitted disease.

Exercise 4.10:

Part I:- choose the correct answer from the given alternatives

1. Male sex hormone that produced during puberty stage is known as _____
   A. estrogen B. progesterone C. testosterone D. none
2. Which of the following is female reproductive cell
   A. sperm B. egg C. ovary D. penis
3. The male gonad is called _____
   A. testes B. ovary C. testosterone D. estrogen
4. The monthly discharge of blood through vagina is called_____
   A. ovulation B. ejaculation C. excretion D. menstruation
5. One of the following is reproductive diseases, which one
   A. syphilis B. gonorrhea C. chancroids D. HIV E.all

Unit summary

- The integumentary system includes the epidermis, dermis, hypodermis, associated glands, hair, and nails.
- The skin has three major layers of hypodermis, dermis and epidermis is the outer layer of the body that covers the internal parts of body.
- Human Hair come from follicles, which are simple organs made up of cell called epithelial cells.
- Nail is the hard covering at the end of the finger or toe, a finger or toe nail and used to protecting the upper end part of humans and most other organisms.
- Integumentary systems have four types of exocrine glands that secrete some type of substances outside the cell and body these gland are -sudoriferous, -Sebaceous, -Ceruminous, -Mammary.
- There are many different types of skin disorders and disease like -Acne, Rosacea, - Eczema etc.
- Muscles can used to perform different types of body movements like pumping blood, stability, posture, digestions, circulations etc.
- There are three distinct types of muscles: skeletal muscles, cardiac or heart muscles, and smooth (non-striated) muscles.
- The skeletal system gives the body its shape, allows movement, makes blood cells, provides protection for organs and stores minerals.
- Bones are a major component of the skeletal system and grouped in to four.
  - Long bones, - Short bone, - Flat bones, - Irregular bone.
- In addition to these bone also divided in to two major groups of the axial skeletal bone and appendicular skeletal bones.
- There are two different types of joints, namely immovable and movable joints.
- Osteoporosis is a disease in which the bones become fragile and prone to fracture and leukemia is a cancer of the white blood cells.
- Digestion is the process in which the larger, complex, hard and insoluble food substances are changed into smaller, simpler, easier and soluble by the action of the digestive organs.

- Human have four types of teeth these are Incisors, Canines, Premolars and Molars.
- Mouth, esophagus, stomach, small intestine, large intestine and anus are components of gut.
- Respiration is the exchange of gas between organisms and their environments.
- Humane respiratory organ are nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and lung.
- Respiration is divided into two parts namely breathing and cellular respiration.
- The shape of the lung can be controlled by the relaxation and contraction of the diaphragm and intercostal muscle.
- Circulatory systems are used to transport different materials such as air, food, mineral, vitamin, and other liquid materials and solutions between cells in the body.
- In human being there are two different types of blood circulation systems: Systematic circulation and pulmonary circulations.
- Blood circulation systems consist of the three elements that are blood, blood vessel and heart.
- There are different types of disease or disorders which affect the human circulation systems such as hypertension.
- The human reproductive organs produce reproductive cells within gonads.
- The human male reproductive system consists of the testes which two glands are made up of mass of tubules called seminiferous tubules.
- Female reproductive system consists of ovary and other structures such as vagina, uterus, fallopian tube, cervix, clitoris, and vulva.
- The primary and secondary sexual characteristics are used to determine the puberty stages of male and female.
- Secondary sexual characteristics appear during puberty.
- Menstruation is discharged of blood through vagina.
- Menopause is the stop of ovulations when the age is above 50.

- There are a numbers of sexual transmitted diseases like HIV and syphilis.
- STDs are very dangerous disease because it affect other organ and in all age of peoples.
- HIV/AIDS, Gonorrhea, Chancroids, Syphilis and others are examples of STDs.

Review exercise

Part I: Choose the best answers for the following questions

1. Which of the following is larger organ of the body?
   A . ligament B. skin C. bone D. joints
2. Which layer of skin is external?
   A. hypodermis B. dermis C. epidermis D. all
3. The parts of the skin that store energy is _____
   A. epidermis B. dermis C. upper layers D. hypodermis
4. One of the following is not layers of hair?
   A. Medulla B. Cortex C. matrix D. cuticle
5. _____ is the gland which secret oil in to hair follicles
   A. sebaceous B. Ceruminous C. thyroids D. all
6. Which of the following are skin disease?
   A. Rosacea B. Hives C. Warts D. all
7. Which of the following are self -care for skin disease?
   A. Washing with cool water
   B. Applying cool compresses
   C. Limiting contact with common allergies
   D. Applying calamine lotion
   E. all
8. _____ is the weakest type of muscle
   A. skeletal muscle B. smooth muscle C. heart muscle D. all
9. Which of the following is called musculoskeletal systems?
   A. circulatory B. respiratory C. digestive D. skeletal
10. _____ is hard and compact with yellow bone marrow
   A. long bone B. short bone C. flat bone D. none

11. The following one is parts of one of axial skeleton
    A. skull B. hyoid C. thoracic cage D. all
12. _____ bone is composed of scapula and clavicle
    A. hip bone B. limb bone C. shoulder D. appendage
13. The place where two bone meet together are called _____
    A. ligament B. scapula C. joints D. tendon

Part II: Fill the blank space

14. The mouth has the cavity called_____
15. The major function of alimentary canal is_____
16._____ is parts of teeth which are found above the gum.
17._____ is the living layer under the tooth enamel.
18. The two important functions of bile are _____and _____
19. Breathing through the nose is better because _____
    _____ _____ _____
20. A millions of tiny air sacs that used to for exchange of gas in the lung is called _____
21. The two types of blood circuits are _____ and _____
22. Blood vessel that carry oxygenated blood is called _____
23._____ is male sex organ that produces sperm cells.
24. The flow of blood from vagina approximately every four weeks are called _____

Parts III:-write short answer

25. How can you prevents yourself from different types of STDs?

UNIT FIVE

ECOSYSTEM AND CONSERVATION OF NATURAL RESOURCES

Learning Outcomes:

At the end of this unit, you will be able to:

- define ecosystem and components of ecosystem;
- identify and describe the types of biological interactions of organisms in an ecosystem;
- construct simple food chain and explain its components;
- differentiate between food chain and food web ;
- distinguish between the different components of food chain;
- describe the role of nutrient recycling in nature;
- explain how energy flows from producers to consumers;
- explain why nutrients are said to recycle while energy flows (does not recycle);
- summarize the characteristics of soil;
- describe the various types of soils;
- explain the various uses of soil in nature and to human being;
- engage in the Environment Club of School and participate in awareness creation campaigns;
- explain the various uses of soil in nature and to human being;
- list down and describe the various water conservation strategies;

- describe the various components of atmospheric air;
- identify and discuss the various human activities that cause air pollution;
- discuss the impacts of air pollution with examples;
- explain the various uses of air in nature and to human being;
- explain the cause and impacts of global warming;
- list down and describe the various actions that can be taken to reduce the emission of carbon dioxide to atmosphere;
- define forest and give examples of natural forests in Ethiopia
- explain the various uses of forest in nature and to human being
- identify and discuss the various human activities that cause deforestation
- discuss the impacts of air pollution with examples
- devise and coordinate various forest conservation actions
- organize groups that would campaign to teach the community on environmental protection
- organize plantation campaigns in their school compound and its environs
- list and describe the values of biodiversity
- list down and describe the various in-situ and ex-situ conservation strategies in biodiversity conservation
- give examples of the various indigenous knowledge and practices that are used in the conservation of various natural resources such as soil, forest, etc.

