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መ/ር፡ደሳለው ዓለመ(BSc)

የካቲት 2015 ዓ.ም

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UNIT FOUR

HUMAN BODY SYSTEMS AND HEALTH

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

MAIN CONTENTS

4.1 Integumentary System

4.2 Muscular System

4.3 Skeletal System

4.4 Digestive System

4.5 Respiratory System

4.6 Circulatory System

4.7 Reproductive System

4.1 Integumentary Systems

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

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.

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.

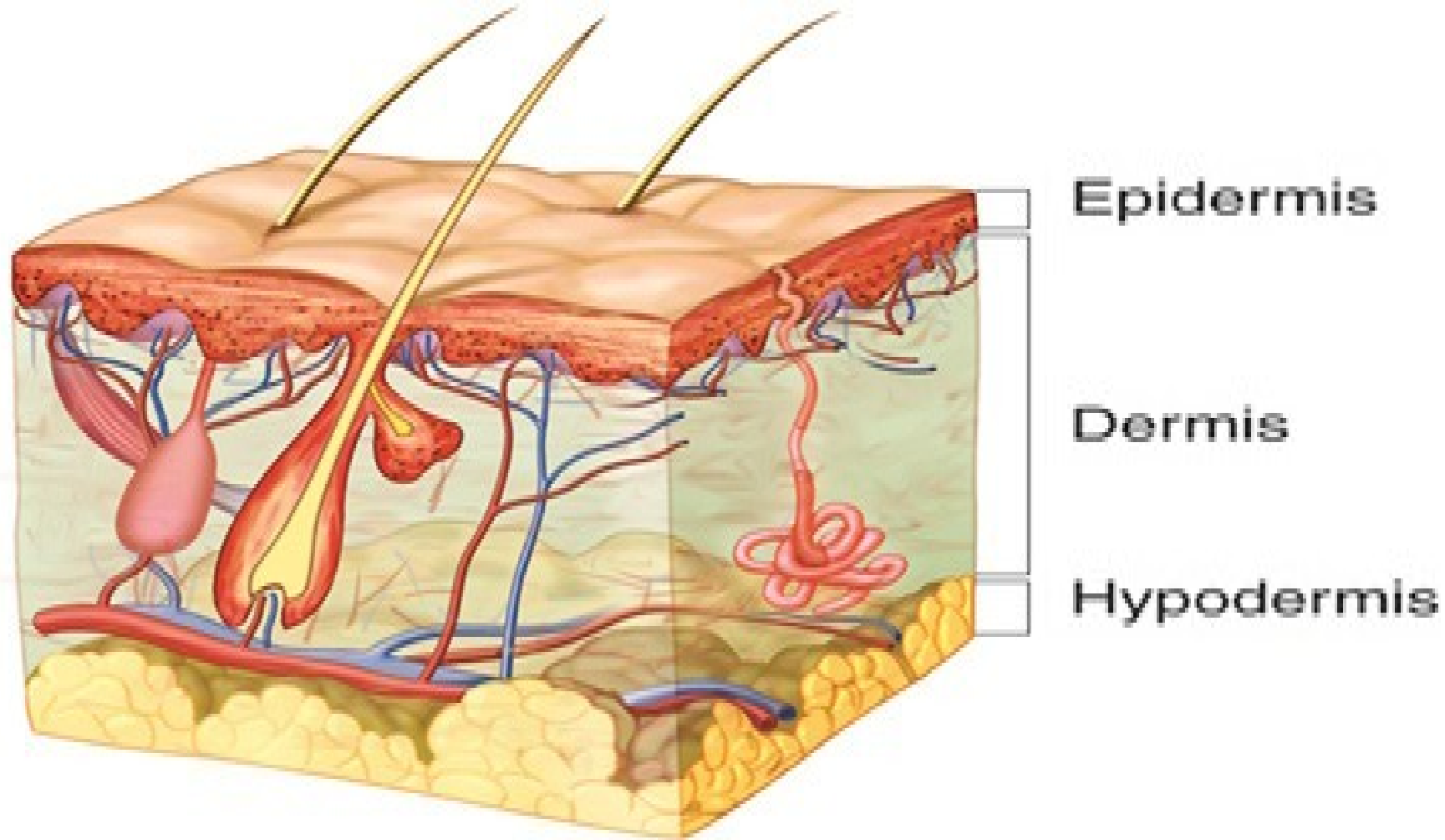
B. Middle layer

- 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

Figure 4.1 Layers of human skin



2. Hair:

- Hair come 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.

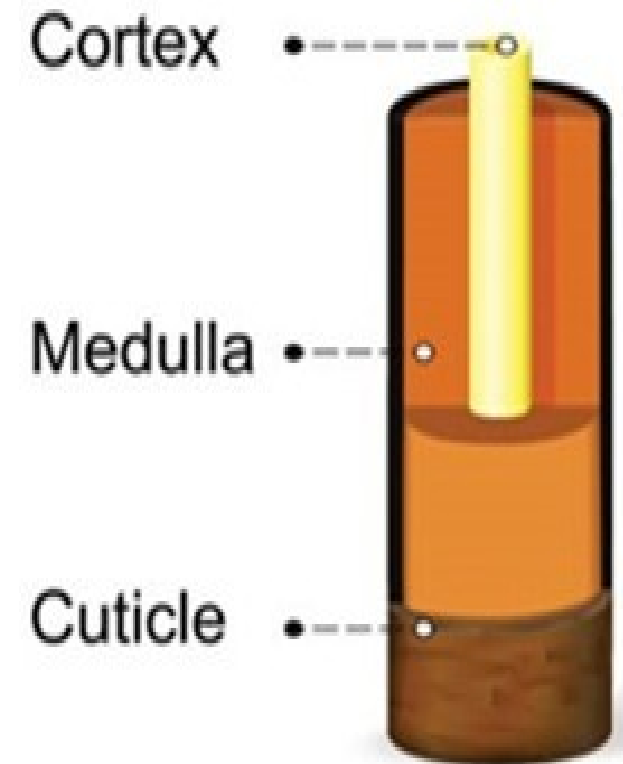
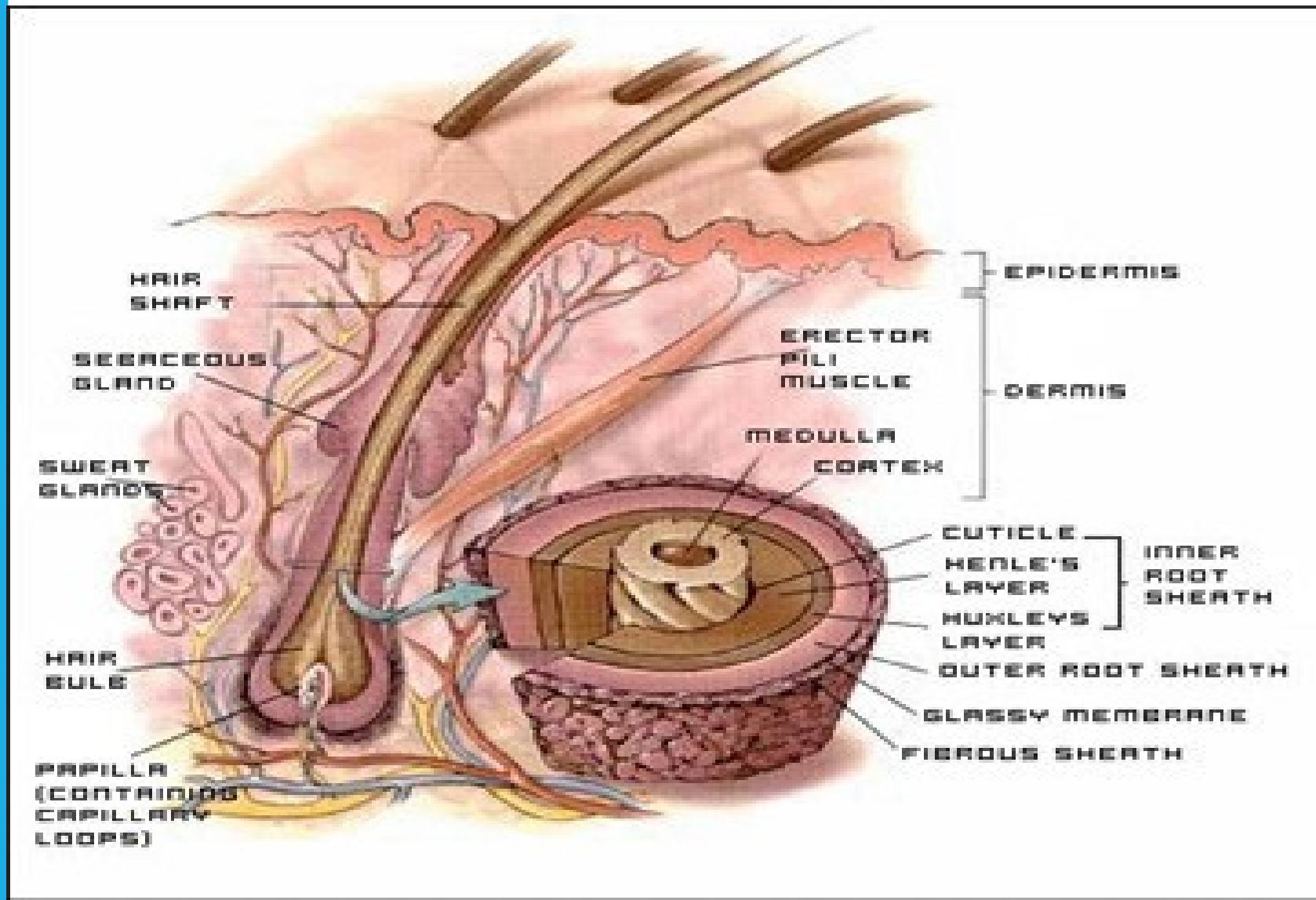
A. Medulla: deepest layer of hair shaft, only seen in large and thick hairs.

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

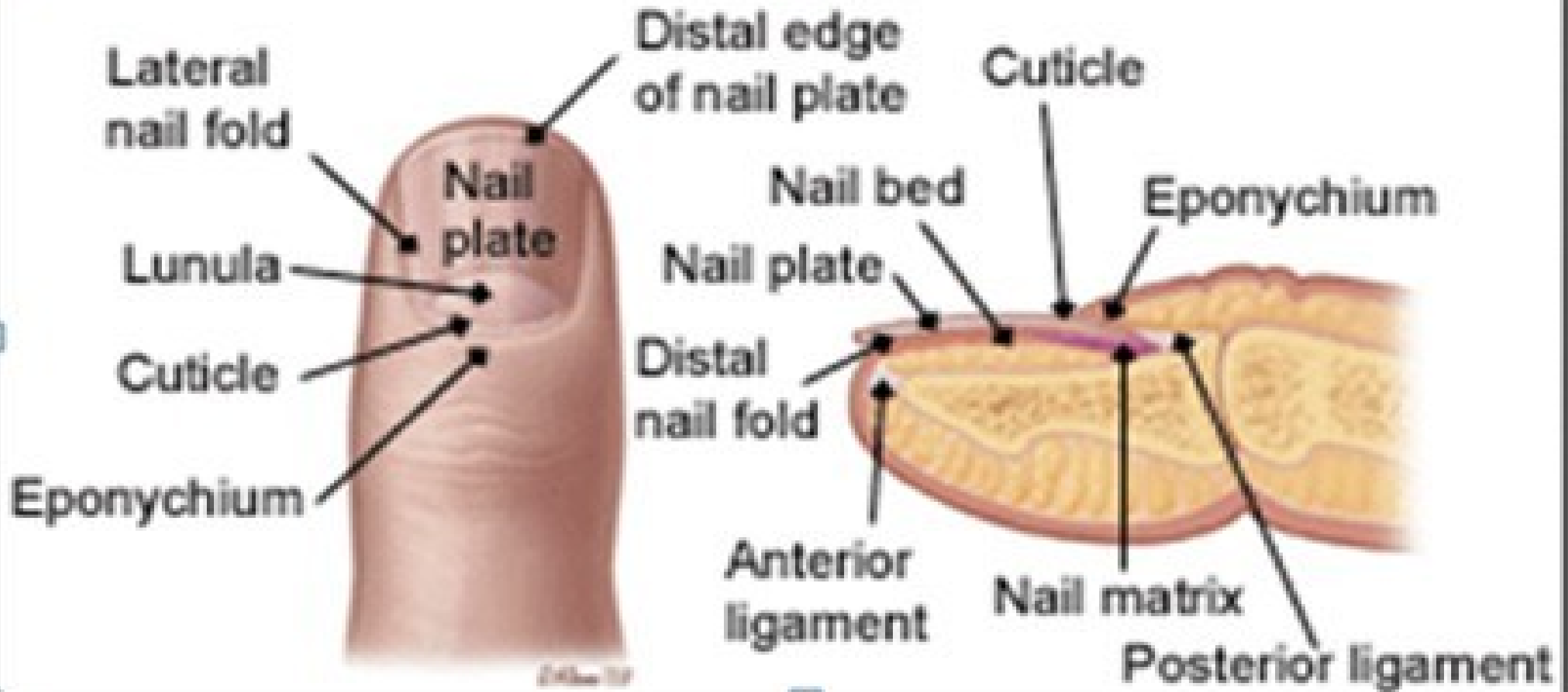
Figure 4.2 layers of hair shaft



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 substances such as hormone digestive juice, sweat, tear, saliva or milk.

- Integumentary systems have four types of exocrine glands, that secrete some type of substances out- side 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

➤The best answer is E

2. The outer layer of the human body is

A/ gland B/ skin C/ nail D/ all

➤The best answer is B

3. The middle layer of the skin is

A/ dermis B/ hypodermis C/ epidermis D/ endodermis

➤The best answer is A

4. Layers of skin that made from dead cell are called

A/ upper layer B/ lower layer C/ meddle layer D/ all

➤ The best answer is A

5. The outer layers of the hair is

A/ medulla B/ cuticle C/ cortex D/ none

➤ The best answer is B

Part II: describe briefly

1. Briefly describe the structural components of the integumentary systems with their functions.

➤ Stated in slide 5

2. List the functions of the sweat glands.

➤ Sweat glands occur all over the body, but most numerous on the forehead, the armpits

➤ Sweat is mainly water , it also contains some salts.

➤ Control body temperature by excretion sweat.

4.1.2. Functions of Integumentary Systems

- The skin is remarkably complex organ which carries out a number of important functions in our 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 secrete 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.

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:

a.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 our skin become blocked with **oil**, dead skin or bacteria.



