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1.0 Unit Overview & Description:

Overview

This unit will provide the student information about the structure and functions of various body systems.

Knowledge and skill outcomes

- The basics of Cells and Tissues
- Skeletal System
- Joints & Muscular System

Duration: Hours Theory - 16 hrs (15 Periods)

Resource Material:

- Body Massage Therapy Basics– Mo, Rosser
- Human body– Dorling Kindersley
- Human body– Steve Parker
- Anatomy & Physiology in Health and Illness– Ross & Wilson
- New book of Muscles– Ian. Mc. Chesney
- Concise Book of Muscles– Chris Iarmy
- A guide for Health and Beauty therapist– Gaynor Winyard
- Human Anatomy– B.D. Chaurasiya
- Textbook of medical physiology– Guyton and Hall

Learning Outcomes: Unit 1: Anatomy and Physiology

1.1 Cells and Tissues	Outcomes
	<p>You will be able to understand</p> <ul style="list-style-type: none"> • Definition, parts of cell • Functions of cells • Cell growth & Reproduction • Definition of tissues and its types
1.2 Skeletal System	<p>You will be able to understand</p> <ul style="list-style-type: none"> • Introduction& types of bones • Structure of the Human bone • Divisions of Human Skeleton • Types of Cranium Bones • Bones of Neck & Trunk • Study of Joints • Basic types of joints
1.3 Muscular System	<p>You will be able to understand</p> <ul style="list-style-type: none"> • Introduction & types of Muscles • Muscles according to its position • Structure of facial, head & neck muscles • Structure of upper & lower extremities of muscles • Functions of the muscles

Assessment Plan for the Teacher:

Unit I	Topic	Assessment Method	Time Plan	Remark
1.1	Cells and Tissues	Exercise: Question & Answer Practical: Diagram, use of charts, Audio visual aids & modals		
1.2	Skeletal System	Exercise: Question & Answer Practical: Diagram, use of charts, Audio visual aids & modals		
1.3	Muscular System	Exercise: Question & Answer Practical: Diagram, use of charts, Audio visual aids & modals		

1.1 Cells and Tissues

The human body develops from a cell. Cell is basic structural and functional unit in a living organism. It is the smallest functional unit of the body. These are grouped together to form a tissue, each of which has a specialized functions.