Introduction

Environments are a place where organisms are found. In this unit you will learn about ecosystems and their components and also for types of interaction in that ecosystem. So ecosystems are the place which contains both biotic and abiotic components. In ecosystems there are interaction between organisms and their environments.

5.1. Ecosystem and Interactions

At the end of this section, you will be able to:

- define ecosystem and components of ecosystem;
- identify and describe the types of biological interactions of organisms in an ecosystem;
- construct simple food chain and explain its components;
- differentiate between food chain and food web;
- distinguish between the different components of food chain;
- describe the role of nutrient recycling in nature;
- explain how energy flows from producers to consumers;
- explain why nutrients are said to recycle while energy flows (does not recycle).

What is an ecosystem?

Different types of living organisms can be interacts one another and with non-living things in their habitats for the purpose of survive. The interactions are studied by science called ecology. Ecosystems involve all organisms in the given habitat and their interactions between their physical environments. The main physical components that are vital for all form of living organisms are water, sunlight, air, temperatures, and others.

Key term:

Ecology:- branch of biology that study about the interaction between organisms and their habitat.

5.1.1. Definition and Components of Ecosystem

Environment is the sum of all living (biotic) and non-living (abiotic) components in a given habitat. Ecosystems can be affected by living (biotic) and nonliving things or physical components (abiotic) of an environment. Therefore an ecosystem has two major components are biotic and abiotic.

1. Biotic components

These components include all living organisms living in particular ecosystems like plant, animal, bacteria, algae etc.

1.1 Types of biological interactions

Each organism is the parts of other organism's environments thus they interact in various ways. These interactions of organism can be intra specific or inter specific.

1. Intra-specific interaction

These type of interaction occur between the same species. These may be for competition for food, territory, and for finding mate. E.g lion and lion, birds with birds for food.



Figure 5.1 intra-specific interaction

2. Inter-specific interaction

These are the interaction between one group of species with the other group of species for various numbers of purpose. e.g. hyena and lion.



Figure 5.2 nter-specific interaction

- **Predators:** predator animals like hyena feed on others animals prey like cow.
- **Symbiosis:** any type of biological association between two organisms that interact. The association could be beneficial to both, beneficial to one without benefiting or harming the other or beneficial to one and harmful to the other.

There are different types of symbiosis or biological interactions. These includes

A. Mutualism: the relationships in which both organisms are get benefitted and it is an obligatory relationship. E.g. fungi and algae, cow and some birds. Fungus digests dead body to release chemicals and algae do photosynthesis.



Key term:-
Epiphytes:- are plants that drive its moisture and nutrients from the air and rain and grow usually on other plants

Figure 5.3 mutualism

B. Commensalism:- in this relationship one organism is get benefit while the other is neither benefited nor harmed. E.g. big tree and epiphytes.





Figure 5.4 commensalism

C. Parasitism:- the relations in which one organism is benefited (the parasite) and the other is harmed (host). E.g. relation between human and tape worms.

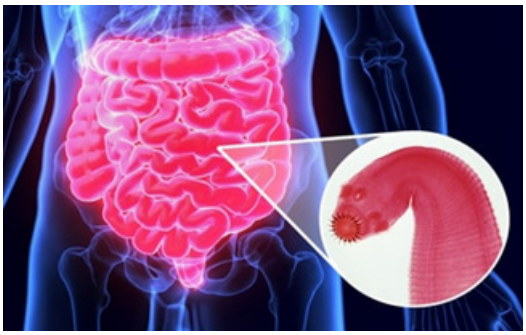


Figure 5.5 parasitism

D. Protocooperations:-the relation in which both organisms are benefitted but it is not obligatory relationships. E.g. between teeth cleaning birds and crocodile.



Figure 5.6 Protocooperations

E. Competition:-two populations compete for resources indirectly by efficient exploitation or directly by physical forces. In this both populations are harmed. E.g sport man



Figure 5.7 Competition

Activity 5.1

- Discuss on ecosystems and biological interaction.
- Categories the components of ecosystems.

In groups discuss on the following points

- How do you understand ecosystem
- Explain your summary about biological interactions.
- Then present outcome of your discussion in the class

2. Abiotic components

What is abiotic?

They are the physical or nonliving things that can affect the living condition of a given ecosystems. Some of these components are water, sunlight, air, soil, temperature, land topography and others.

A. Water:- is most important components of an ecosystems. It serves as a habitat, sources of drinking water and for irrigation in farming activities.

B. Sunlight:- is primary source of energy for all life on earth during the process of photosynthesis by green plants.

C. Air:- is the combination of different components of gases like oxygen, nitrogen, carbon dioxide and water vapor.

D. Soil:- which mainly control the growth of vegetation by its fertility, pH level and other. It determines the distribution of life in the ecosystems.

E. Temperatures:- it may be higher for some organisms and lower for other organism so greatly affect organisms' distributions.

F. Land topography:-which may be the arrangements of land.

Exercise 5.1

Part I: choose the correct answer from the given alternatives

1. _____ is used to sources of food for plant
   A. soil B. temperature C. topography D. all
2. Which is not abiotic?
   A. temperature B. water C. plant D. all
3. The students compare with other students in question and answers in order to get awards. Then this is what types of interactions?
   A. mutualism B. competition C. parasitism D. all
4. All types of animal can grouped in to _____
   A. heterotrophs B. autotrophs C. decomposers D. none
5. The interaction between cat and rat is called _____
   A. parasitism B. mutualism C. commensalism D. predators

Part II: explain briefly the following questions.

1. Briefly explain the importance of biotic and abiotic factor for ecosystems.
2. Discus how ecosystems are affected by nonliving things.
3. Compare the advantage and disadvantage of biological interaction
4. Going to the school compounds and observe types of components.

5.1.2Trophic (Feeding) Relationships

Based on the mode of nutrition living organisms can be grouped in to two major groups namely autotrophs and heterotrophs organisms.

1. Autotrophs: are organisms which can synthesize their own energy from the raw materials in their surrounding environments. They also classified as

A /photo autotrophs:- use sunlight for primary sources of energy to synthesize organic food materials. Also called producers because they are source of food for other. E.g green plants, algae and photosynthetic bacteria.

B /chemoautotrophs:-these type of organisms release energy from simple chemical reactions. E.g nitrifying bacteria.

2. Heterotrophs: cannot make foods & feed on other organisms so called consumers. They are herbivores, carnivores, decomposer or omnivores.

Key term:
Consumer:-organism which does not make their own food.