Figure 4.4 Acne

b. Rosacea:

- The skin condition rosacea is most commonly associated with redness.
- There are four sub types that cause other symptoms as well.
- **Visible blood vessels, eye irritation, dry appearance,**



Figure 4.5 rosacea

c.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**

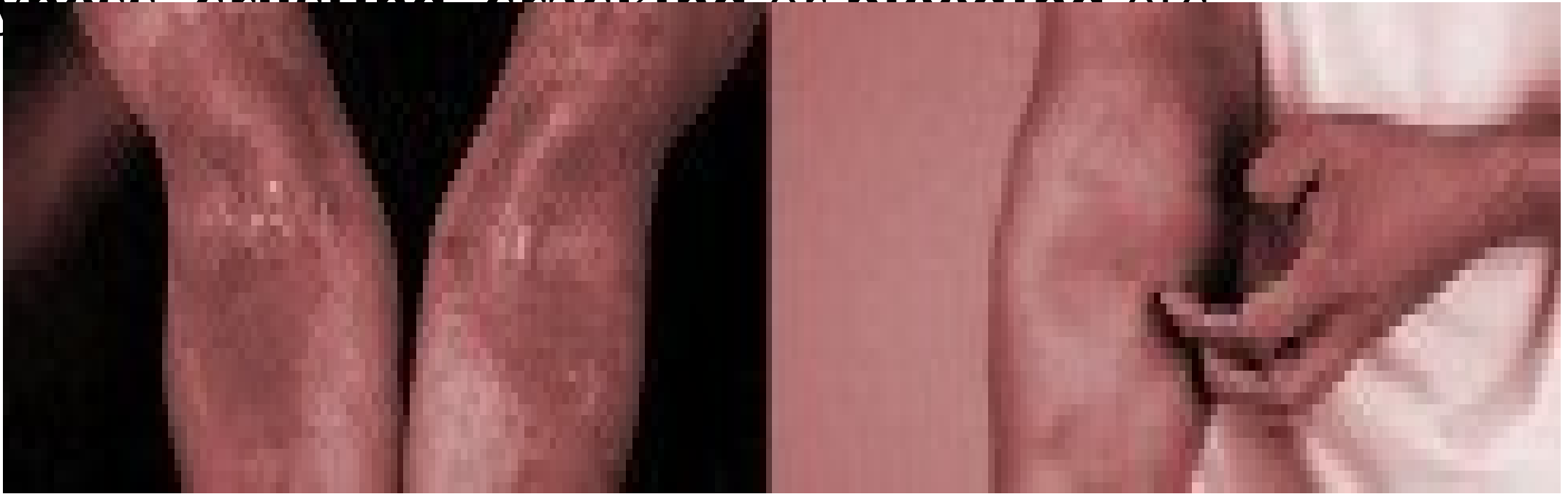


Figure 4.6 Eczema

d.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

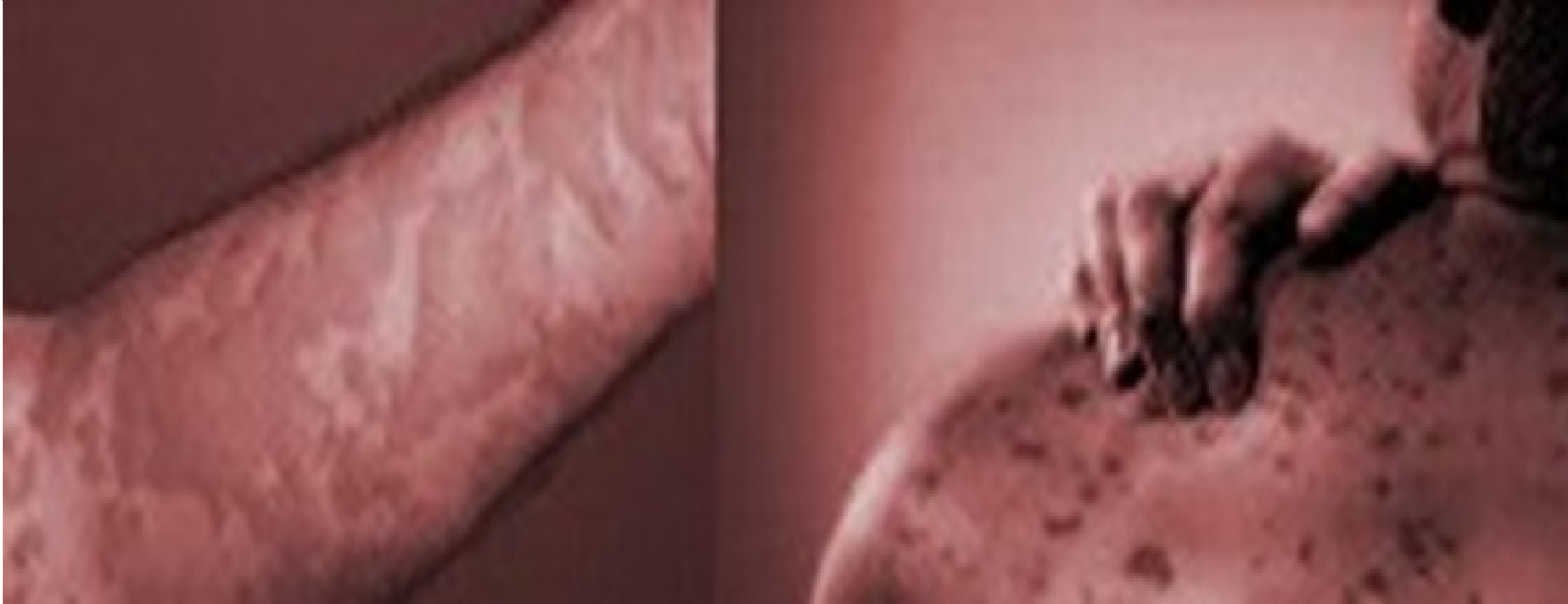


Figure 4.7 Hives

e.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 are caused on their own, though unsightly warts can be treated.



Figure 4.8 Warts

f. 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 l

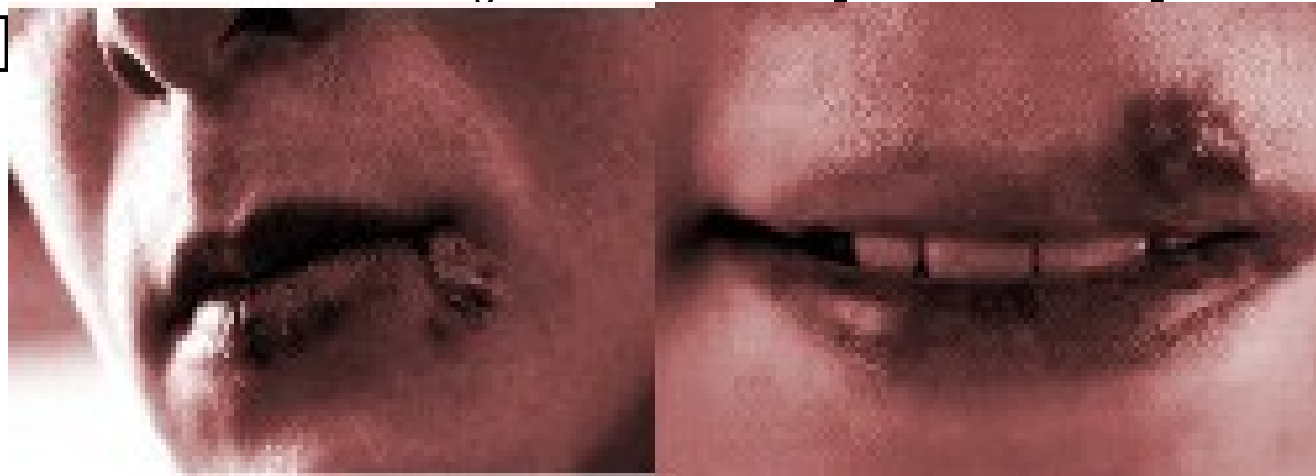


Figure 4.9 Cold sore

g. 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 a fever.
- Carbuncles are treated with antibiotics and antiseptic washes.

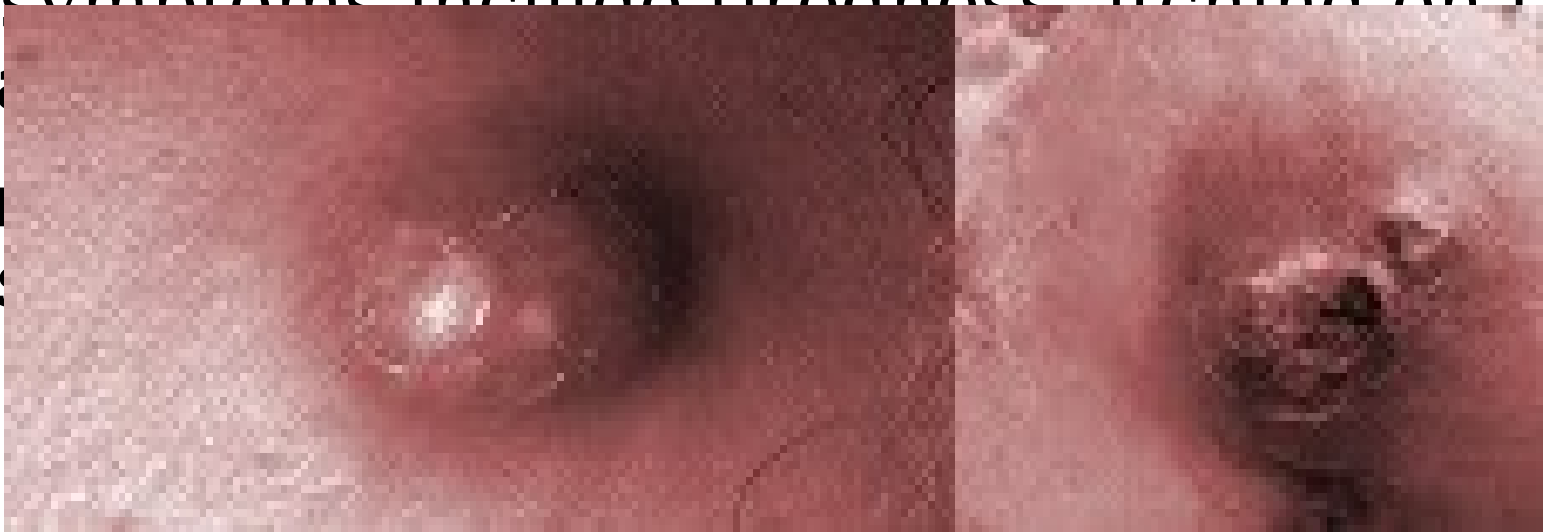


Figure 4.10 Carbuncle

h. Blister:

- A blister is a bubble of fluid under the skin, caused by **injury** , **allergic reactions** or **infections**.
- 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

i, 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

j. 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

k. 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**



Figure 4.14:- Chickenpox

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

1. Which of the following is outer layer of skin?

- A. lower B. hypodermis C. epidermis D. dermis

➤ **The best answer is C**

2. The outer layer of the body is called

- A. lung B. hair C. skin D. gland

➤ **The best answer is C**

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

➤ **The best answer is E**

4. _ is a skin disease and characterized by bubble of fluid under the skin

- A. hives B. rosacea C. cold sore D. blister

➤ **The best answer is D**

Activity 4.4:

2. What do you do, if your skin color is changed to redness?

➤ When the skin color is become redness it may be the symptoms of the skin diseases like eczema and rosacea then take treatment like **washing with cold water daily and you must be going to the nearest clinic.**

3. How you take care about your skin?

➤ Everybody must take care about their skin by the following methods:-

1. Washing with cool water daily.

2. Applying cool compresses

3. Limiting contact with common allergens

4. Using wet wipes.

5. Avoiding poor personal habits like smoking, drinking alcohol etc.

6. Keeping the affected area covered.

7. Keeping the skin moist.

8. Avoiding long time sunlight exposure.

4.2 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.
- Muscles



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.
- Ca

ontractions that form our heartbeat.

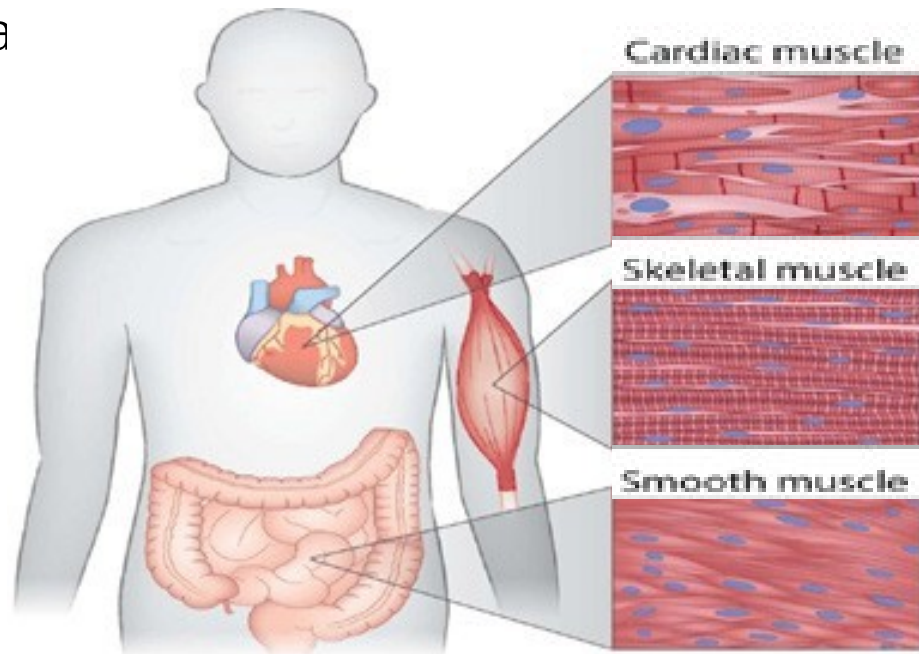


Figure 4.16 human muscle

Identify which muscle types are involved in each activity and determine whether it is voluntary or involuntary.

Activities	Types of muscles involved	Voluntary or Involuntary
Pointing fingers	Skeletal muscles	Voluntary muscle
Holding a pen	Skeletal muscles	Voluntary muscle
Pumping blood	Cardiac muscles	Involuntary muscle
Swimming in a river	Skeletal muscles	Voluntary muscle
pushing food through the digestive tract	Smooth muscles	Involuntary muscle
Blinking eyes	Skeletal	Voluntary

Exercise 4.3

Part I: describe briefly the following questions

3. Identify special properties of muscle cell that allow movements.

- The special properties of muscle that permit movements are **contractibility**.

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**.
- Muscles control **heartbeat, breathing, and digestion**.
- All muscle cells can share the different types of properties for functions and used commonly by each muscles.
- Some of these properties are:-

I. **Contractibility:**

- 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.

II. **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**.

III. **Excitability:** is ability of muscle to give response to stimuli which come from motor neuron and hormone.

IV. **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

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

- When the age is increased the relaxation and contraction of muscle is decreased.

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. Muscles are tissue that composed of cells are called_

A. long B. muscle fibers C. muscle fatigue D. all

➤ **The best answer is B**

2. One of the following is not common for all muscles.

A. contractility B. excitability C. extensibility D. none

➤ **The best answer is D**

Part II: fill in the blank space

1. The quality of muscle being elastic is called_

▪ **Elasticity**

2._ _is a type of muscle located on the hearts

▪ **Cardiac muscle**

3. The disease that infected muscle systems is called_

▪ **Muscle disorders**

4.3. Skeletal System

- **The skeletal system is an organ system that includes the bones and the connective tissues that hold the bones together.**
- The skeletal system interacts with other systems by **holding up our body** and giving it **support**.
- The muscular system 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 into four major groups:-

1. Long bones: it is hard and compact, tubular filled with yellow bone marrow.

- E.g. Upper and lower limb bones, finger and thigh bones.