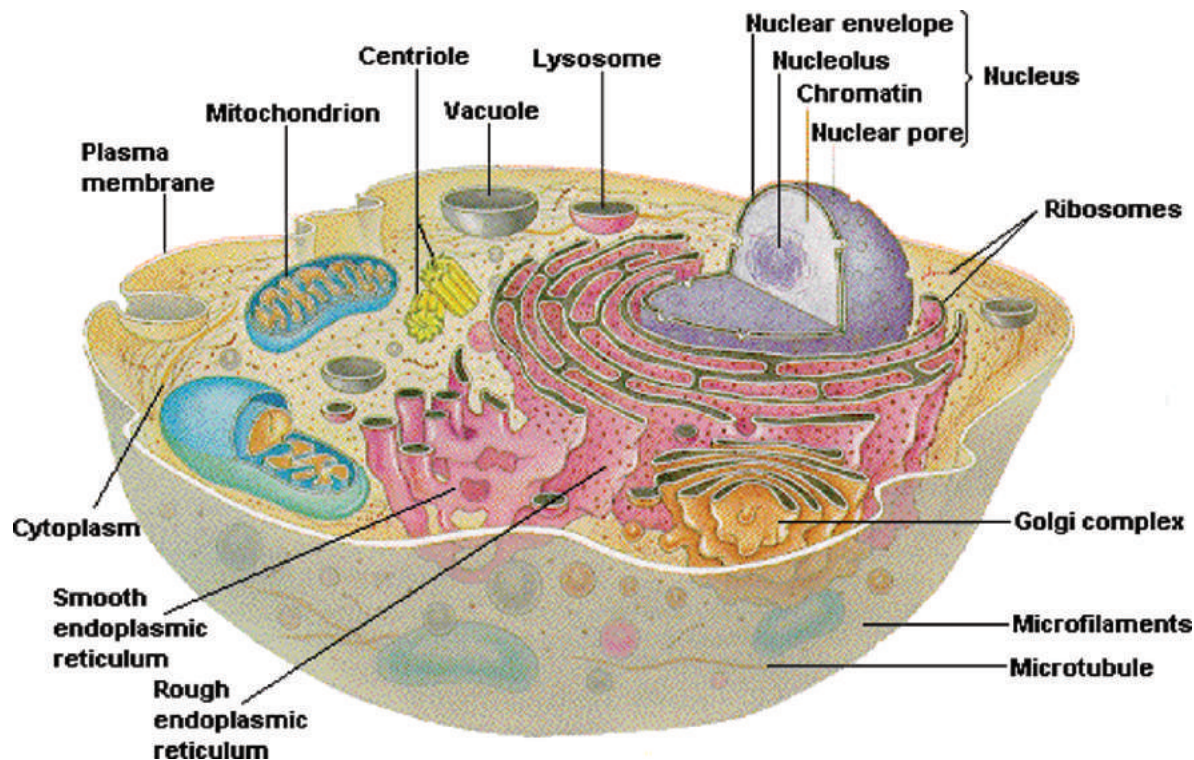


Figure: Structure of Cell

Parts of the Human Cell

The various parts of the human cell and their functions are:

- A) Cell Membrane, Nucleus and Nucleolus and Cytoplasm
- B) Cytoplasmic Organelles: Mitochondrion, Ribosomes, Endoplasmic Reticulum, Golgi Apparatus, Andlysosomes.

A) Cell Membrane, Nucleus and Nucleolus and Cytoplasm

• Cell membrane:

This is the outer layer of the cell. It protects the cell. The cell membrane is a semi-permeable membrane which allows exchanges of substances in the cell.

• Nucleus

This is called as the control center of the cell. This is the largest cell organelle. The nucleus contains the nucleolus which contains the genetic material (DNA, chromosomes and chromatin). The nucleus is surrounded by a nuclear membrane.

- **Nucleolus**

This is located inside a nucleus and is made of protein, RNA and DNA. The nucleolus is a dense region of ribonucleic acid (RNA) in the nucleus and is the site of ribosome formation.

- **Cytoplasm:** It is a liquid substance surrounding nucleus within the cell membrane.

B) Cytoplasmic Organelles: Mitochondrion, Ribosomes, Endoplasmic Reticulum, Golgi apparatus, and Lysosomes.

- **Golgi Apparatus**

It is a smooth, irregular structure containing enzymes, proteins and lipids. This stores food inside the cell. It produces collagen and mucus

- **Lysosomes**

It is called as the digestive center of the cell. It helps to digest and break down food material.

- **Centrioles**

This is concerned with cell division, the reproduction of the cell and the movement of cell chromosomes.

- **Mitochondrion**

These are rod shaped structures containing enzymes which converts raw material into energy provide energy. Therefore, it is called as the power house of the cell.

- **Endoplasmic Reticulum**

This is the part where protein is manufactured, so it is also called as the protein factory of the cell

- **Chromatin**

A mass of thread like genetic material which is mainly DNA, present inside the nucleus.

Functions of the Cell

Respiration, Excretion, Reproduction and Irritability are the functions of the cell.

- **Respiration:** Cells take in oxygen and glucose to produce energy in the form of heat.
- **Excretion:** Waste products of respiration must be excreted. Waste products are carbon dioxide and water.
- **Reproduction:** Cells nuclei divide into two and a new cell is formed, this is called as mitosis
- **Irritability:** Cells respond to stimuli in the form of electrical, thermal or chemical response.

Cell Growth and Reproduction: A cell does not go on growth indefinite in size. But a certain optimum divides into two daughter cells. This kind of cell division is called mitosis. Division of cell activities begins in the nucleus, the nucleus membrane disappears and a certain changes in character and terms along filaments called chromosomes. The chromosomes divide and two new chromosomes move away from each end of the nucleus called poles. The chromosomes then are attracted to the poles and divide into two new cells known as daughter cells.