5.1.3. Food Chain and Food Web

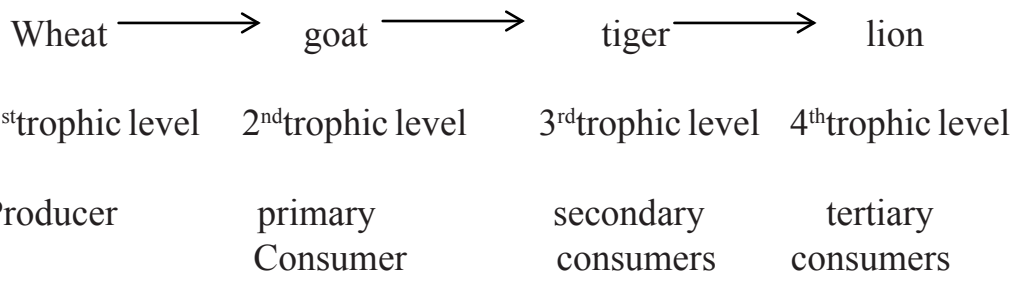
Food chains

What is food chain?

A food chain is the direct and simple feeding systems that involve the transfer of nutrient and energy. In food chain the energy flows from one organism to the other organisms in one direction autotrophs (producer) to heterotrophs (consumers). In the food chain each organisms occupies specific trophic level.

1. **Producer (first trophic level):-** all organisms directly or indirectly depend on first trophic level. Sun is the main source of energy for all food chain.
2. **Primary consumers (second trophic level):** it contains herbivores and omnivores. They feed on producers.
3. **Secondary consumers (third trophic level):** they are carnivores that mainly eat herbivores and omnivores.
4. **Tertiary consumers (fourth trophic level):-** they are carnivores and mostly feed on other carnivores.

Examples;- The wheat(producer) produce food by photosynthesis is eaten by goat. Then the goat eaten by tigers. The tiger also eaten by lion.



Food web

What is food web?

It is too complex feeding interrelation among the organisms which consists of many food chains. It is differ from food chains because in food chain the energy flows in only one direction. But in food webs there are more than one food chains. E.g:-

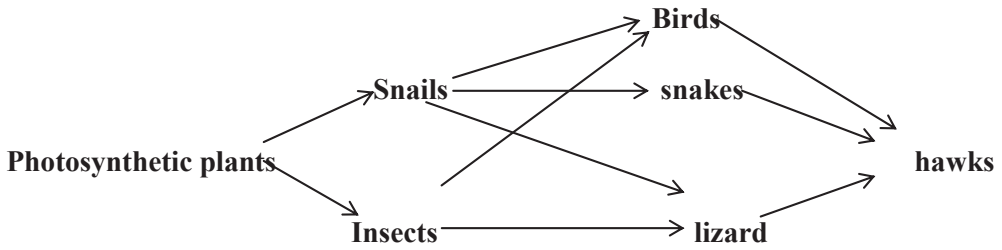


Figure 5.9 food web

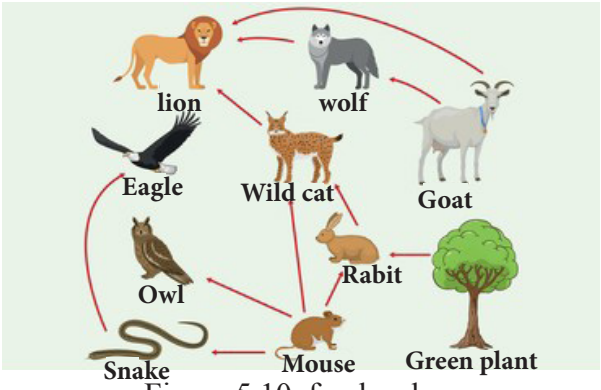


Figure 5.10 food web

Exercise 5.2

Part I: choose the correct answer from the given alternatives

1. Which of the following are consumers?
   A. flower B. grass C. sheep D. plants
2. Autotrophs can be _____
   A. primary consumer B. secondary consume
   C. producers D. all
3. The organisms that feed on dead body parts are _____
   A. producer B. consumer C. decomposer D. B &C

4. The following one is found at the end of food chain, which one?
   A. flower B. fungus C. grass D. all

Part II: explain the following questions

1. Compare and contrast food web and food chain.
2. Define the function of decomposers in the environment.

5.1.4. Trophic Pyramids

Pyramid is the diagram that used to express the amounts of organisms presents in each trophic level. It can be used to express the number of biomass, amount of energy and number of organisms in the trophic level.

A/ pyramid of numbers:-The pyramid made based on the number of organisms at each trophic level. A pyramid of numbers shows the total number of individual organisms at each level in the food chain of an ecosystem.

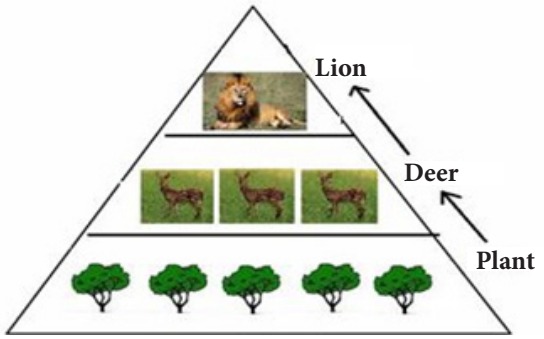


Figure 5.11 pyramid of number

B/ pyramid of biomass:- It provides more accurate representation of the energy contents at each trophic level.It shows the mass of producers that are needed to support primary consumers, the mass of primary consumers required to support secondary consumers, and so on.

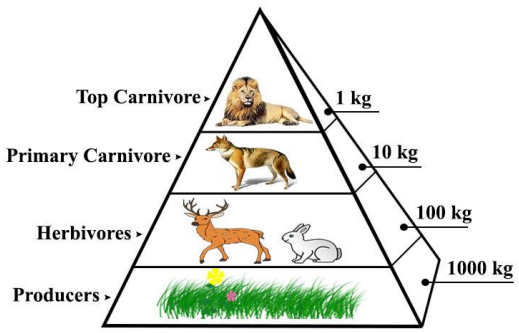


Figure 5.12 pyramid of biomass

C. pyramid of energy:- An energy pyramid, also known as a trophic or ecological pyramid, is a graphical representation of the energy found within the trophic levels of an ecosystem. The energy can be flow not recycled because its main sources are the sun and then energy cannot be returned to the sun.



Figure 5.13 pyramid of energy

Activity 5.2

1. Identify and explain the components of food chain and food web with their roles.
2. Brain storming on function of plant during photosynthesis.
3. Discuss and reason out why the number of organisms in each group (level) decreases from bottom to top.

5.1.5. Nutrient Cycles and Energy Flow

Living organisms require different kinds of chemical elements like nitrogen, oxygen, carbon, hydrogen etc for their metabolic and biological processes. The cyclic of elements from environment to organism and back to environment are called nutrient cycle.