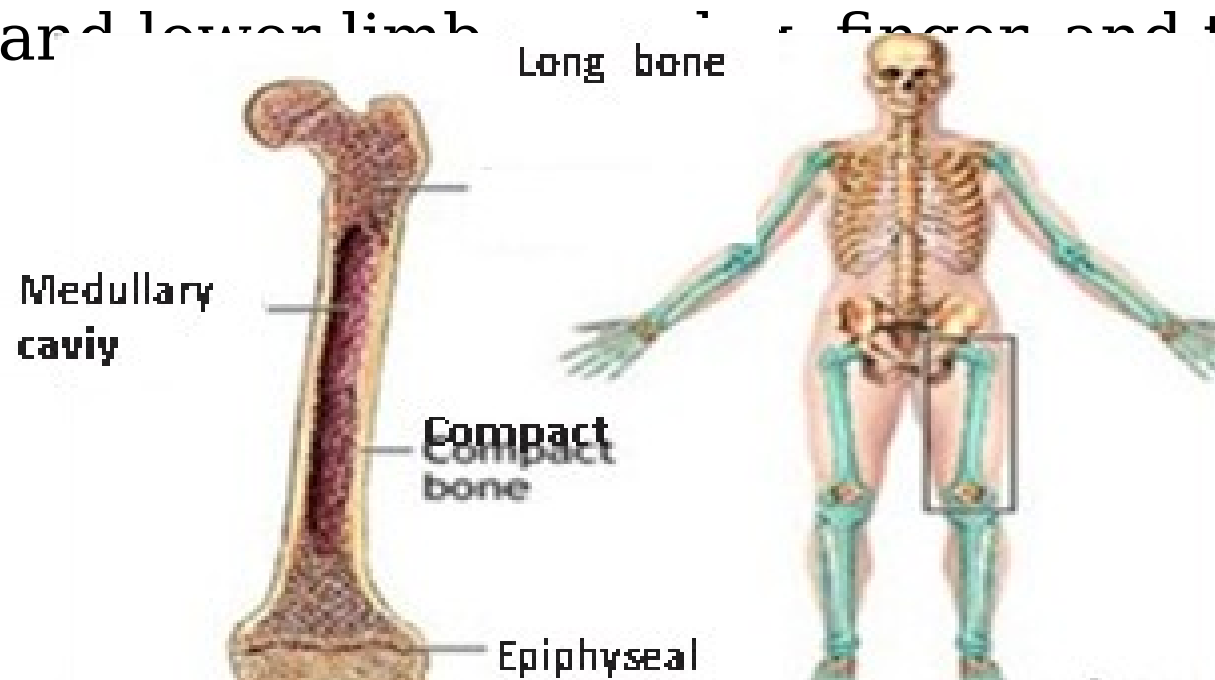


Figure 4.18 long bone

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

(c) Short Bones

Short bones are boxlike in appearance. Examples of short bones include the carpal bones (wrists) and tarsal bones (ankles).

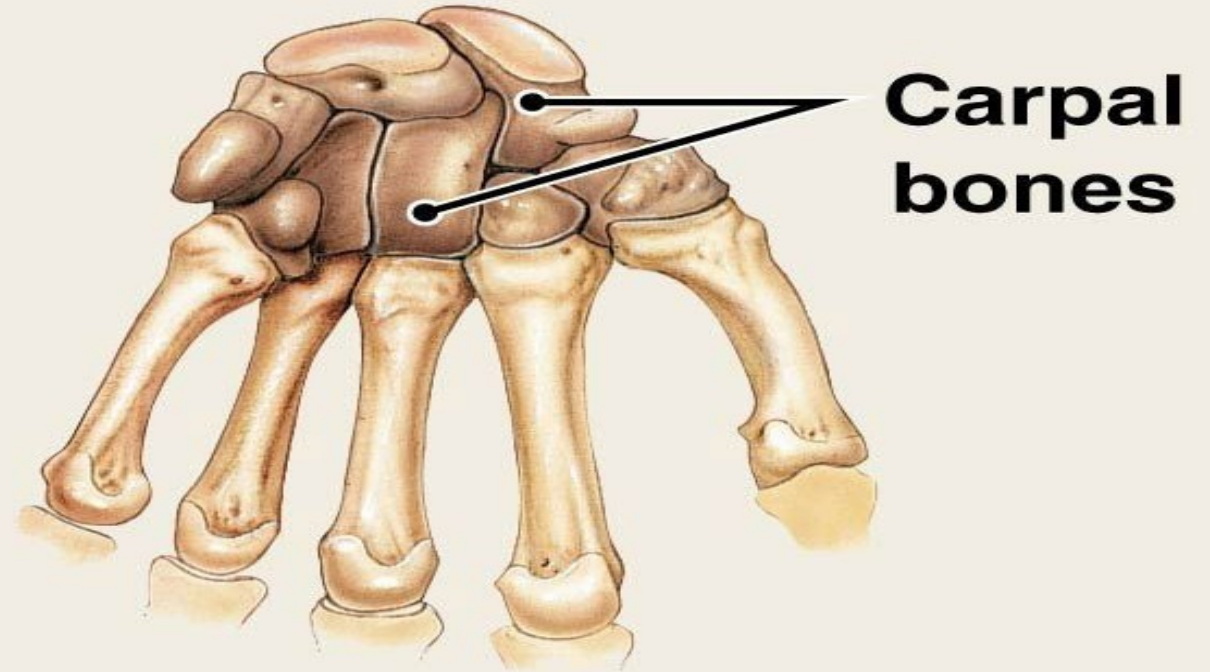


Figure 4.19 short bone

3. **Flat bones:** are thin, flat, compact and typically curved..

- They have no cavity or hollow. E.g. ribs, sternum, cranial bone and scapula

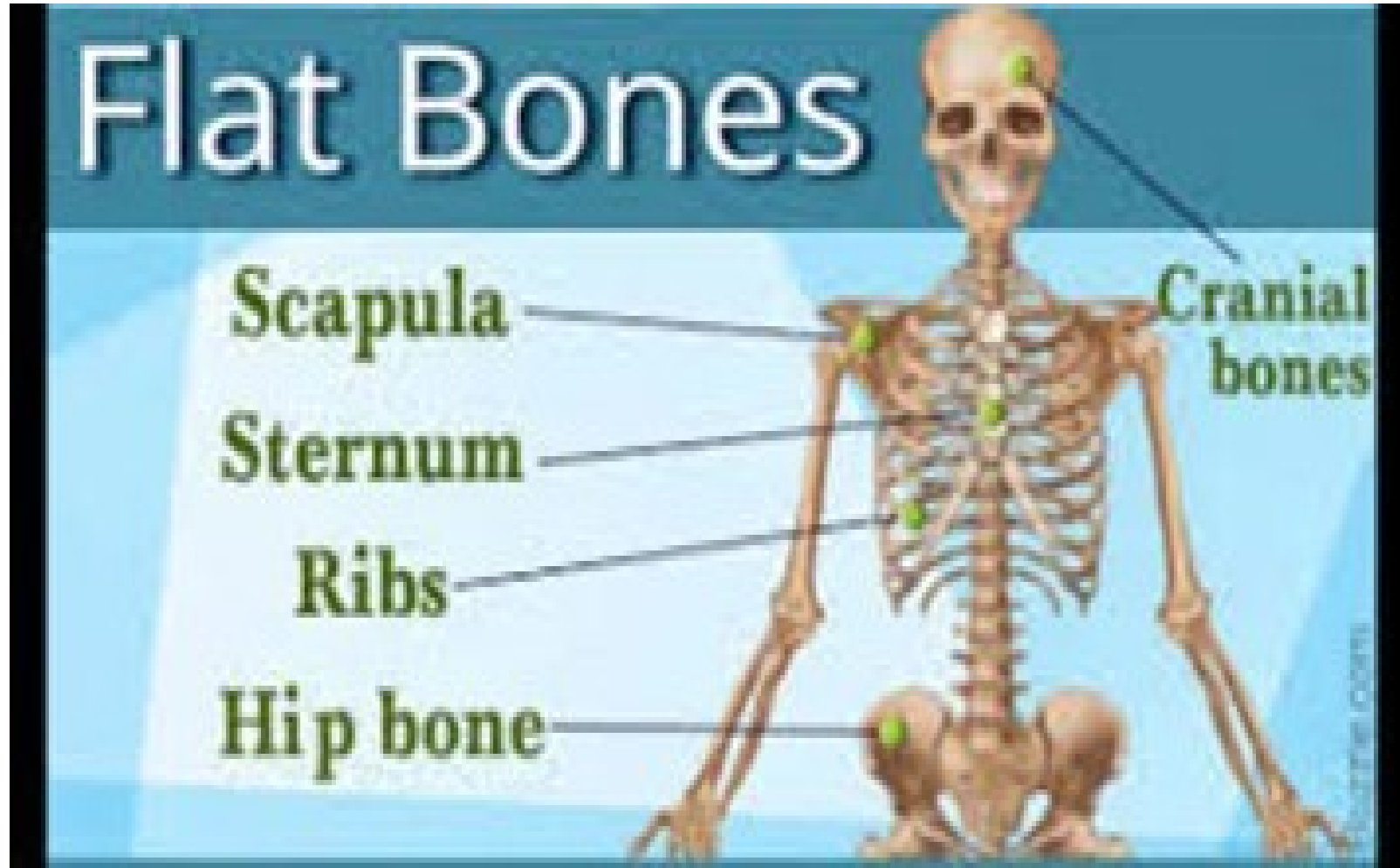


Figure 4.20 flat bone

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 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).