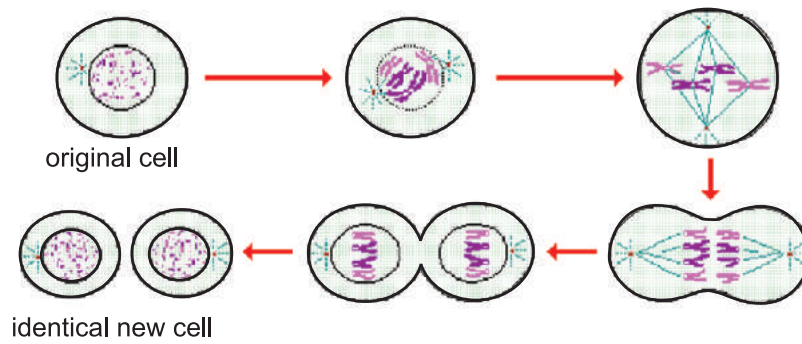


Figure: Cell Growth and Reproduction

Tissues: Tissues are the similar group of cells making one particular organ, external or internal. There are four groups of tissues:

1. Epithelial Tissue
2. Connective Tissue
3. Muscular Tissue
4. Nervous Tissue

Epithelial tissue: It provides lining for internal and external surfaces. It protects the body from wear and tear. There are different types of epithelial tissues found in different areas of the body.

They are as follows:

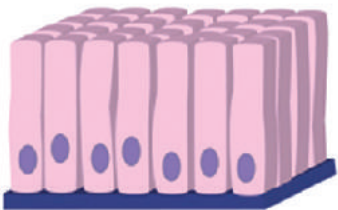
- Simple pavement epithelial tissue e.g. lines the blood vessels
- Simple cuboidal epithelial tissue e.g. covers the ovaries
- Simple columnar epithelial tissue e.g. lines the stomach and intestines
- Ciliated epithelial tissue e.g. lines the respiratory tract
- Stratified epithelial tissue e.g. lines the mouth and forms skin
- Transitional epithelial tissue e.g. lines the bladder



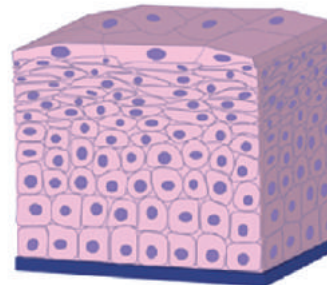
Simple Cuboidal



Simple Squamous



Simple Columnar



Stratified Squamous

Figure: Types of Epithelial Tissue

Connective Tissue: It connects and supports other types of tissues in the body. It consists of living cells e.g. Blood vessels; Non-living fibers collagenous fibers and elastic fibers. Collagenous fibers provide strength. Elastic fibers provide elasticity. There are different types of connective tissues in different areas of the body. They are as follows:

- Loose connective tissue e.g. It lines between and within organs
- Adipose tissue e.g. It protects and insulates internal organs, acts as food reserve
- Dense connective tissue e.g. It is present in fascia surrounding muscle and in tendons
- Cartilage e.g. It forms tough, elastic discs between vertebrae of the spine
- Bone tissue e.g. It is a specialized type of cartilage which forms strong, rigid bone

Muscular tissue: It helps in support and movement in the body. Muscle tissue is a soft tissue, and is one of the four fundamental types of tissue. There are 3 types of muscular tissues. They are as follows:

- **Smooth or visceral or involuntary:** These muscles are under involuntary control governed by the autonomic nervous system. The cells of the muscles are spindle shaped and form into bundles. Each cell contains a nucleus, but there is no distinct membrane, which gives them a smooth flat appearance.

Areas where smooth muscle can be found are: Walls of blood and lymph vessels, walls of the intestines to move the food along the digestive tract (peristalsis)

- **Cardiac:** This is specialized tissue found in the heart. It forms the wall of the heart and pumps blood around the body. This is an involuntary muscle tissue under the control of the autonomic nervous system. The structure resembles voluntary muscle as fibers are striated and each cell has a nucleus. This type of muscle rarely tires E.g. Muscles of wall of the heart
- **Skeletal or striated or voluntary:** Viewed under a microscope, transverse stripes are visible which is why skeletal muscle is also known as striated. Works with tendons and bones to move the body. It is also referred to as voluntary muscle because it is under conscious control. The brain transmits impulses via motor nerves to initiate contraction of muscle fibers. The muscle contracts producing movement at joints.