Nitrogen cycle

The nitrogen cycle is a repeating cycle of processes during which nitrogen moves through both living and non-living things: the atmosphere, soil, water, plants, animals and bacteria. This atmospheric nitrogen must convert to ammonia and nitrates by chemical synthesis especially by decomposers. Producers use soil nitrates to synthesis protein for the consumers.

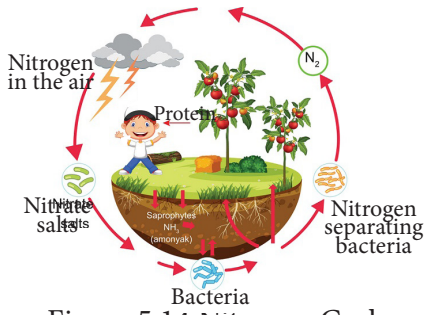


Figure 5.14 Nitrogen Cycle

The process of nitrogen cycle

Many of the process are carried out by microbes either to produce energy or to accumulate nitrogen in the form needed for growth. ***Nitrogen fixation:-***Decomposers can break down prote in which is found in wastes and in dead body of plant and animals in to ammonium compounds. Then it oxidized in to nitrates which return in to soil by nitrifying bacteria.

Ammonification:- when plant and animal die or from their waste, the organic nitrogen is convert to ammonium by decomposers. The processes are called ammonification or mineralization.

Nitrification:- conversion of ammonia to nitrates by soil living bacteria. These are the oxidation of ammonia by nitrosomonas bacteria in to nitrites (NO2). Then also there is oxidation of nitrite in to nitrates (NO3) by nitrobacter bacteria. The nitrate is usable forms of nitrogen by plants.

Denitrification:-is reduction of nitrate back to inert nitrogen gas (N2) completing the nitrogen cycle. This process is performed by pseudomonas and clostridium bacterial species in anaerobic conditions.

Oxygen cycle

Oxygen cycle refers to the movement of oxygen through the atmosphere (air), biosphere (plants and animals) and the lithosphere (the earth's crust). The oxygen cycle demonstrates how free oxygen is made available in each of these regions, as well as how it is used. The main driving factors of the oxygen cycle are the process of photosynthesis which has responsible for life.

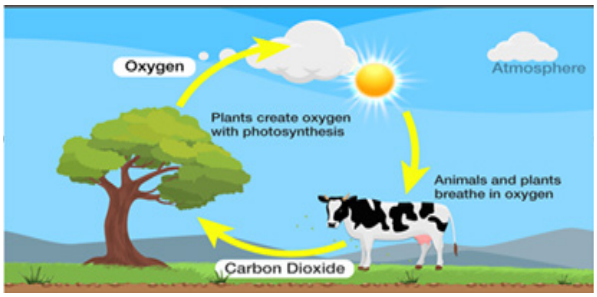


Figure 5.15 oxygen cycles

Carbon cycle

Carbon is released back into the atmosphere when organisms die, volcanoes erupt, fires blaze, fossil fuels are burned, and through a variety of other mechanisms. It is one of the most important cycles of the earth and allow for the most abundant elements to be recycled and reused throughout the biosphere and all of its organisms. In carbon cycles, carbon move from atmosphere to plants, from plant to animal, from plant and animal to soil, from living thing to atmosphere and from atmosphere to ocean.

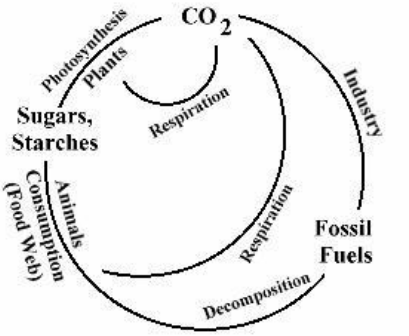


Figure 5.16 carbon cycles

Hydrogen cycle

The hydrogen cycle begins with the evaporation of water from the surface of the ocean. The hydrogen cycle consists of hydrogen exchanges between biotic (living) and abiotic (non-living) sources and sinks of hydrogen-containing compounds.

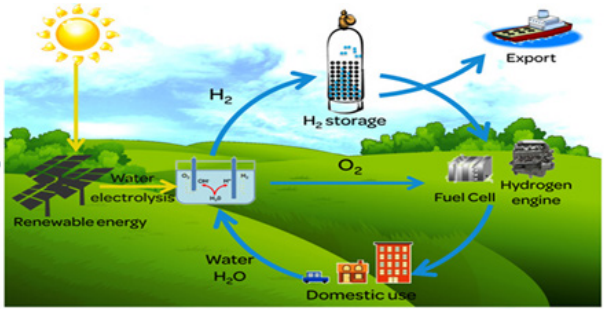


Figure 5.18 water cycle

Water cycle

Water cycle is the continuous movements of water on above and below the surface of the earth. Water can change its states among liquid(water), vapor (gas), and solid (ice) at various places in the water cycle. The water evaporates and turns to clouds. It falls down in the form of rain, snow or ice. The water that flow into river and streams eventually flows back in to the oceans. From the ocean it evaporates back in to clouds and starts the whole cycle over again and becomes rain.

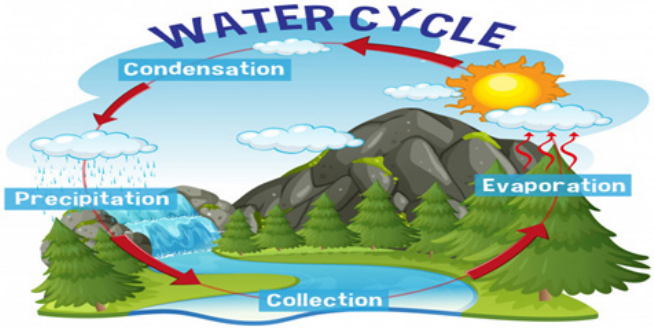


Figure 5.19 water cycle

Exercise 5.3

Part I:- choose the best answer from the given alternatives

1. The following one is not cyclic in nature
   A. oxygen B. nitrogen C. carbon D. none
2. The organisms that play great role in all nutrient cycle is called
   A. producer B. plant C. decomposer D. herbivores
3. The main driving factor in oxygen cycle is _____
   A. photosynthesis B. chemosynthesis C. heterotrophs D. all

4. The convert of carbon from air to earth and back to air is called__
   A. element cycle B. nitrogen cycle
   C. oxygen cycle D. carbon cycle
5. Which types of element are more needed by plants
   A. phosphorous B. sulfur C. oxygen D. nitrogen

Part II:- discuss and explain briefly

1. Briefly discuss on the role of decomposers in nutrient cycle.
2. Explain how energy flows in trophic relationship in ecosystems.
3. Explain and discuss why energy said to flow but not cycle?