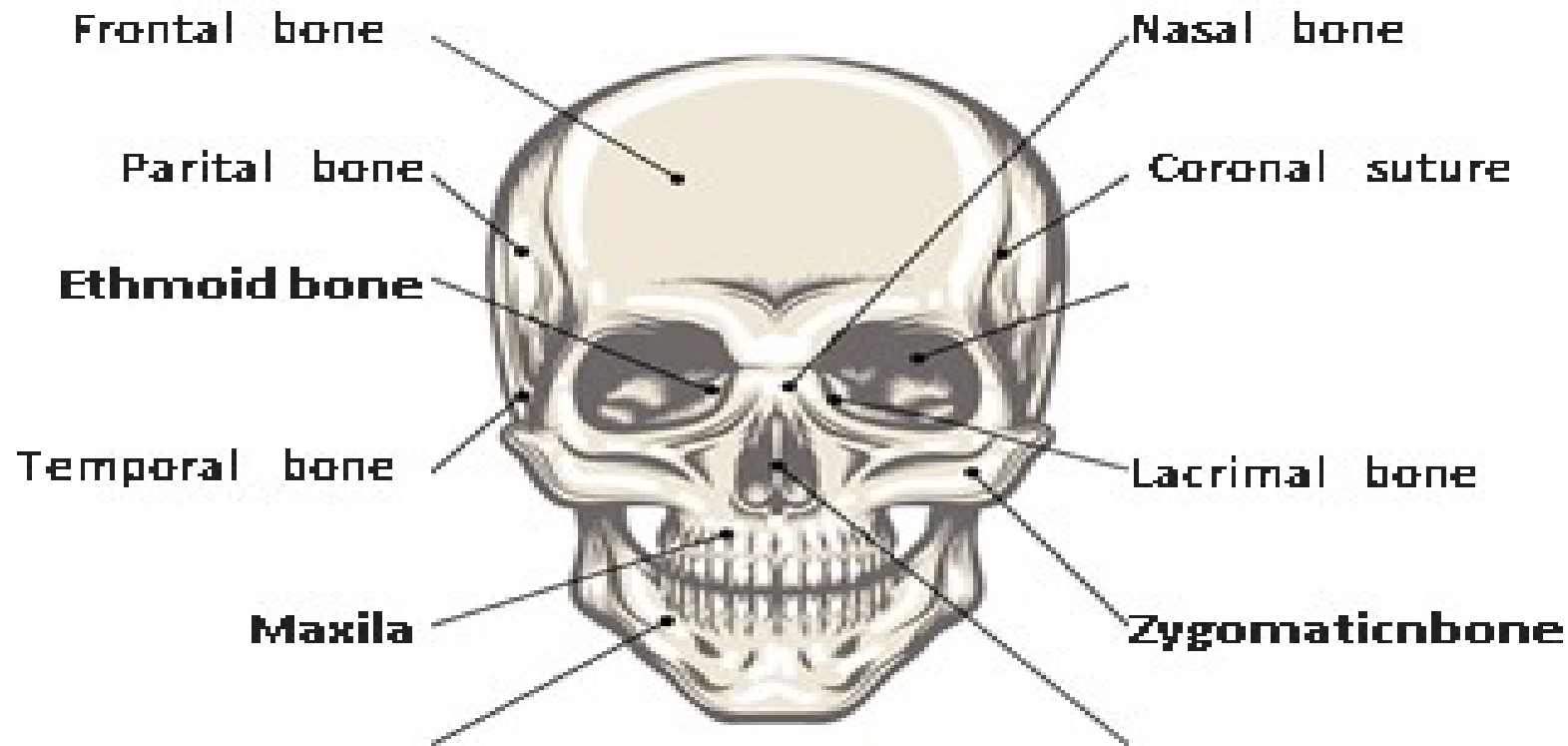


Figure 4.22 human skull

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

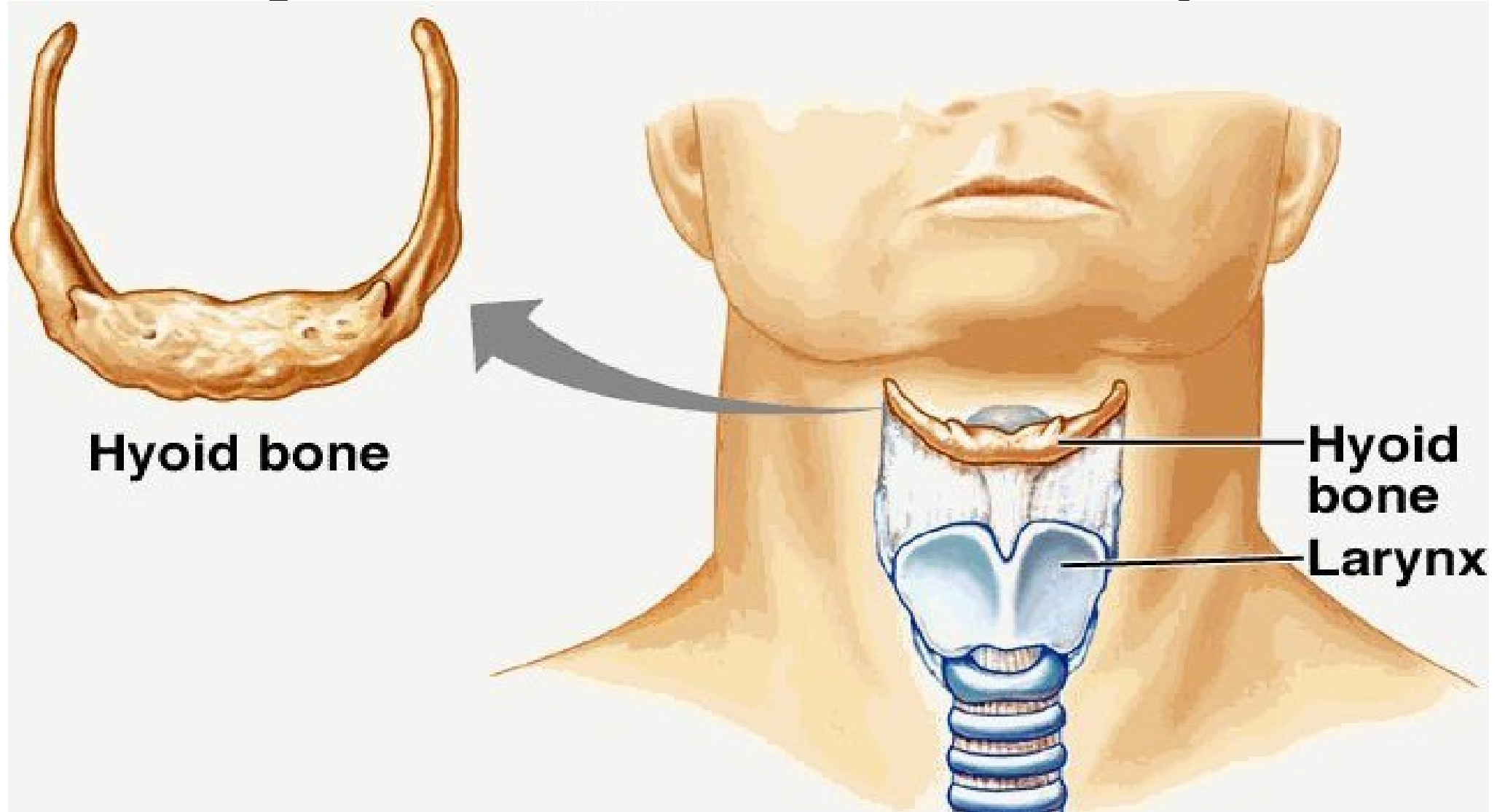


Figure 4.23 hyoid bone

Vertebral column: Include spinal vertebrae

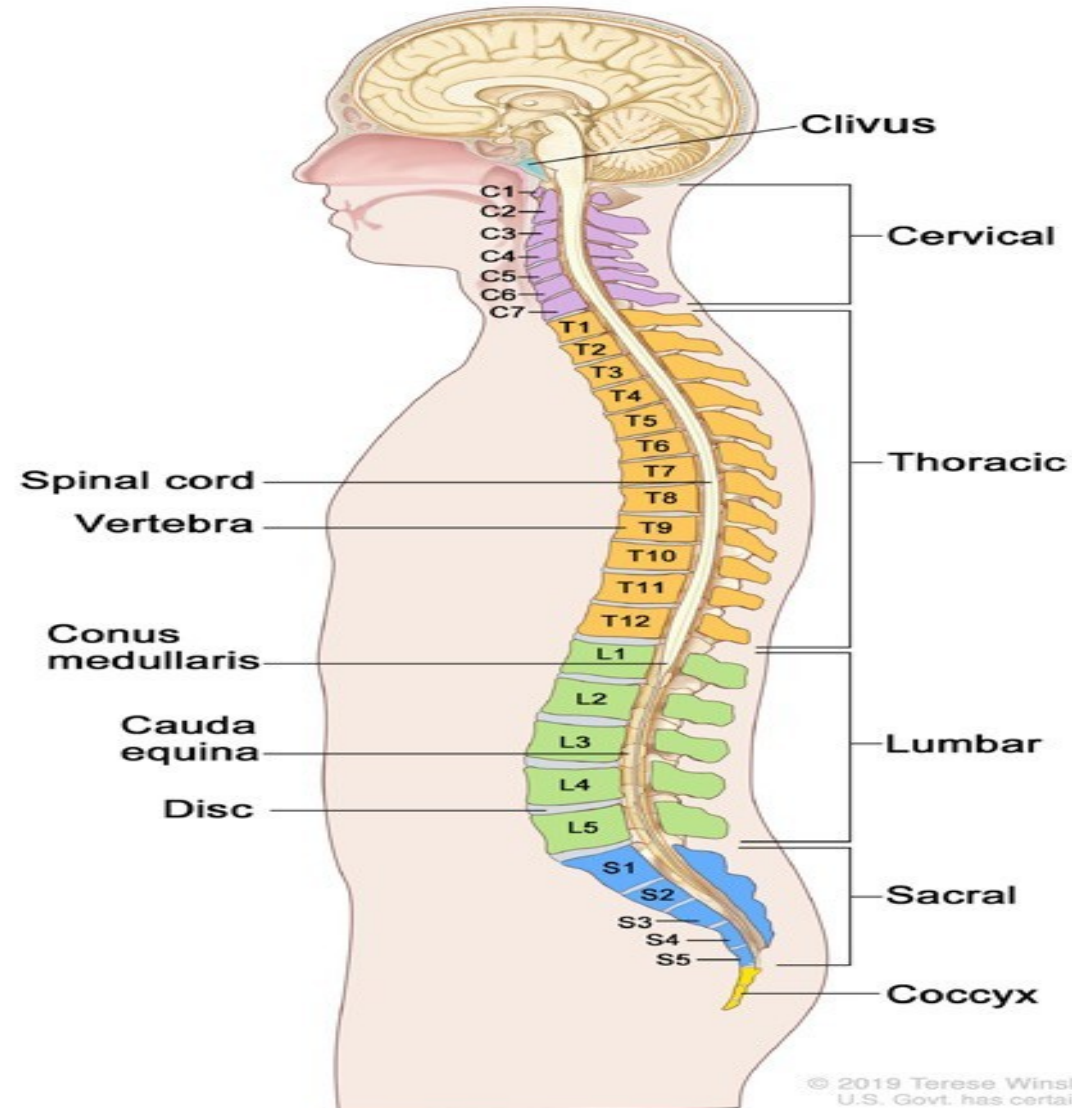


Figure 4.24 Vertebral column

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

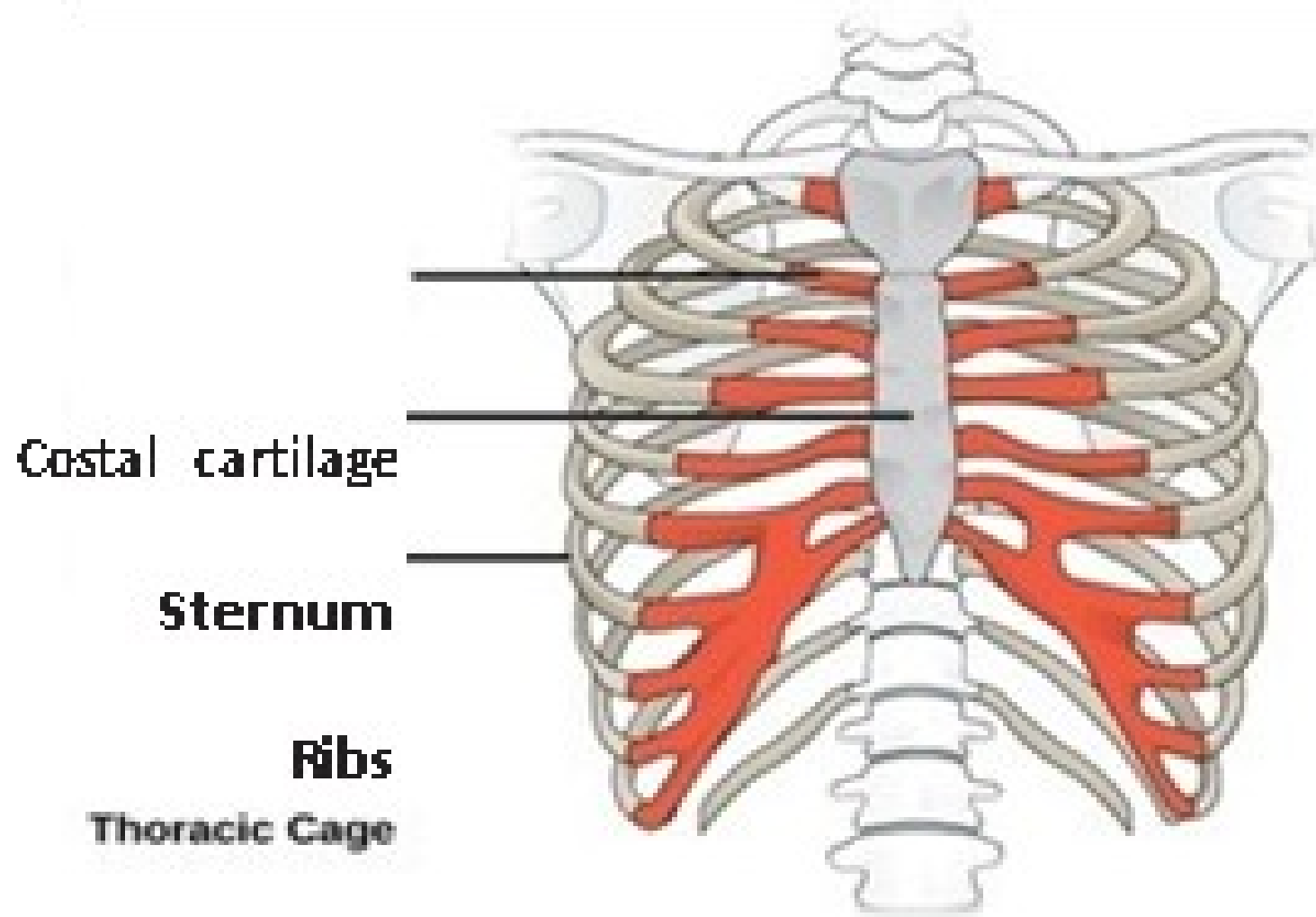


Figure 4.25 Thoracic cage

2. Appendicular Skeleton

- It supports the limbs and connects them to the axial skeleton.
- It is composed of bones of the upper and lower limbs, pectoral girdles, and the pelvic girdle.
- The main functions of this skeleton are of **digestive**, **excretory** and **reproductive** functions.

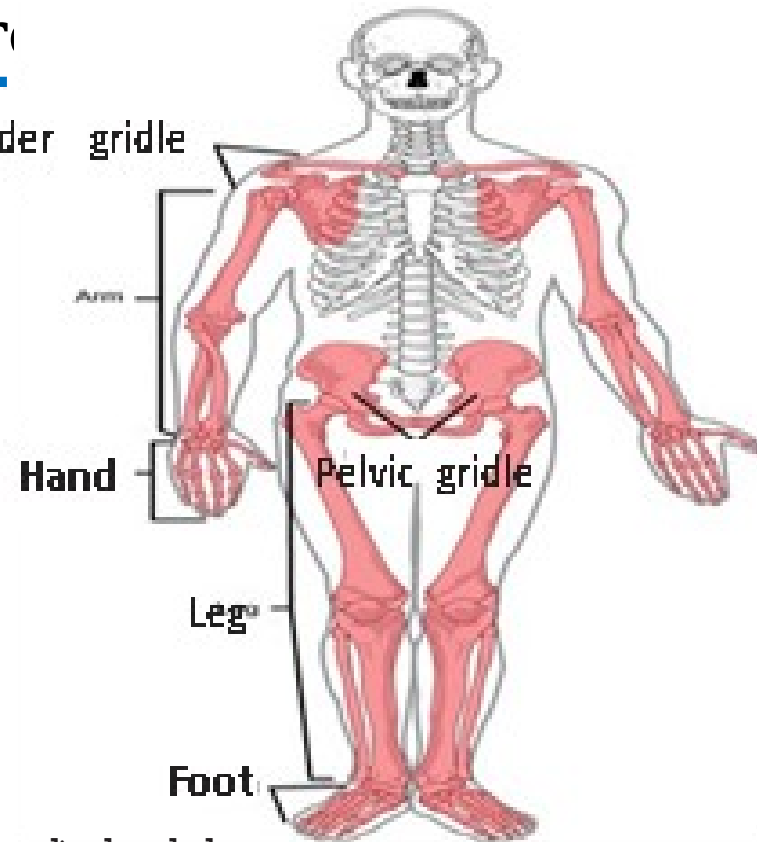


Figure 4.26 Appendicular skeleton

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.

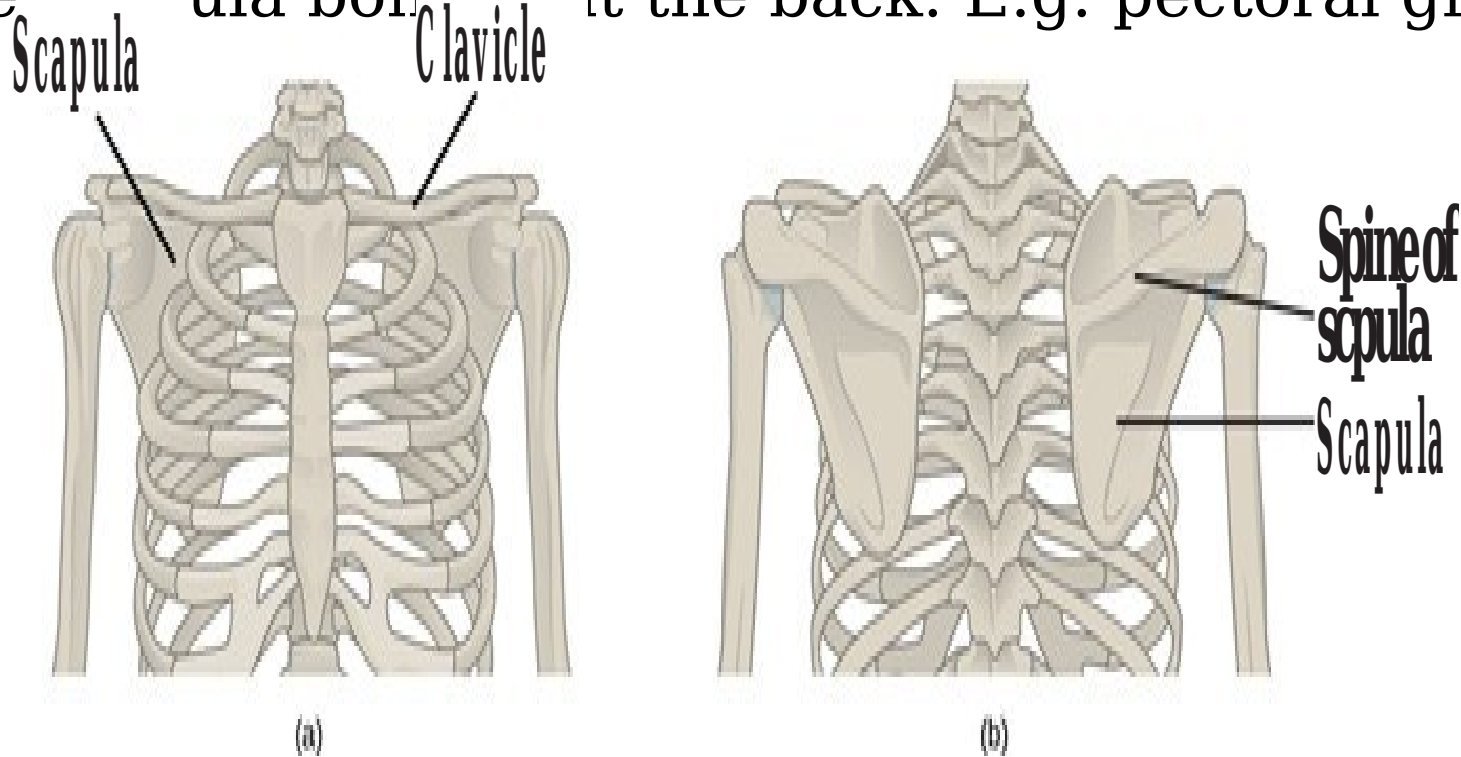


Figure 4.27 Pectoral girdle

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)