Skeletal		Voluntary	Striated	Multinucleated	Non-branched
Cardiac		Involuntary	Striated	Single nucleus	Branched
Smooth		Involuntary	Nonstriated	Single nucleus	Tapered

Figure: Types of Muscle Fibres

Nervous tissue: The nervous tissue forms the nervous system of the body. Nervous tissue is the main component of the nervous system - the brain, spinal cord, and nerves-which regulates and controls body functions. It is composed of neurons, the basic structural and functional unit which transmits impulses. All living cells have the ability to react to stimuli. Nervous tissue is specialized to react to stimuli and to conduct impulses to various organs in the body which bring about a response to the stimulus. All neurons have a similar structure. They have a cell body one long nerve fiber called the axon and several small nerve fibers called dendrites. Axons carry impulses away from the cell body. Dendrites carry impulses towards the cell body. A mixed nerve contains both sensory and motor fibers.

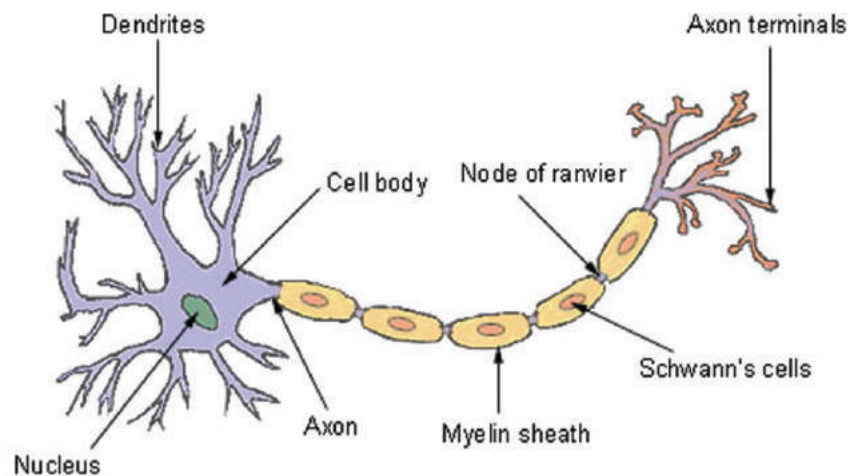


Figure: Structure of a Typical Neuron

Review Questions:

- Q.1. Define Cell?
- Q.2. Make the diagram of Cell?
- Q.3. Write the parts of Human Cell?
- Q.4. What is Cell Growth?
- Q.5. Define Tissue?
- Q.6. Write the names of different Tissues?

1.2 Skeletal System

Introduction: The bones of our body form a framework called as skeletal system. It supports our body in an upright position and protects our body all vital organs. It is composed of about 2/3 minerals (primarily phosphate and carbonate of lime). At birth, there are over 270 bones in an infant human's body, but many of these fuse together as the child grows, leaving a total of 206 separate bones in an adult. The study of bones is called osteology. The bones of the human body are grouped into three groups based on their shapes:

1. Long bones (Arms, Legs, Hands and Feet)
2. Flat bones (Skull or Cranium)
3. Irregular bones (Wrists, Ankles and Vertebrae)

Structure of Bone: Bones are composed of two kinds of tissue. The outer part of bone is made up of hard, compact tissue. This hard outer part contains many channels that are penetrated by small blood vessels and nerves. The inner part is made up of softer and more porous tissues. This tissue is honeycombed with nerves and blood vessels. The large bones have an internal cavity that is filled with bone marrow. Red blood cells, blood platelets and some white blood cells are formed in the marrow. The bones in our arms, legs, hips, ribs and breast bones are most active in blood formation.

Cartilage is a tough elastic tissue which is different from the bone. It does not contain minerals to make it hard. It is generally found at ends of bones. But some of our features e.g. nose and ears are composed entirely of cartilage. This flexible tissue helps to prevent fractures.