5.2. Conservation of Natural Resources

At the end of this section, you will be able to:

- summarize the characteristics of soil
- describe the various types of soils
- explain the various uses of soil in nature and to human being
- list down and describe the various soil conservation strategies
- engage in the Environment Club of School and participate in awareness creation campaigns.
- explain the various uses of soil in nature and to human being
- list down and describe the various water conservation strategies
- describe the various components of atmospheric air
- identify and discuss the various human activities that cause air pollution
- discuss the impacts of air pollution with examples
- explain the various uses of air in nature and to human being
- explain the cause and impacts of global warming
- list down and describe the various actions that can be taken to reduce the emission of carbon dioxide to atmosphere
- define forest and give examples of natural forests in Ethiopia
- explain the various uses of forest in nature and to human being
- identify and discuss the various human activities that cause deforestation
- discuss the impacts of air pollution with examples

- list down and describe the various actions that can be taken to conserve forests
- list and describe the values of biodiversity
- list down and describe the various in-situ and ex situ conservation strategies in biodiversity conservation
- give examples of the various indigenous knowledge and practices that are used in the conservation of various natural resources such as soil, forest, etc.

What is natural resource?

Any natural substance that humans use can be considered a natural resource e.g oil, coal, natural gas, metals, stone and sand. It grouped in to two namely renewable and non-renewable. Renewable natural resources are capable of being produced, reused and replaced e.g. vegetation, animal. Nonrenewable resources are cannot be easily made or produced if they are used once. e.g. petroleum, coal.

What is conservation of natural resources?

Conservation is the care and protection of natural resources so that they can persist for future generations. If the natural resources is not conserved and not managed their number reduces and finally become extinct.

Key term:
Humus:-is dark, soft, and rich in nutrients decaying organic matters of plant and animals.

5.2.1. Soil

Soil is the loose surface material that covers most land. It consists of inorganic particles and organic matter. Soil is a mixture of broken rocks and minerals, living organisms, air, water and decaying organic matters which called humus. Soils are home to myriad micro-organisms that fix nitrogen and decompose organic matter, and armies of microscopic animals as well as earthworms and termites.

Types of soil

Soil is used in agriculture activities where it serves as the primary sources of nutrients for plants. The different types of soil that used in agriculture are varying with respect to the species of plants which are cultivated. It provides minerals and water to plants. There are three common types of soil namely: loam, sandy and clay soil.



Figure 5.19 types of soil

Physical and chemical property of soil

Soil horizon

A soil horizon is a layer parallel to the soil surface whose physical, chemical and biological characteristics differ from the layers above and beneath. Horizons are defined in many cases by obvious physical features, mainly color, root quantity, pH, structure, size and texture. Humus is the biochemical substance that makes the upper layer of the soil become dark.

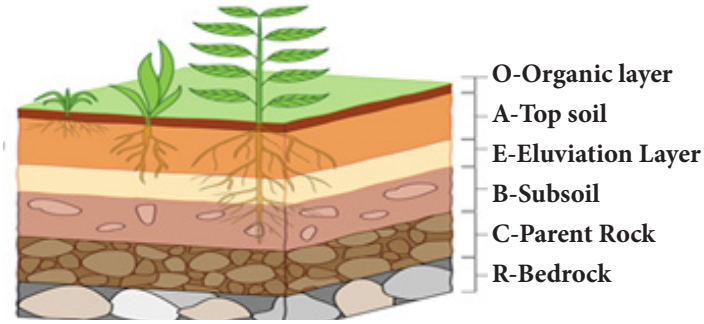


Figure 5.20soil horizons

Soil texture

It refers to the size distribution of the mineral particles found in a representative sample of soil. Particles are normally grouped into three main classes namely: sand, silt and clay. These all mineral particles have different size. Soil texture (such as loam, sandy loam or clay) refers to the proportion of sand, silt and clay sized particles that make up the mineral fraction of the soil

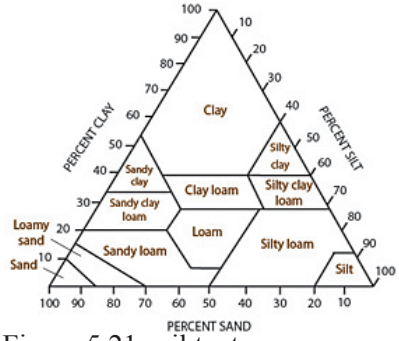


Figure 5.21 soil texture

The soil's ability to retain water is strongly related to particle size. So, sandy soils have relatively poor ability to hold water. Soils that are high in clay content can hold relatively large amounts of water for extended periods of time. Because clay-rich soils have the largest pore space, hence the greatest total water holding capacity.Silt is intermediate in its water holding properties.

Soil fertility

A loam soil contains more nutrients, moisture, humus and has better drainage of water air, and is easier to till. It is suitable for growing plants. So it is the most fertile soil. The major causes to soil fertility decline are a land degradation which is caused through the different agents such as soil erosion, deforestation, overgrazing, sedimentation, continuous farming and pollution.

Soil conservations

Is a set of management strategy for prevention of soil being eroded from the earth's surface or becoming chemically altered. It can do through the use of various methods. Some are:-

1.Afforestation:- it also called reforestationas tree grow tall, it also keep rooting deeper in to the soil. When the root spread deep in to soil layer, they contribute to the prevention of soil erosion.




Figure 5.22 afforestation

2.Terracing:- it is very good methods of soil conservations and leveling section of a hilly cultivated area. It gives the landmass a stepped appearance thus slowing washing down of the soil.





Figure 5.23 terracing

3. Contour ploughing:- it is a method of ploughing across the contour line of a slop. This method helps in slowing the water runoff, prevents the soil from being washed away along the slop and in percolation of water in to the soil.





Figure 5.24 contour plouphing

4. Crop rotation:- continuous cultivation of the same crop leads imbalance fertility demand of soil. Crop rotation is growing of dissimilar crops. This method used to help for improvements of soil structure and fertility

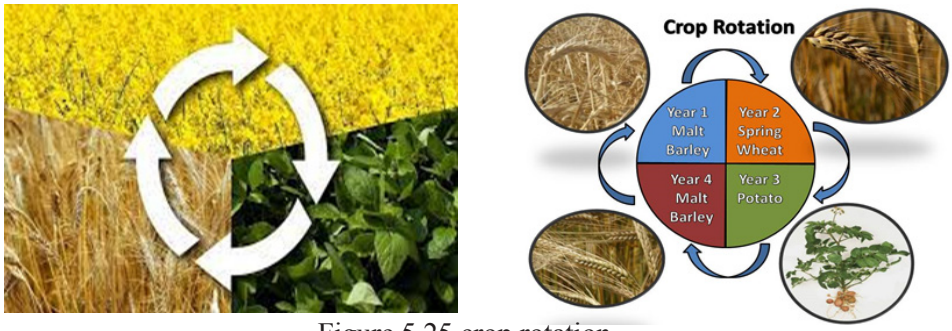


Figure 5.25 crop rotation

Activity 5.3:-demonstration

1. The students bring some types of soil from their surrounding and observe the color, size, texture etc. Then discuss in groups about their observation.
2. Ordered students to take part in soil conservations programs around their home and schools.
3. Student demonstrates on which types of soil pass water, which is intermediate and which is hold more water and then discuss on the results.

Procedure:-make a group and bring soil sample, water from surrounding

- Observe and clearly understand on characteristics of soil and present the result
- Present the result in class
- Demonstrate carefully and record the results.