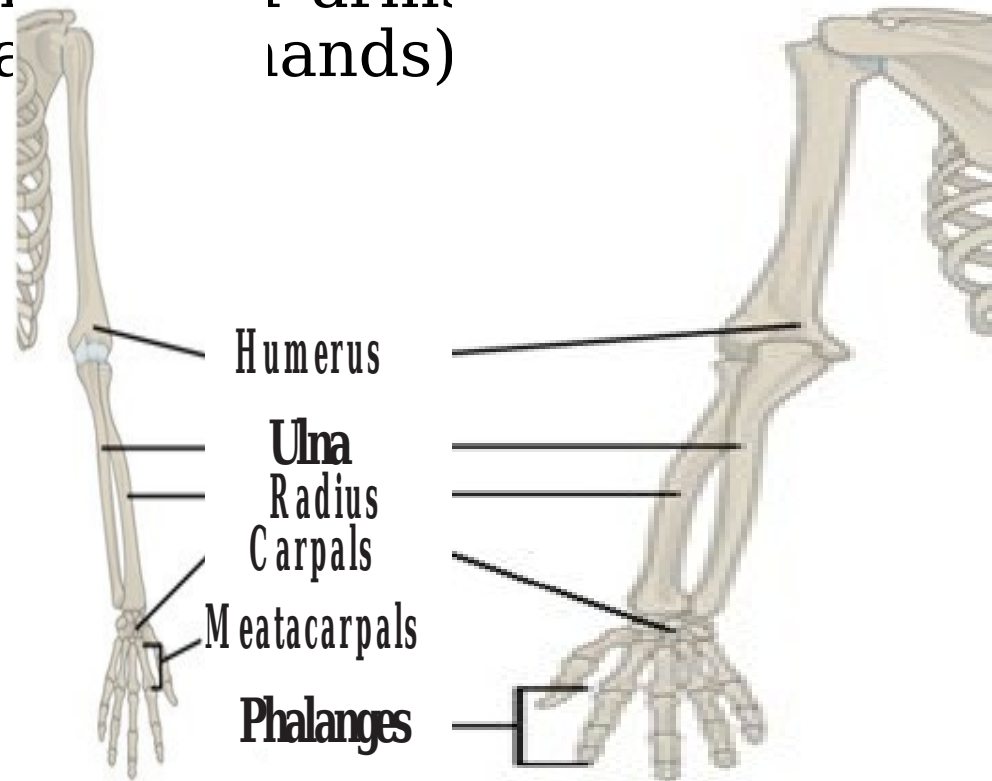


Figure 4.28 Limbs or appendage

Hip bones

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

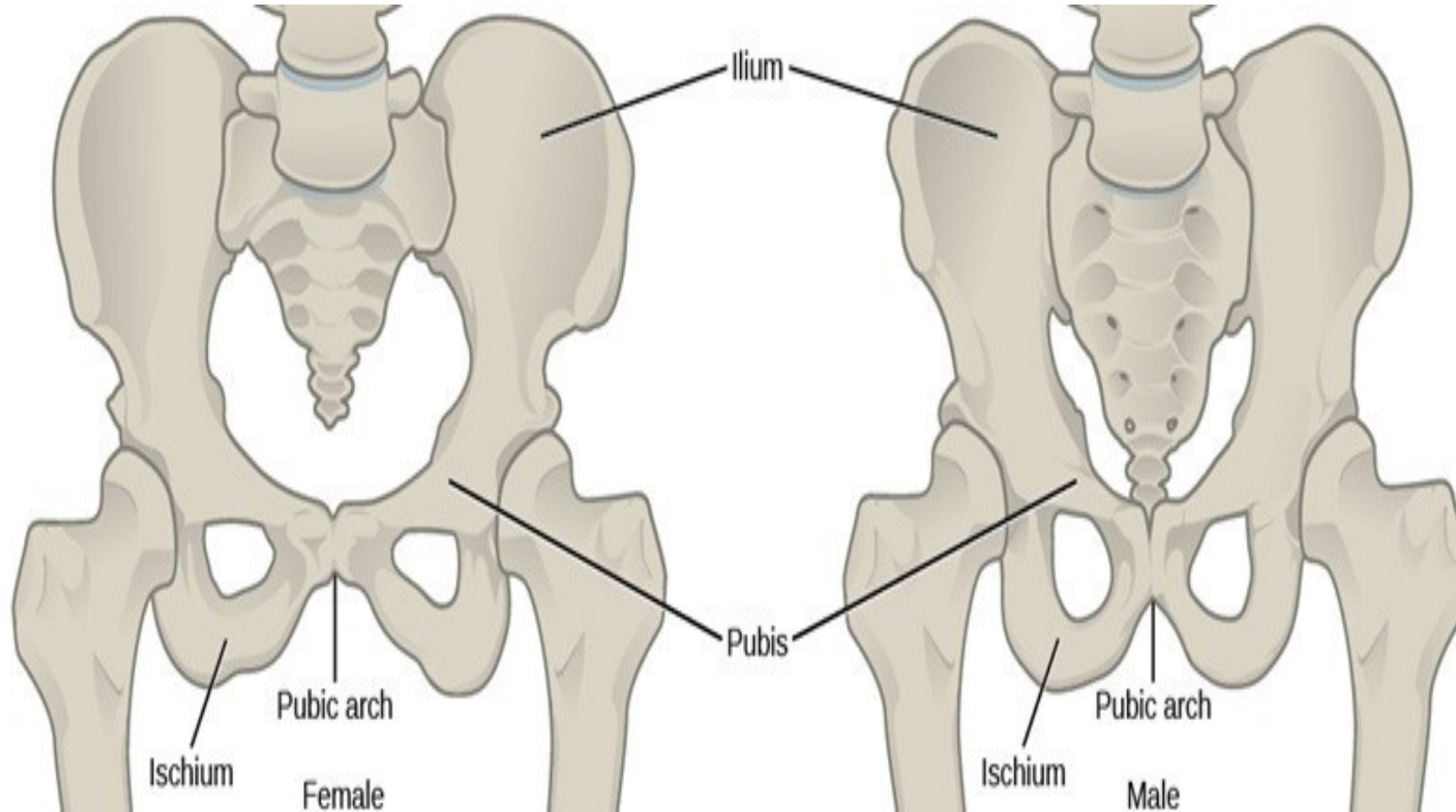


Figure 4.29 Pelvic girdle

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 limb
-

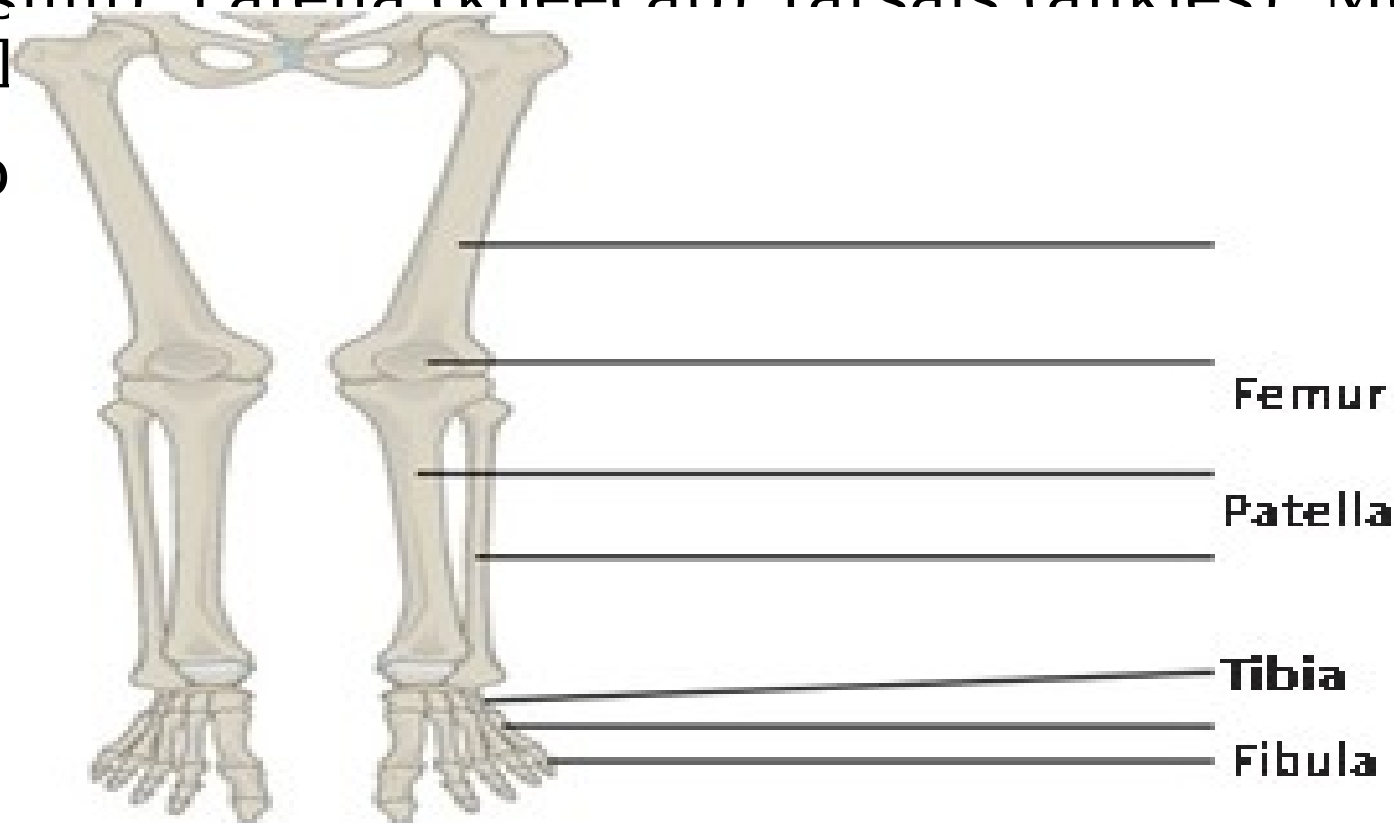


Figure 4.30 lower limb

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. Movable joints: permits(allow) 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 are found in shoulder and hips joints

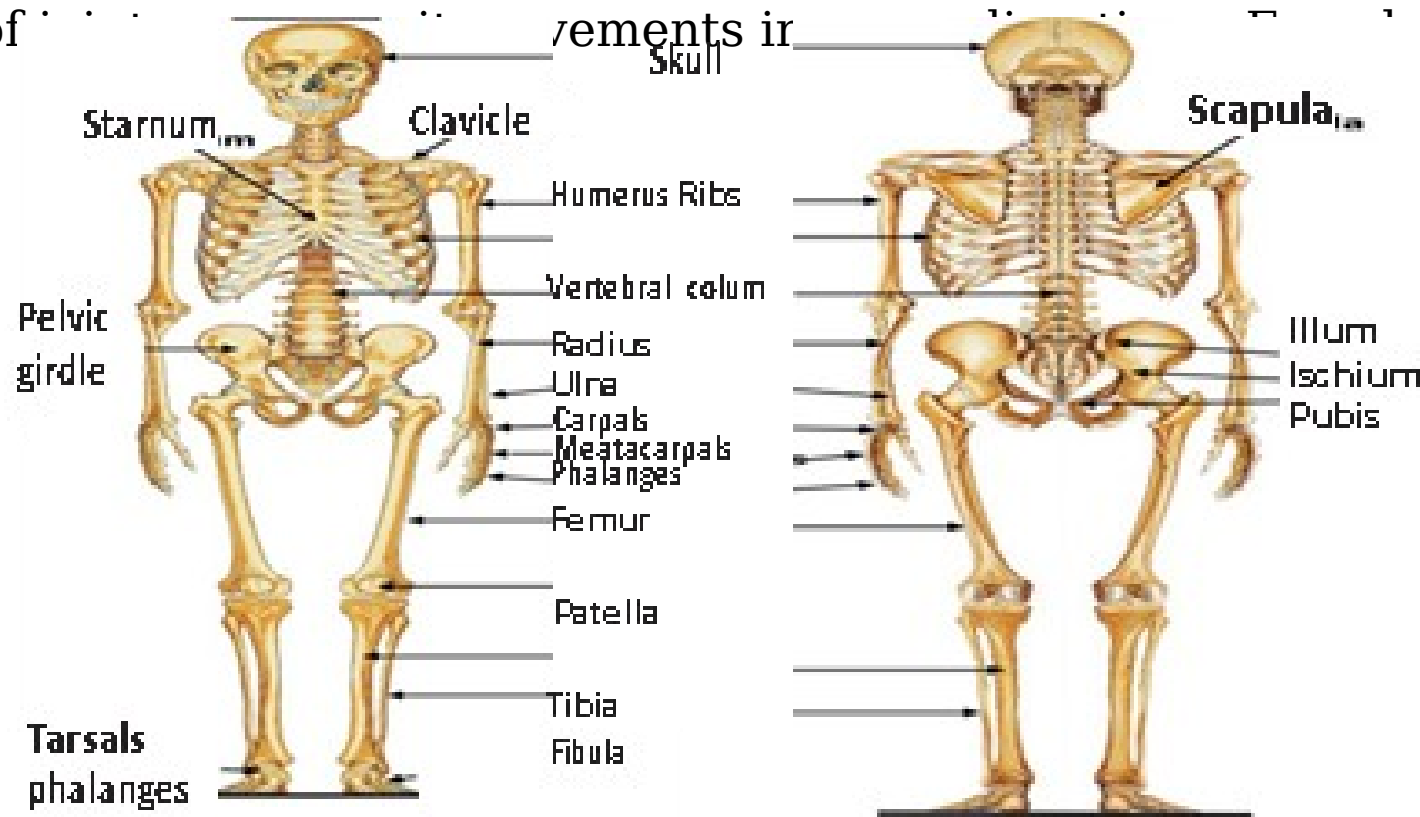


Figure:-4.31 human skeletal systems

Axial and appendicular skeletons.

- Axial skeletons.

- Skull
- back bones
- breast bones.

- Appendicular skeletons.

- Hip bones
- Upper arm
- Lower jaw
- Lower leg
- Shoulder bones
- Fingers
- Forearm

2. Who has a greater number of bones, children or adults and why?

- Children have more than 370 bones whereas adult human beings have about 206 bones.

The number of bones decreases as age increases as some forms of bones found in child stage become **fused** to increase the strength of the skeletal system.