Sesamoid Bones: Small bones called sesamoid bones are sometimes found within tendons to help their movement over bone surfaces e.g. the patella.

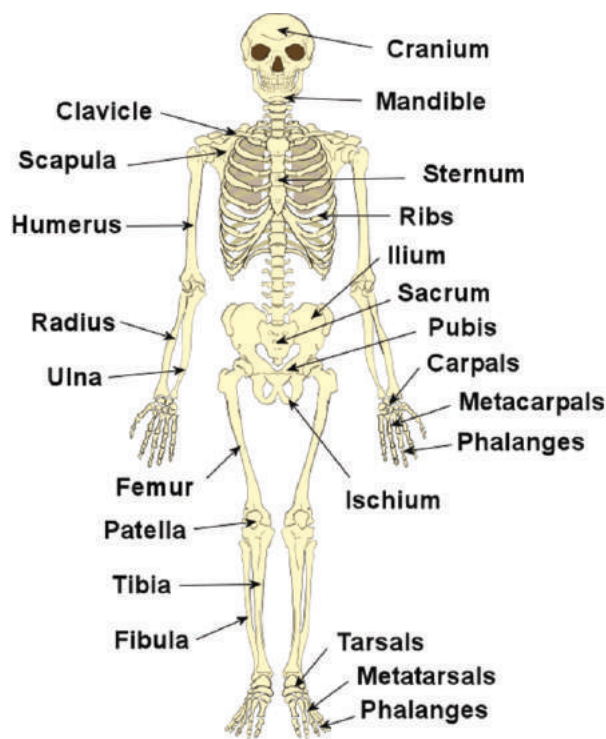


Figure: The Human Skeleton

Skull and Face (Cranium)

Name of the bone	Number	Placement of bone
Frontal	1	Forehead
Parietal	2	Sides and top of Skull
Occipital	1	Back of Skull
Temporal	2	Sides of Skull (Below Parietals)
Sphenoid	1	Front Base of Skull (behind eyes and nose) Root of Nose (between eyes)
Ethmoid	1	
Zygomatic	2	Upper cheeks and floor of eyes cavity
Maxella	2	Upper Jaw
Mandible	1	Lower Jaw
Nasal	2	Upper part of bridge of Nose
Vomer	1	Back of Nasal Cavity
Lacrymal	2	Side wall of Nasal Cavity
Palatine	2	Back of Nasal Cavity and Roof of Mouth
Turbinate	2	Side wall of Nasal Cavity