5.2.2. Water

It is the main constituent of living cell and also used as a habitat for most organisms. Water used as universal solvents so it used for metabolic reactions. It has cooling effect, temperature regulation, lubricating body, transport food, hormone, waste product etc. It helps for hydrolysis reaction, osmoregulation and removal of wastes. Animals need water for drinking, washing and living and as sources of oxygen. Water also used for plants to manufacturing of food and rigidity.

Key term:

Pesticides:-chemicals that is used to kill insects that damage plant.
Herbicides:-chemicals used to destroy plants or stop plant growth.

Water pollution

Increased human activity, agricultural and industrial wastes pollute water, when they drain in to lakes, rivers, streams and seas. These wastes contain toxic compounds, salts, solvents are industrial wastes. Sewage, garbage and pathogens are domestic wastes. Agricultural wastes also contain pesticides, herbicides, fungicides and fertilizers.

Key term:
Fungicides:-substance that kill fungi.



Figure 5.26 water pollutants

Impact of water pollution

Toxic chemicals like mercury and lead, salts like phosphorous compounds etc are not broken down inside living things. They build up in tissues of aquatic organisms. When human eat this organisms lead is stored in liver, kidney and damage nervous systems. Finally they cause severe birth abnormality. If agricultural wastes enter into water body, they are dangerous for living things. Because these accumulate in the fats and body tissue. Domestic wastes may contain urine, faces, viruses and bacteria. It transmitted the disease of cholera, typhoid, and others for living organisms.

Activity 5.4:

1. Students discuss briefly on the purposes of water for living things and present for the class.
2. List and discuss on human activity which cause water pollutions and their conservation methods.
3. How you celebrate water conservation day on 22nd March?

- Present for the other groups and receive the comments.

Water Conservation

Water must be conserved by the use of various methods for the continuity of life on earth. Some of these methods are:-

1. ***Cover vegetation:-*** vegetation used to absorb and hold water. It reduce the rune off and decrease force of rain drops allowing the rain fall to reach the ground gently.
2. ***Contour ploughing:-*** is ploughing the hill across the slope but not up and down. It prevents waters from running off.
3. ***Terracing:-*** collect water in the channel and prevent erosion and increase the crop yield.
4. Building artificial mechanical barriers, check dams prevent running off.
5. Preventing water pollution by educating people and formulating water policy.

Ground water is water that found under the ground. This water must be conserved by different methods. Some are by

- Use native plants in your landscape. They look great, and don't need much water or fertilizer
- Use fewer chemicals around your home and make sure to dispose of them properly - don't dump them on the ground.
- Properly dispose of potentially toxic substances like unused chemicals, pharmaceuticals, paint, motor oil, and other substances.
- Get involved in water education! Learn more about groundwater and share your knowledge with others.
- Keeping it safe from contamination
- Using it wisely by not wasting it.

These and others method of ground water conservation are make the water sustainably used for long period of time.

Exercise 5.4:

1. Student guess which type of soil is more fertile reason out.
2. Briefly explain on the functions of the three types of soil.
3. Brainstorming on loss of soil fertility and their conservations.
4. Engage and participate in environmental protection club.

5.2.3 Air

Air is made up of 78.09% nitrogen, 0.93% argon, 0.04% carbon dioxide, and other gases in very small amounts. Air comprises almost 21% oxygen. Water vapor is also a constituent of air in varying amounts along with dust particles. The required gas for breathing and respiration are also found in the air.

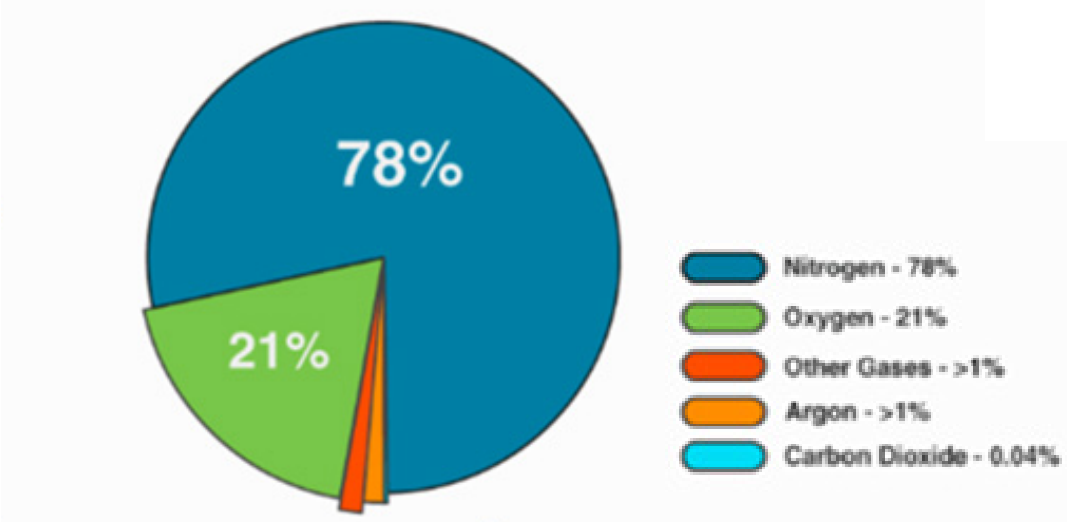


Figure 5.27 air compositions

Activity 5.5:-

1. List the importance of air for living things.
2. Discus in groups on impact of human to air pollution and way of preventions.
3. Discuss on impacts of air pollutions.

Carbon Dioxide

Carbon dioxide is a trace gas with a concentration of just about 0.04%. Carbon dioxide is produced through respiration and also through the decomposition of organic materials. It is also produced through some natural sources like geysers, volcanoes, burning of fossil fuel, deforestation, and hot springs. During the combustion of petroleum and natural gases, carbon dioxide is evolved. CO_2 is used in food industry as an additive in order to regulate acidity. Carbon dioxide is a great choice for use in soda products as it easily absorbs into a liquid including soft drinks to forms tiny bubbles. The CO_2 also serves as a protective measure that keeps the soft drink fresh and prevents the growth of bacteria in the liquid while stored.

Oxygen

Oxygen is the most important chemical element of air. Oxygen is a highly reactive gas which readily forms bonds known as oxides with other elements. It is also highly combustible (quick to catch fire). Oxygen plays a critical role in respiration, the energy-producing chemistry that drives the metabolisms of most living things. We humans, along with many other creatures, need oxygen in the air we breathe to stay alive. Oxygen is generated during photosynthesis by plants and many types of microbes.

Nitrogen

The most abundant, pure component of air is nitrogen with a concentration of around 78%. Nitrogen is produced through a process called nitrogen fixation which is a continuous cycle between the living organisms and the atmosphere. It is also produced in industries by fractional distillation of air in its liquid form.

Water Vapor

The water vapor concentration in the atmosphere varies from about 0.01% to 3% depending upon the temperature. When we respire we also release some amount of water vapor. In many chemical reactions, water vapor is evolved as a by-product. Apart from carbon dioxide and methane, water vapor also contributes to the greenhouse effect as it absorbs and emits radiations.