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:-

I. Movements(facilitates 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.

II. 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.

III. 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.

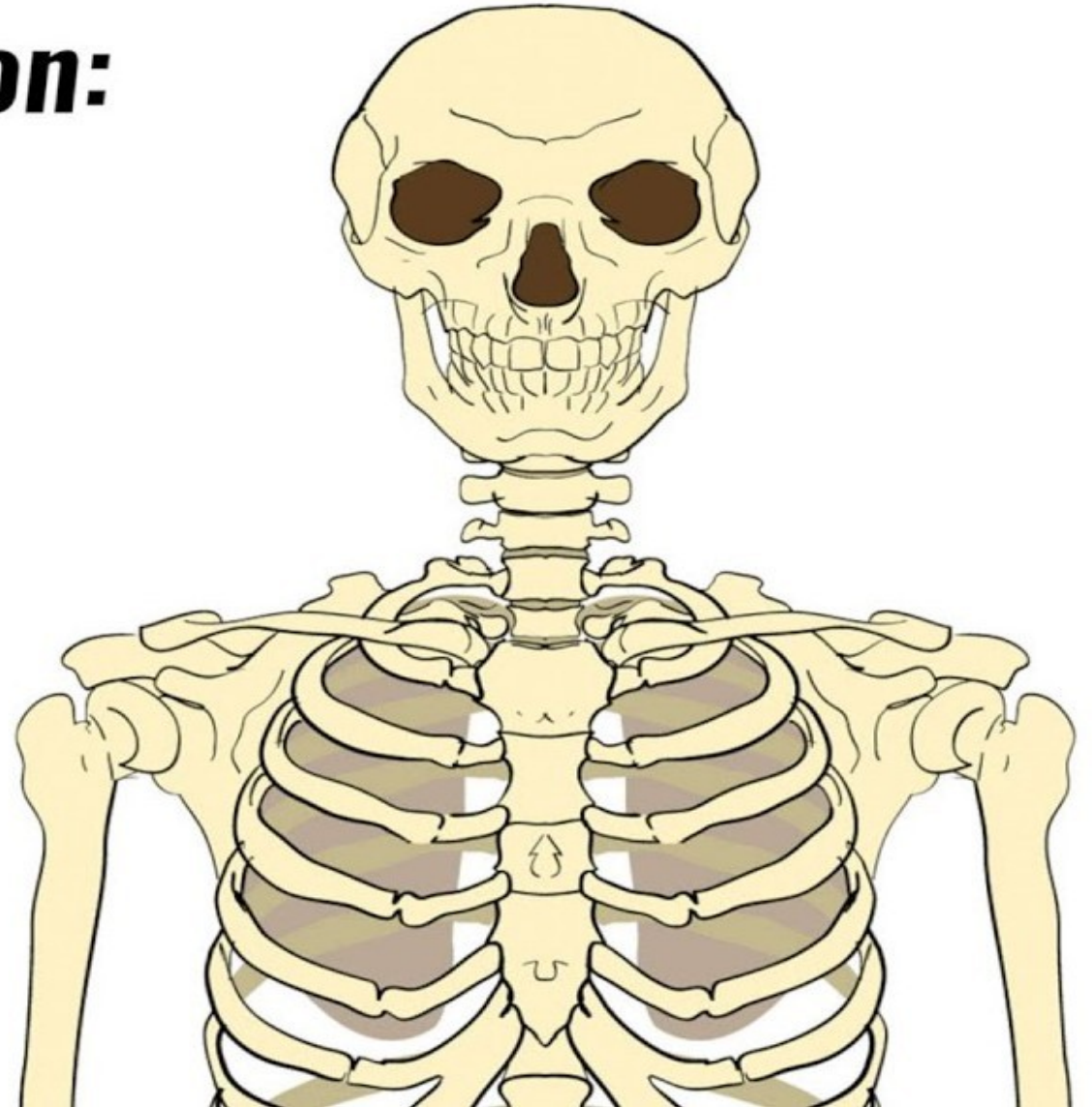
IV. Storage substance

- 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.

Functions of Skeletal System

Functions of the skeleton:

- ***Shape & structure***
- ***Protect organs***
- ***Muscle attachment***
- ***Produce blood cells***
- ***Calcium storage***



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.
- **Types of cancer of the bone marrow in which there is an excessive production of WBC.**
 - **Osteopenia**, osteitis(**infection of the bones**), deformans and osteomalacia(**softening of the bones, typically through a deficiency of vitamin D or Calcium**) : 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.
- **In which the bones become brittle and fragile from loss of tissue, typically as a result of hormonal changes or deficiency of calcium or vitamin D.**

Osteoarthritis: is involving degradation of joints.

- Its symptom is joint pain, tenderness, stiffness, locking and sometimes an effusion.
- **Osteoarthritis happens when the cartilage and other tissues within the joint break down or have a change in their structure(joint injury overuse)**
 - **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

▪ ***The correct answer is C***

2. Which of the following is **not** examples of axial skeleton

A. skull B. hyoid C. thoracic D. none

▪ ***The correct answer is D***

3._ is a joint that fix in place and do not move.

A. movable joint B. immovable joint C. ligaments D. all

▪ ***The correct answer is B***

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 |

- 1 C
- 2 D
- 3 A
- 4 B

Part III: fill in the blank space

1. Shoulder bone composed of _ and _

➤ ***The correct answer is clavicle and scapula***

2. _ run through your body from front to back and divide the body into equal right and left regions.

➤ ***The correct answer is Axial skeleton***

Part VI: briefly describe

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

➤ When the baby grows into childhood, much of that cartilage will be replaced by actual bone.

➤ But something else happens, which explains why 300 bones at birth become 206 bones by adulthood.

➤ Many of your baby's bones will fuse together, which means the actual number of bones will decrease.

Activities 4.8: briefly identifies and explain the following questions

1. What are the differences between axial and appendicular skeletons?

- The axial skeleton consists of the braincase (cranium) and the backbone and ribs, and it serves primarily to protect the central nervous system, Whereas the appendicular skeleton is one of two major bone groups in the body.
- The appendicular skeleton is comprised of the **upper** and **lower extremities**, which include the shoulder girdle and pelvis.

2. Discuss and report on some roles of bone of lower extremities.

- Its roles in supporting the weight of the body and allowing movements of the leg.
- To provide stability and support to the rest of the body, provide mobility and an upright position.

3. Reason out, why joints are important at articulations of two or more bones?

- A joint is the part of the body where two or more bones meet to allow movement.
- Ball and socket joint – the rounded head of one bone sits within the cup. Many joints allow for movement between the bones.
- At these joints, the articulating surfaces of the adjacent bones can move smoothly against each other.
- However, the bones of other joints may be joined to each other by connective tissue or cartilage.

Importantly, joint stability and movement are related to each other.

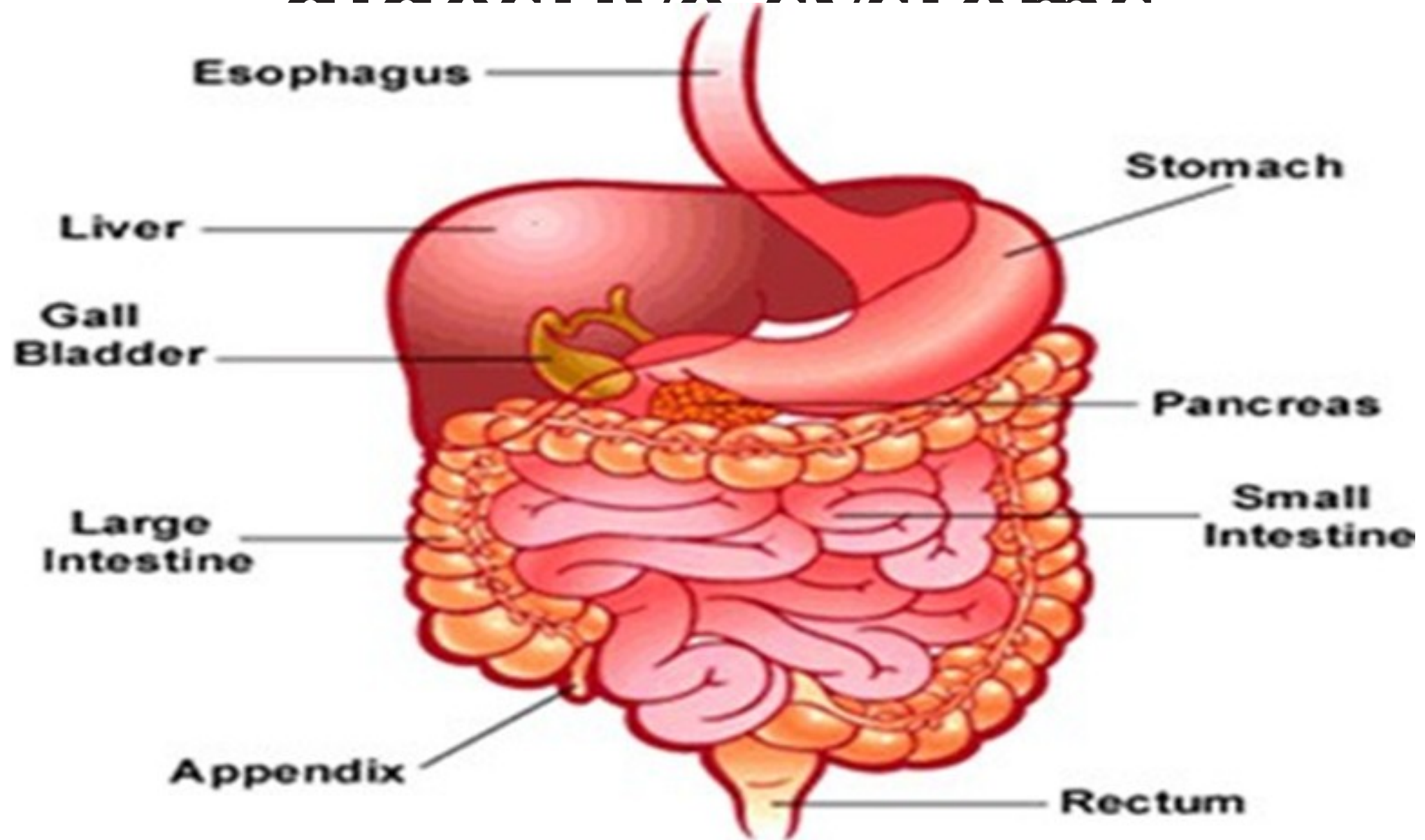
4.4. Digestive System

- **What does digestion means?**
- 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 system



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 r movements of digested food also

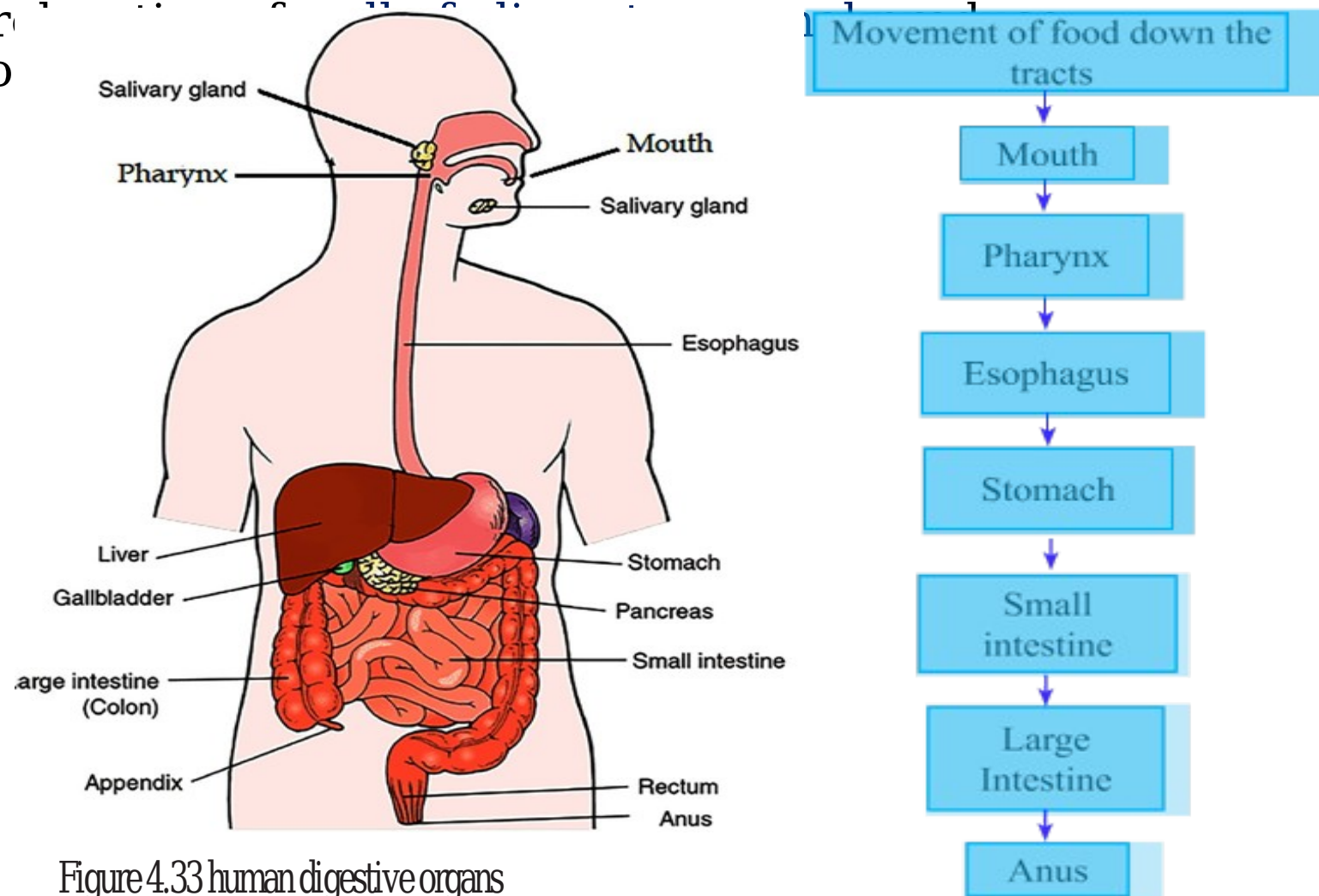
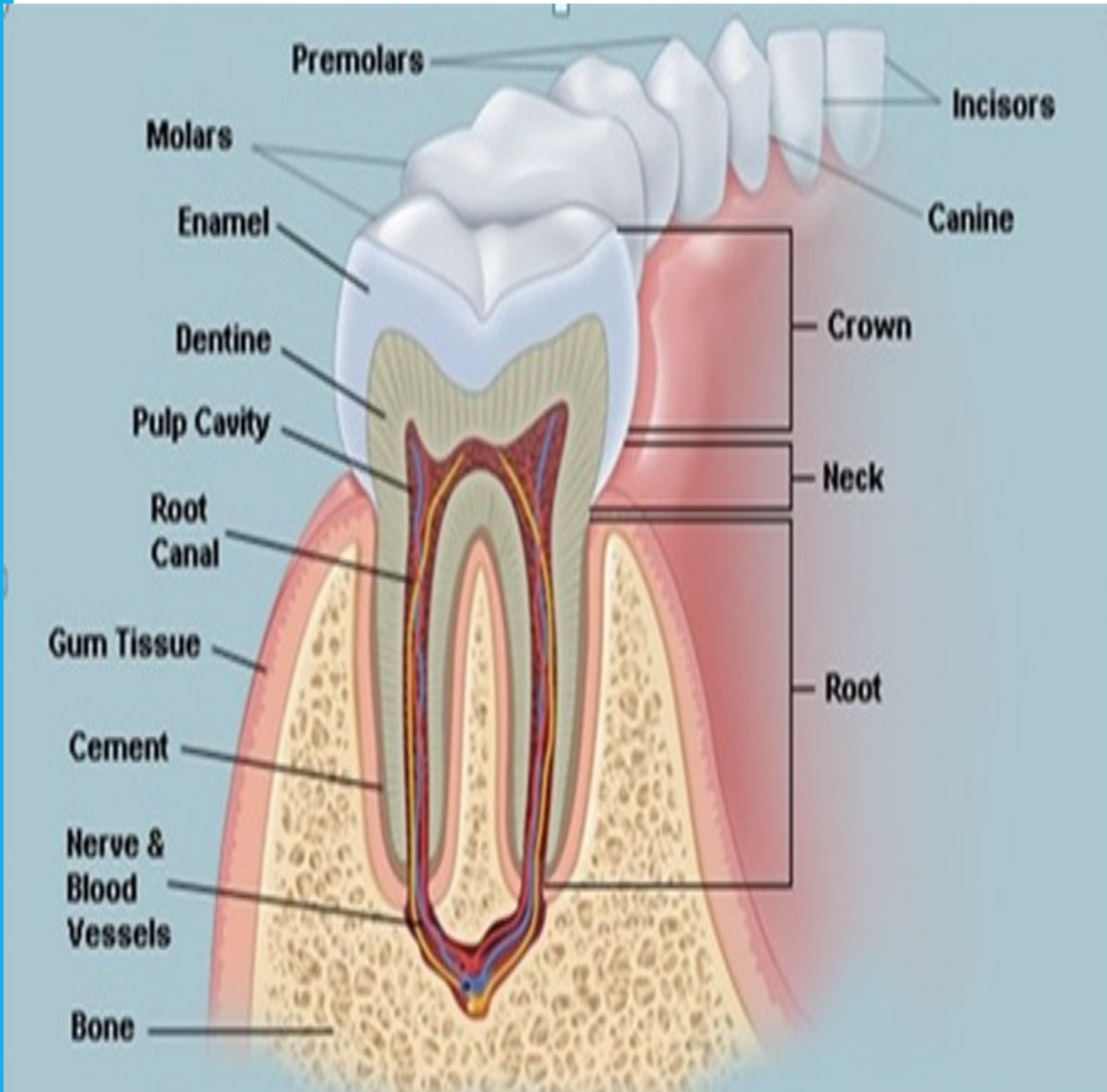


Figure 4.33 human digestive organs

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:** is the 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 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**.