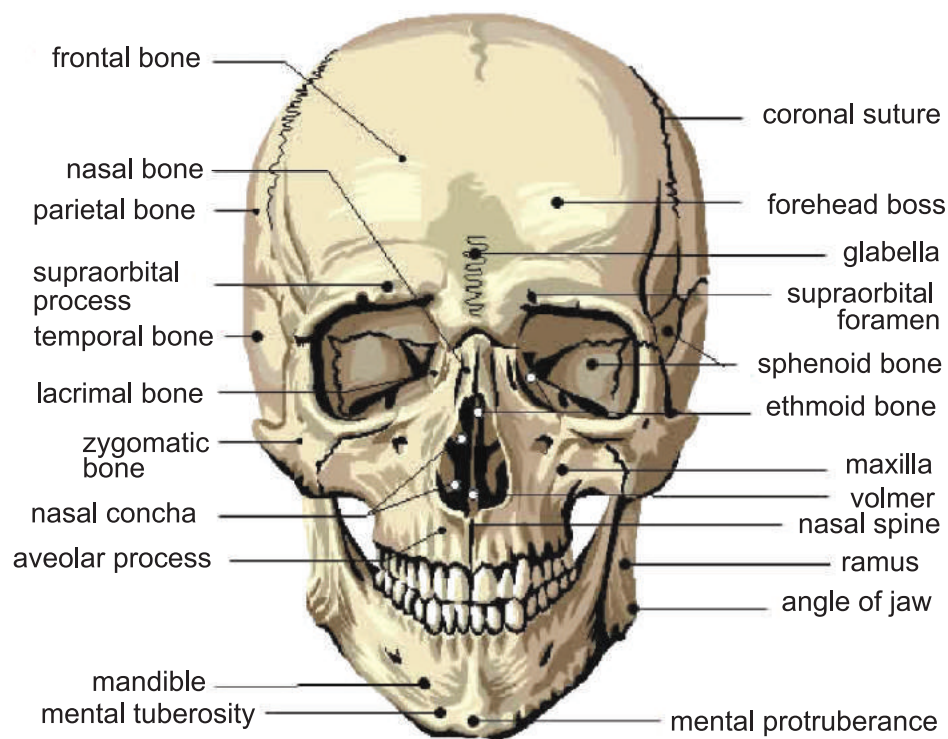


Figure: Overview of Facial Bones

Division of Skeleton into two classes:

1. **Axial Skeleton:** It includes cranium (8 Skull, 14 Face), vertebral column (33 Bones; 7 Cervical, 12 Thoracic, 5 Lumbar, 5 Sacral, 4 Coccyx) and rib cage (12 Pairs)
2. **Appendicular Skeleton:** It includes shoulder girdle, upper limbs, pelvic girdle and lower limbs

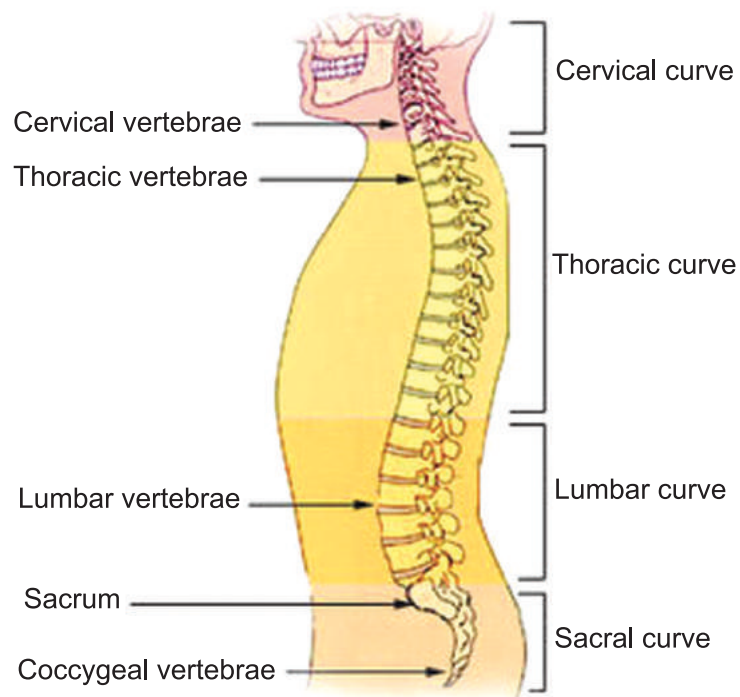


Figure: Overview of Vertebrae

Neck and Trunk

Name of the Bone	Number	Placement
Hyoid Bone	1	Front of throat between root of tongue and Adam's apple
Cervical	7	Top of Spine 7 vertebrae
Thoracic	12	12 Vertebrae
Lumbar	5	5 Vertebrae
Sacral	5	5 Fused Bones
Coccyx	4	4 Fused Bones forming Tail Bone
Sternum	1	Breast Bone, Thorax
Ribs	24	12 Pairs Thorax

Joints: Joint is a location at which bones are connected. Some joints which move very easily are known as movable joints, for example, fingers and arms, while some other joints cannot move at all which are known as immovable joints for example the joints in our skull. Some joints can move only slightly, are known as slightly movable joints.