Water vapor is used as steam which helps in cooking and also in producing energy.

Key term:-
Greenhouse effect:-a natural process that warms the Earth's surface

Effects of Air Pollution

The effects of air pollution on the human body vary depending on the type of pollutant and the length and level of exposure as well as other factors, including a person's individual health risks and the cumulative impacts of multiple pollutants or stressors. Air pollution can cause different forms of effects on living and non-living things. Some are:-

1. ***Global warming:-***it is the rising of temperatures on the surface of earth as a result of accumulation of greenhouse gas like carbon dioxide.These greenhouse gases can trap heat from sun and make earth's temperature high.
2. ***Global dimming:-*** is worldwide blockage or reduction of sunlight from reaching the earth's surface as a result of unborn hydrocarbon released in to the air.
3. ***Acid rain:-***it caused by release of toxic substance in to the air like sulphuric and nitrogen oxide from factories and vehicles. During rain, the falling water combines with the oxides of sulphur and nitrogen. The acid rain causes killing leaves, soil depletion, polluted the water body and damage on building materials. The acid rain also can be the cause of volcanic eruption and lightening. It is oxidized in the atmosphere to SO_2, which can then be converted to sulfate. H_2S is some what soluble in water, resulting in formation of sulfhydric acid, which is corrosive to metals, and contributes to acidic deposition to soil and water.

Air pollution greatly affect our health by causing of lung cancer, heart disease, respiratory inflammations, brain damage, skin cancer etc.

How prevent air pollutions?

Any persons have responsible for the reduction of air pollution because it is worldwide problems. By using different methods like: Avoid use of traditional fuels, using solar wind and hydroelectric powers, reforestation or planting trees, take care for water pollutions, educating society and establish law of pollution control etc must prevent pollutions.

Activity 5.6;-

1. Plantation used to reduce carbon dioxide and global warming from the atmospheres. Briefly discuss how it reduces?
2. Brainstorming and discuss how photosynthesis is important for air pollutions?

Procedures: list way of reduction by plants

- Explain in their groups about the role of photosynthesis on air pollution

5.2.4. Forests

What is forest?

The forest is a complex ecosystem consisting mainly of trees that buffer the earth and support a variety of life forms. Harenna forest is one example of natural forests in south eastern Ethiopia. The trees help create a special environment which, in turn, affects the kinds of animals and plants that can exist in the forest. They clean the air, cool it on hot days, conserve heat at night, and act as excellent beauty of the earth.






Figure 5.29 forests

Plants provide a protective canopy that lessens the impact of raindrops on the soil, thereby reducing soil erosion. The layer of leaves that fall around the tree prevents runoff and allows the water to percolate into the soil. Roots help to hold the soil in place. Dead plants decompose to form humus, organic matter that holds the water and provides nutrients to the soil. Birds build their nests on the branches of trees, animals and birds live in the hollows, insects and other organisms live in various parts of the plant. They produce large quantities of oxygen and take in carbon dioxide.Transpiration from the forests affects the relative humidity and precipitation in a place.

Key term:
Transpiration:- Process of water movements through plants parts to environments during evaporations.

Activity 5.7:
1. Discuss on the role of forests in nature and present in the class.
2. Brainstorming on way of deforestations and discuss conservation methods.

Effects of human on forests

Human can affects the forests at different types of ways for various reasons. They cut down the trees for different purpose like for farming activities, furniture, wood, selling, building of home, and for others. These cut down of plant is called deforestation.



Figure 5.30 deforestation of forests

Reforestation is the process of planting trees in a forest where the number of trees has been decreasing. It's helping to bring forest back to an area where it was destroyed. Because forests are the best and most cost-efficient method for removing and storing consequential amounts of climate-warming carbon dioxide (CO_2).

5.2.5. Biodiversity

What is biodiversity?

The term bio diversity or biological diversity refers to the collection of life and habitat in ecosystems. They interact together between different species from ecosystem and ecological process. Biodiversity represents the most fundamental library in support of the life science. They are used as a bank of gene and species. Biodiversity is also the measure of the wealth of species in a given place or habitats. Biodiversity includes all types of living organisms ranging from smaller microorganism to largest organisms.

Importance of biodiversity

Ecological life support biodiversity provides functioning ecosystems that supply oxygen, clean air and water, pollination of plants, pest control, wastewater treatment and many ecosystem services.

Biodiversity is important to humans for many reasons.

• **Economic—**biodiversity provides humans with raw materials for consumption and production. Provisioning services—the production of food, fiber and water. Many livelihoods, such as those of farmers, fishers and timber workers, are dependent on biodiversity.

• **Ecological life support—**biodiversity provides functioning ecosystems that supply oxygen, clean air and water, pollination of plants, pest control, regulating services—the control of climate and diseases wastewater treatment and many ecosystem services.

• **Recreation—**many recreational pursuits rely on our unique biodiversity, such as bird watching, hiking, camping and fishing. Our tourism industry also depends on biodiversity.

• **Cultural—**cultural services—such as spiritual and recreational benefits.

• **Scientific—**biodiversity represents a wealth of systematic ecological data that help us to understand the natural world and its origin

Key terms:

Botanical garden: - institutions holding documented collections of living plants.

Seed banks:- the principle of conserving local varieties on farm.



Figure 5.31 biodiversity

Exercise 5.5

Explain and discuss briefly

1. List some example of organisms for each of the five kingdoms.
2. Discuss and explain types of national park and zoos and present in the class.
3. Ask and collect any indigenous practice from other persons that used to conserve natural resources.

Biodiversity conservation

The protection and efficient management of wild species and their environment is the prime objective of conservation. This conservation is usually carried out in two ways namely in-situ and ex-situ.

What is In situ Conservation?

It means the conservation of biodiversity in their natural habitats itself. It aims to enable biodiversity to maintain itself within the context of the ecosystem. Establish a protected area network, with appropriate management practices, corridors to link fragments restore degraded habitats within and outside. It helps in the multiplication of the species through the process of evolution and adaptation. It provides greater mobility to the animal species because of the large habitat area. Example- national parks, biosphere reserves, parks, sanctuaries.

What is Ex-situ conservation?

It means the conservation of biological diversity outside their natural areas. Artificial conditions are created to make their habitat almost like a natural habitat. It involves the maintenance of genetic variation (Genetic Conservation) away from its original location. Established botanical and zoological gardens, conservation stands; banks of germplasm, pollen, seed, seedling, tissue culture, gene, and DNA, etc. It identifies and rehabilitates threatened species; launched augmentation, reintroduction, or introduction programs. This method will enhance the probability of reproductive success for endangered species. It provides less mobility to the organism because of the small habitat area. Example- Zoo, aquarium, seed banks, botanical gardens, etc.

Hence, we can say that both In situ and Ex-situ are the method of conservation. The basic difference between in situ and ex-situ lies in the habitat place where the process is carried out.

Key terms:
Sanctuaries:-an area where animal habitats and their surroundings are protected from any sort of disturbance.
Germ plasm:-living tissue from which new plants can be grown.