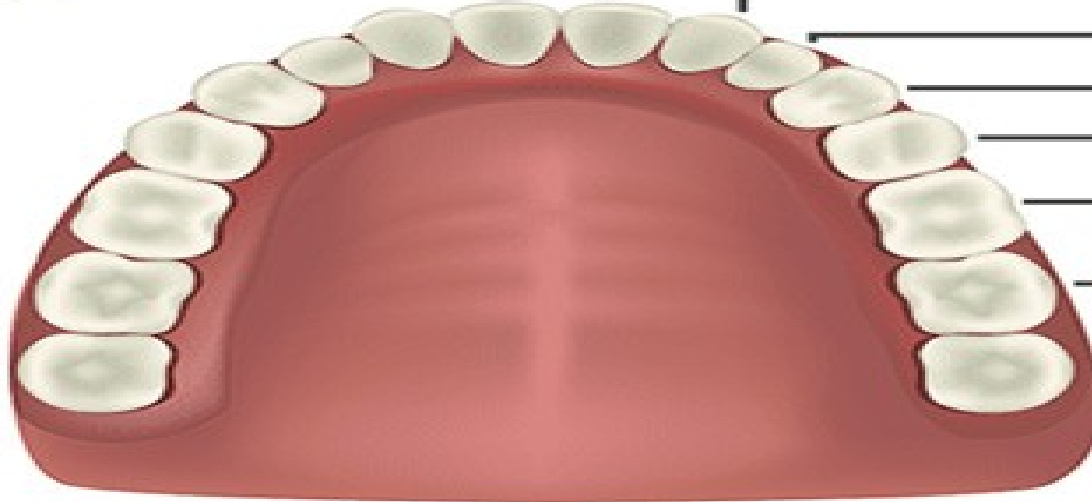
Types of teeth

- 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 , 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 behind canines 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.

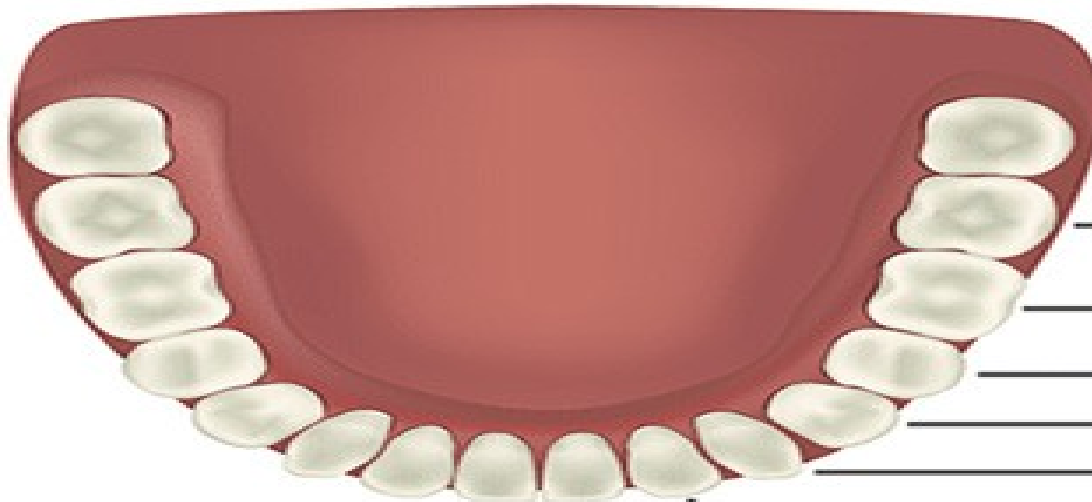
Figure 4.35 types of human teeth

Upper Jaw



- Central Incisor
- Lateral Incisor
- Canine / Cuspid
- First Premolar
- Second Premolar
- First Molar
- Second Molar
- Wisdom Tooth / Third Molar

Lower Jaw



- Wisdom Tooth / Third Molar
- Second Molar
- First Molar
- Second Premolar
- First Premolar
- Canine / Cuspid
- Lateral Incisor
- Central Incisor

Dental formula

- 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 2, Finally, sum up the product.
- i.e. $2+1+2+3 = 8 \times 2 = 16$
- $2+1+2+3 = 8 \times 2 = 16$
- $16 + 16 = 32$

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**
- **Bile is a greenish-yellow alkaline liquid that is produced in the liver.**
- 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 called **defecation**.
- **Defecation**: is removal of wastes from body parts (**egestion**).

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:-

I. 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.
- **Defecation:-** removal of wastes from body parts (**egestion**).
- **Roughage:-** fibrous indigestible material in vegetable foodstuffs which aids the passage of food and waste products through the gut

II. 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(faeces)** examination and early treatment by the proper medicines.

III. 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

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.

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

V. 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.
- **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(carefully)**.

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
amylase

B. HCl

C. HS₂O

D.

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?

The food digestion both physical and chemical digestion in human

2. What will be undigested food molecules?

- The undigested food is called **faeces**.
- From the small intestine, undigested food (and some water) travels to the large intestine through **a muscular ring or valve** that prevents food from returning to the small intestine.
- It enters the caecum (large intestine) from ileum and then temporarily stored in the rectum before egestion through the anus.

3. What types of digestion take place in stomach? Why?

- **In the stomach**, food undergoes **chemical** and **mechanical** digestion.
- Because here, peristaltic contractions (**mechanical digestion**) churn the bolus, which mixes with strong digestive juices that the stomach lining cells secrete (chemical digestion).
- Protein digestion starts in the stomach because in stomach there is enzyme which is called **protease**.
- This enzyme breakdown protein in to smaller **amino acids**.

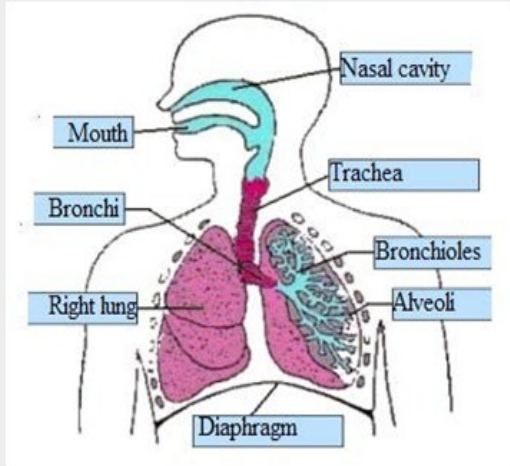
4.5 Respiratory System

- *What are respirations?*
- **Respiration is the action of breathing.**
- **Breathing** is a process of bring oxygen **into** organism's body (**inhalation**) and removal of the waste carbon dioxide (**exhalation**) from the body to the environments.
- 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.
- **Inhalation:- taking oxygen into the body.**
- **Exhalation:-removal of carbon dioxide out of body.**
- **The pathway of air from out to inside of the body.**
- **Nose---pharynx---larynx---trachea---bronchi---bronchioles---alveoli---lung**
- The pathway of air from inside to out of the body.
- **Lung---Alveoli --- bronchioles --- bronchi --- trachea --- larynx --- pharynx ---nose**

4.5.1. Structural Components of Respiratory System

- The human respiratory systems have well developed and adapted structures for breathing of air.
- Humans 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.
- **Pathogen is a bacterium, virus or other microorganism that can cause disease.**
- **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.

Cellular respiration: combination of food and oxygen inside the body



Parts of respiratory system	Their functions
Alveolus	Allows the exchange of oxygen and carbon dioxide between lungs and the blood vessels
Larynx	It is associated with the production of sound
Trachea	The main respiratory tract that leads air into the bronchi
Nasal cavity	It is responsible for warming or cooling, filtering, moistening of air
Diaphragm	Controls the size of the lung due to its contraction and relaxation nature
Pharynx	It is part of both the digestive and respiratory systems
Bronchioles	Air passage way that lead air into alveoli
Epiglottis	It prevents the entry of food or water into the trachea
Bronchi	It is used for passage of air into the lungs

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.**
 1. The first part is breathing which involves **inhaling and exhaling**.
 2. 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.

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.
- a. 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.

b. 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.

c. 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**.

d. 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.

e. 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?

- For exchange of gas in lung

3. List the respiratory disease and their causes.

- **Asthma**
- **Sinusitis**
- **Influenza**
- **Bronchitis.**

4.6

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:- **Systematic circulations and Pulmonary circulations**

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

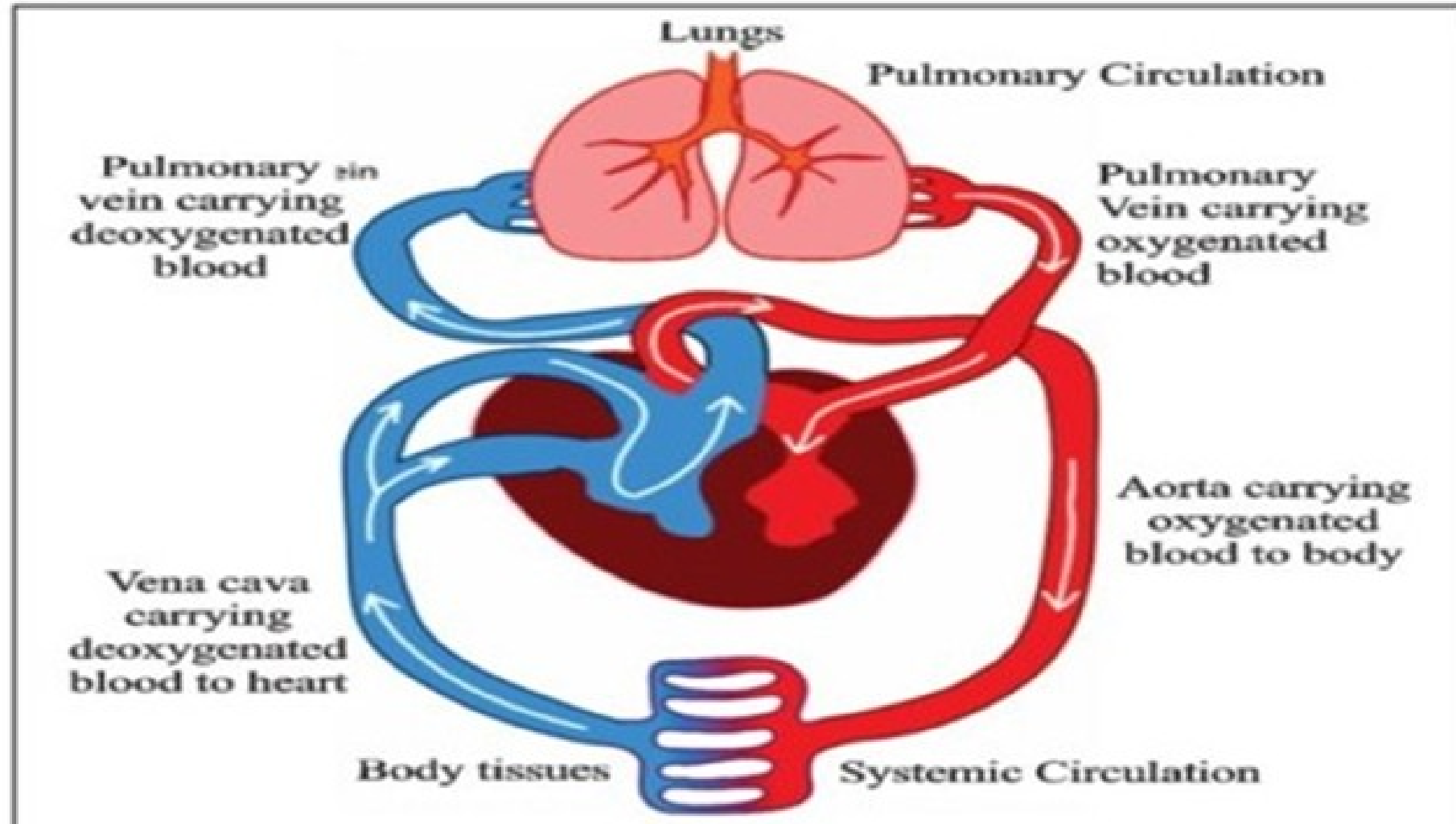


Figure 4.37 double circulatory systems

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 mixed together because the heart **chamber** can be separated by **valves**.

Valves are the structures that used to prevent the back flow of the blood.

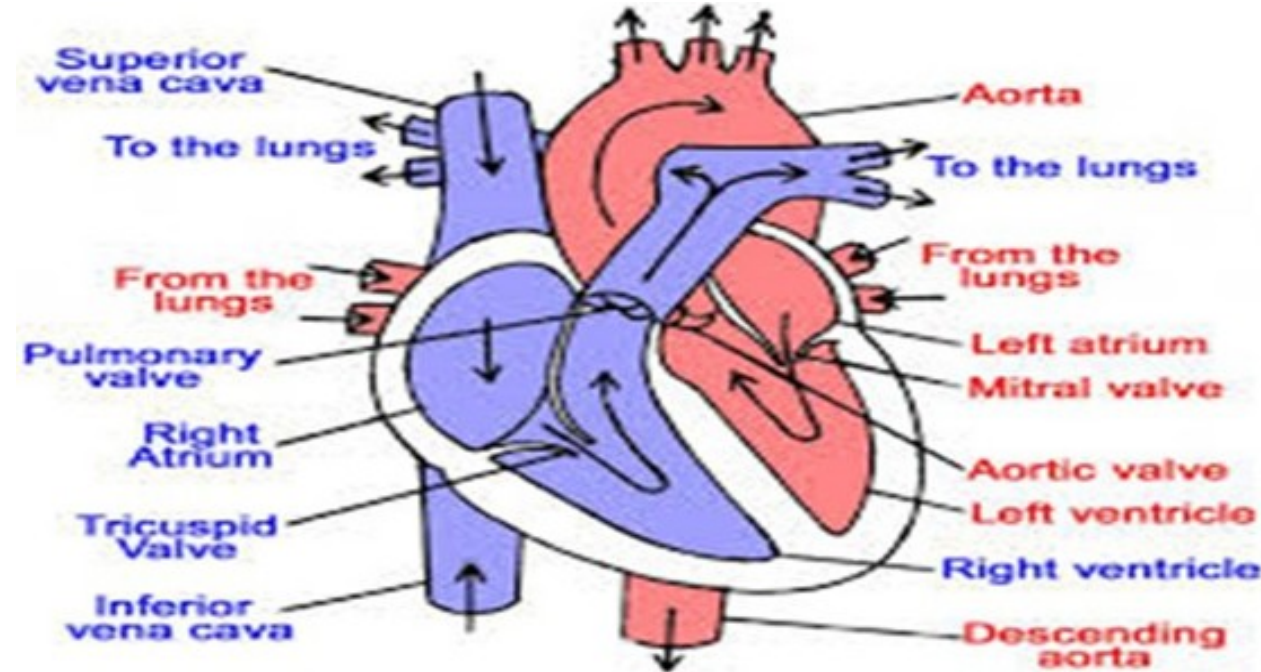


Figure 4.38 parts of human circulatory systems

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

- 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 2-3 μm in diameter and have biconvex shape.
- They are important for inciting 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(fatness), high salt consumption, drug addiction, stress, kidney problem, diabetes(sugar), 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 questions.

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**

➤ In pulmonary artery from heart to lung and in pulmonary vein from lung to heart.

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?

- It used to move most substances inside the body like **food, gas, minerals, vitamin, hormone and other types from place to place.**

2. List elements of blood circulation, with their functions.

- **Hearts** used to pump blood
- **blood vessel** used to transport substances in the body.
- **Blood used** to carry nutrients, respiratory gases, metabolic wastes and other substances

6. Explain the circulatory diseases.

- There are different types of circulatory diseases that can cause by different

reasons.

- Some of them are **Hypertensions, Heart attack, Strokes** and others.

4.7 Reproductive System

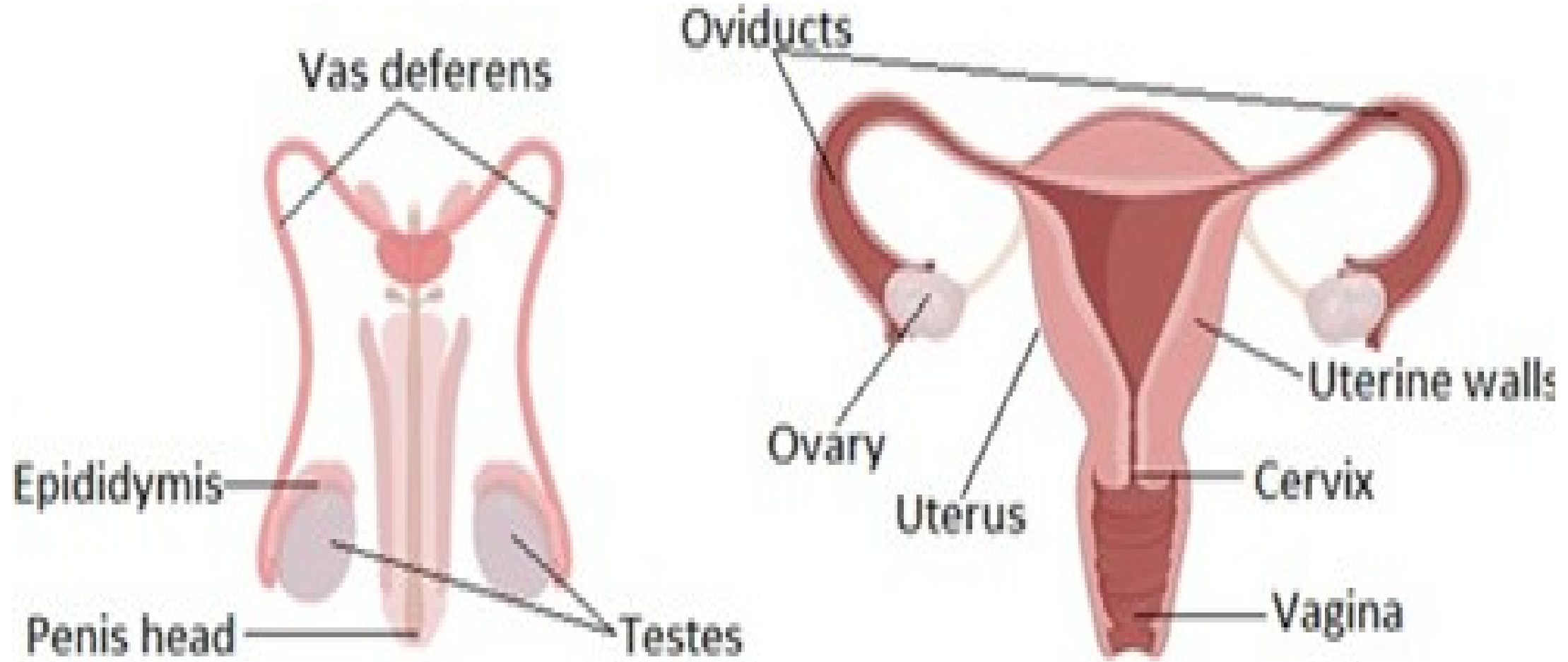
□ What is reproduction?

- **Reproduction is the action or process of making(producing) a copy(duplication) of offspring(children).**
- Most types of multicellular organisms that reproduce sexually have distinct(d/t) male and female reproductive organs.
- 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.

4.7.1. Male and Female Reproductive Organs

- The reproductive cells of human produced by male and female gonads(sex gland), 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 organs



Male reproductive system

Female reproductive system

A. Male reproductive organ

- The human male reproductive system consists of the **testes** and other sex organs like:
- **Penis-male sexual organ homologous with the clitoris.**
- **scrotum –the pouch(bag) of skin containing the testicles.**
- **vas deferens-the duct that conveys(transport) sperm from the testicle to the urethra.**
- **Urethra- canal in mammals through which urine is discharged from the bladder and in males through which semen(seed, seminal fluid) is emitted.**
- **prostate glands –gland surrounding the male urethra at the base of the bladder which produces sperm.**
- **Cowper's glands- that open into the urethra at the base of the penis and secrete a constituent of seminal fluid.**
- ***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 the epididymis to the urethra for transportation of sperm.
- **Sperm:** is a mass of male reproductive cells produced by the testes.

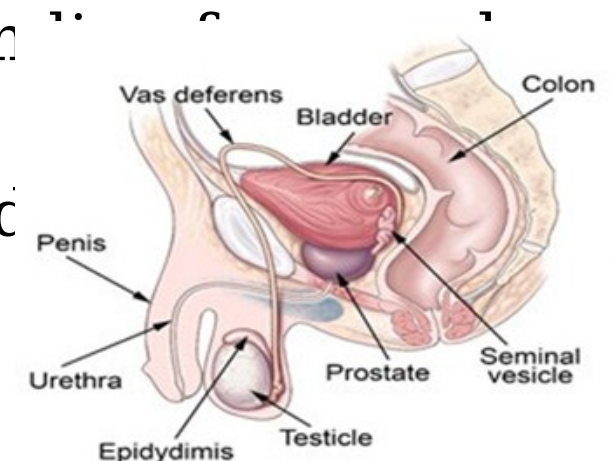


Figure 4.40 Male reproductive organs

Functions of Male Reproductive Structures

Male parts	Functions
Testicle	Producing male sex hormone, testosterone; producing sperm cells
Penis	To insert into the vagina of the females during sexual intercourse to transfer sperms
Vas deferens	To receive sperm cells from the epididymis and to release the sperm cells into the urethra.
Epididymis	To store and allow sperm cells to maturity
Scrotum	To hold testicles outside the body and to keep them cooler than the body
Seminiferous tubules	To secrete or produce sperm cells
Prostate gland	Secretes and adds alkaline fluids to the semen that enable sperm

B. Female reproductive organ

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

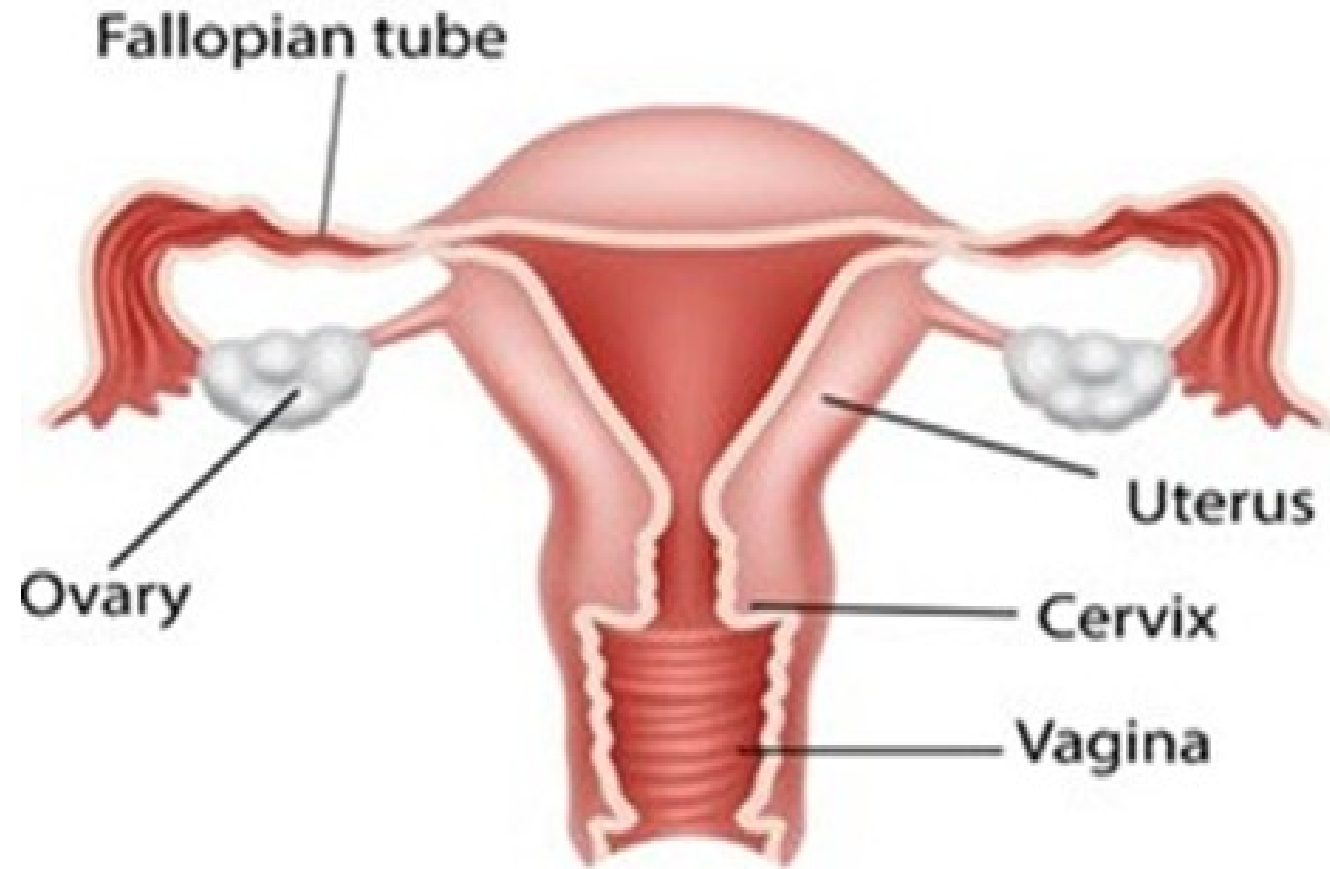


Figure 4.41 Female reproductive organs

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.

Function of Female Reproductive Structures

Female parts	Functions
Cervix	A ring of muscle, separating the vagina from the uterus
Vagina	Receives the male penis during sexual intercourse, sperms are deposited here.
Uterus	The place where the fetus develops
Ovary	Produce oocytes (eggs) and reproductive hormones, estrogen and progesterone
Oviduct	Transport the ova from the ovary to the uterus each month, site for fertilization

***Ejaculates:-* release of sperm from male during sex.**

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 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(activate) 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.

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 gland 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.

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.

- Primary sexual characteristics are present at birth and comprise the external and internal genitalia (e.g., the penis and testes in males and the vagina and ovaries in females).
- Whereas Secondary sexual characteristics are those that emerge during the puberty stages e.g. visible secondary sex characteristics include pubic hair, enlarged breasts and widened hips of females, and facial hair on males.

4.7.4 Menstruation

❑ What does it mean 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 starts the ova to develop.
- FSH also makes 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 (maturation), one of them bursts (splits) out of its follicle.
- This process is called **ovulation**.
- After ovulation the hormone level begins to reduce.
- The remaining of follicle forms the corpus luteum (yellow body) which secretes hormone called **progesterone**.
- Progesterone keeps the thick, spongy wall and makes more blood vessels, ready to receive fertilized ovum.

Conti.....

- 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**.
- **Menopause:-** stopping of menstruation and ovulation in female.
- **Ovulation:-** movements of egg from ovary to fallopian tubes.

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(sexual abuse), illegal abortion and sexually transmitted infections.**
- 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.

- **Rape:-** is a type of sexual assault usually involving sexual intercourse.
- **Female genital mutilation:-**partial or total removal of female external genital.
- 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.
 - Use ABC rules to prevent HIV/AIDS. that are:
 - A =abstain from sex
 - B =be faithful to one sexual partner
 - C =condomize
 - The most effective method is abstain from sex before marriage

Gonorrhea

- Gonorrhea are the other types of sexual transmitted diseases (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(type of ulcer or sore)

- 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 sexual transmitted diseases (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(high temp.), 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

Review exercise on unit-4

Part I: Choose the best answers for the following questions

1. Which of the following is larger organ of the body?

- A . ligament joints B. skin C. bone D.

2. Which layer of skin is external?

- A. hypodermis
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. Sebaceous gland 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 C. Limiting contact with common allergies
B. Applying cool compresses 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

11. The following one is parts 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 oral cavity _

15. The major function of alimentary canal is digestion of food _

16._ crown is parts of teeth which are found above the gum.

17._ Pulp cavity is the living layer under the tooth enamel.

18. The two important functions of bile are emulsification and neutralization ____

19. Breathing through the nose is better because it have hair ____

mucus

blood vessel

moist

20. Millions of alveoli tiny air sacs that used to for exchange of gas in the lung is called ____

Systemic

pulmonary

21. The two types of blood circuits are ____ and ____

15. Artery

15. Testis 22. Blood vessel that carry oxygenated blood is called ____ 23. ____ is male sex organ that produces sperm cells.

Menstruations

24. The flow of blood from vagina approximately every four weeks are called ____

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

- Good sanitation mechanisms
- Accepting and using of ABC rules
- Appropriate use of drugs which are prescribed (advised)
- Check up in clinic and hospitals
- And others

Thank you for your attention!

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