5.2.6. Indigenous knowledge and Conservation of Natural Resources

Local and indigenous knowledge refers to the understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For rural and indigenous peoples, local knowledge informs decision-making about fundamental aspects of day-to-day life. This knowledge is integral to a cultural complex that also encompasses language, systems of classification, resource use practices, social interactions, ritual and spirituality. These unique ways of knowing are important facets of the world's cultural diversity, and provide a foundation for locally-appropriate sustainable development.

Key term:
National park:- an area set aside by a national government for the preservation of the natural environment.

Indigenous Conservation and Management

The recognition that local and indigenous people have their own ecological understandings, conservation practices and resource management goals has important implications. It transforms the relationship between biodiversity managers and local communities. While previously they were perceived simply as resource users, indigenous people are now recognized as essential partners in environmental management.

For example, indigenous knowledge conservation of soil are terracing, contour ploughing, crop rotation, mixed cropping and fertilization some methods. The lands on which they live and the natural resources on which they depend are inseparably linked to their identities, cultures and livelihoods. Therefore, even small changes in their environment can have dramatic impacts on their lives. With the increasing pressure of global development, many countries are conserving these rich forest areas to protect their nature and biodiversity. These areas are called protected areas. Creating protected areas can increase biodiversity and benefit the ecosystem at the national or global level. However, at the local level, conservation can come at a cost to indigenous peoples' physical and spiritual well-being. This is the root cause of many conflicts over conservation objectives. Several examples across the globe show that conflicts with indigenous groups challenge the sustainability of conservation programs. Most recently, tension between large international conservation groups and local communities has been growing.

How does indigenous knowledge help in environmental conservation?

Indigenous knowledge is one of the greatest assets of a community. In a time when the climate is changing this knowledge can help them to adapt to these changes and control the environment around them. Indigenous knowledge means local knowledge that is unique to a given society and is embedded in their cultural traditions.

Key terms:

Aquarium:- a transparent tank of water in which live fish and other water creatures and plants are kept.

Exercise 5.6:

Part I: choose the correct answer from the given alternatives.

1. The interaction between similar species is called _____
   A. inter B. intra C. predator D. prey
2. Which of the following is more important in nature cycle
   A. algae B. fungus C. cyanobacteria D. all
3. One of the following is not components of food chain
   A. producer B. primary consumer
   C. secondary consumer D.none
4. Which of the following is renewable resources
   A. fossil B. petroleum C. charcoal D. food

Part II: Match descriptions in column B with the items in column A

A	B
1. Renewable resources	A/ sandy soil
2. Poor ability to hold water	B/ clay soil
3. Hold large water	C/ solar energy
4. Nitrogen	D/ 21 %
5. Oxygen	E/ 78%

Parts III: fill blank space

1. _____ is complex ecosystems containing many trees.
2. Conservation of organism in their habitat is called _____
3. _____ is a knowledge that local person used to perform different tasks.

SUMMERY

- Any living organisms cannot be survive or live without the interaction each other and with their environments.
- Ecosystems can be affected by living (biotic) components and nonliving things or physical components (abiotic) of an environment.
- Biological interaction of organism can be intra specific between the same species or inter specific between members of different species.
- Decomposers are organisms that can breakdown dead body part of other organisms to get their nutrients. Because of these they found at the end of each food chain.
- Food chain is the direct and simple feeding systems that involve the transfer of nutrient and energy while food web is too complex feeding interrelation among the organisms which consists of many food chains.
- Pyramid is the diagram that used to express the amounts of organisms presents in each trophic level.
- The cyclic of elements such as nitrogen, oxygen, hydrogen, carbon from environment to organism and back to environment are called nutrient cycle.
- Any naturally occurring substance on the earth that humans use can be considered a natural resource.
- It grouped in to two major groups namely renewable and non-renewable.
- Conservation is the care and protection of these resources so that they can persist for future generations.
- Soil consists of inorganic particles and organic matter which provides the structural support to plants and source of water and nutrients.
- Water is the main constituent of living cell and also used as a habitat for most organisms.
- Increased human activity, agricultural and industrial wastes pollute water, when they drain in to lakes, rivers, streams and seas.
- Carbon dioxide is produced through respiration and also through the decomposition of organic material.
- The most abundant, pure component of air is nitrogen with a concentration of around 78%.

- Air pollution is caused by solid and liquid particles and certain gases that are suspended in the air.
- Acid rain, global warming, and global dimming are the results of air pollutions.
- Forests clean the air, cool it on hot days, conserve heat at night, and act as excellent sound absorbers.
- Human can cut down the trees for different purpose like for farming activities, for furniture, wood, selling, building of home, and for others and it is called deforestation.
- The term bio diversity or biological diversity refers to the collection of life and habitat in ecosystems and it is also the measure of the wealth of species in a given place or habitats.
- The maintenance of species and ecosystems is a keystone to sustainable development. This conservation is usually carried out in two ways namely in-situ(in their natural habitats) and ex-situ (outside their natural habitats).
- Local and indigenous people have their own ecological understandings, conservation practices and resource management goals have important implications.

Review exercise

Part 1: For the following questions choose the best answer among the choices given.

1. The collection of living and nonliving things are called _____
   A. plant B. animal C. ecology D. ecosystems
2. All living things also called _____
   A. physical component B. biotic
   C. abiotic D. microorganism
3. The relation between two different species in which one or both are benefited is called _____
   A. competition B. decomposers C. symbiosis D. all
5. One of the following is not biotic component
   A. disease B. plant C. food D. water
6. ___is used to mainly control the growth of vegetation by its fertility.
   A. soil B. water C. air D. all

7._____ is an organism that release energy from simple chemical reactions.
A. decomposers B. heterotrophs
C. photoautotrophs D. chemoautotrophs
8. All organisms can directly or indirectly depend on first trophic level.
A. producer B. primary consumer C.decomposer D.carnivours
9._____ is the main sources of energy for all food chain.
A. plant B. animal C. temperature D. sun
10. The food chain that contain more than one food chain is called_____
A. interaction B. relation C. food web D. food chain
11._____ is reduction of nitrate back to inert nitrogen gas
A. ammonification B. nitrification
C. denitrification D. nitrogen fixation
12. The movement of elements in the atmosphere is called _____
A. carbon cycle B. nature cycle
C. nitrogen cycle D. water cycle
13. The wise use of natural resource is called _____
A. conservation B. management C. protection
D. preservation E. all
14. Conservation is only protection of nonrenewable resources
A. non renewable B. renewable C.water D.all

Part II:- fill in the blank space

1._____ refers to the size distribution of the mineral particles found in a representative sample of soil.
2._____ is the process of growing trees to prevent soil erosion.
3.The contaminated of water with toxic substances are called_____
4. The major components of gas in the atmosphere is called_____
5._____ is a chemical that is toxic for other natural resources.
6.The collection of shrubs and large trees are called _____

Part III:- write short answers

1. List and discus briefly about the prevention of water and air pollution.
2. How can be human activity cause pollution of air?
3. List advantages of biodiversity throughout the world.