There are six basic types of joints:

1. Immovable Joints: (The Skull)
2. Gliding Joints: (The Wrist, Clavicle, Sternum)
3. Hinge Joint: (The Elbow, fingers, lowers Jaw)
4. Pivot Joint: (The Neck, Atlas and Axis)
5. Ball and Socket Joint: (The Shoulder)
6. Slightly Movable Joints: (The Spine)
7. Synovial Joint: Freely Movable Joint

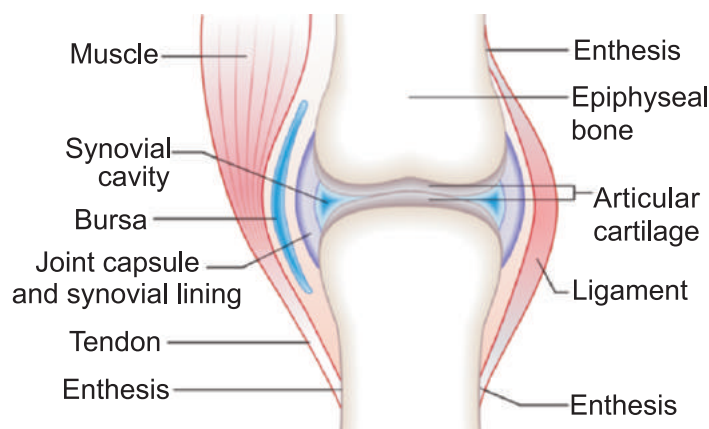


Figure: A Typical Joint

Review Questions:

Fill in the blanks:

- a) The study of bone is known as _____.
- b) There are total no of _____ separate bones in an adult.
- c) Red blood cells are formed in the _____.
- d) Small bones called _____ bones.
- e) Freely movable joints are known as _____ joints.

1.3 Muscular System

Introduction: The group of muscles is called the Muscular System. Muscles make up nearly half of our weight; they support our body and give it its shape. The study of muscles and muscular system is called as Myology. Muscles are of various sizes & shapes. Some are very large, such as in the arms, legs, chest and back. Some of the muscles of face & neck are so small that it is difficult to locate their origin. Along with other muscles these tiny muscle create many facial expressions & assist in talking, laughing, yawning & chewing.

Muscles are elastic and flexible in feature. They can stretch beyond their normal length or shrink & become thicker than normal. They come back to their original size & shape automatically by expanding & contracting. When muscles are being exercised, the heart rate speeds up & flow of blood to the muscles increases. Muscles are frequently injured when a person falls or receives a hard blow which causes muscle fibers & capillaries to rupture which causes a bruise to appear.

Types of Muscles

There are three types of Muscles:

1. Voluntary Muscles (Striated)
2. Involuntary Muscles (Smooth)
3. Cardiac Muscles (Only found in the Heart)

1. Voluntary Muscles (Striated): These muscles are involved in activities such as running and throwing which is controlled by own will. We can force these muscles to move or not to move, that is why these are called as voluntary muscles. These muscles are attached to bones, skin and other muscles by means of tendons.

2. Involuntary Muscles (Smooth): These muscles are involved in those activities which function independently. They will move whether we wish or not.

3. Cardiac Muscles (Only found in the Heart): These muscles are located in the heart

Muscles according to the position:

- Muscles of the Face, Head and Neck
- Muscles of the Trunk
- Muscles of the Upper Extremity
- Muscles of the Lower Extremity

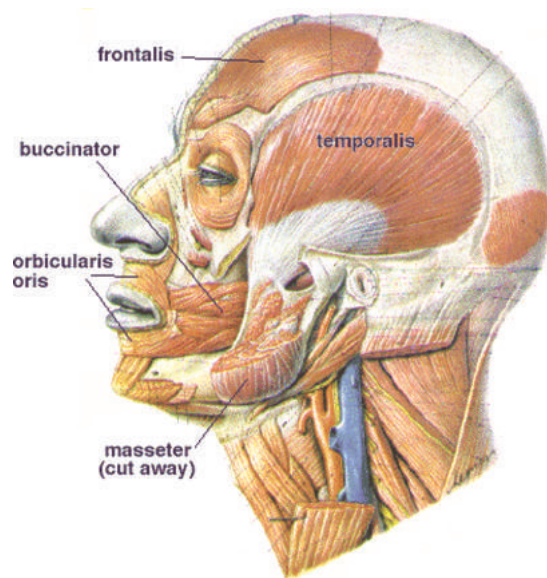


Figure: An overview of Facial Muscles

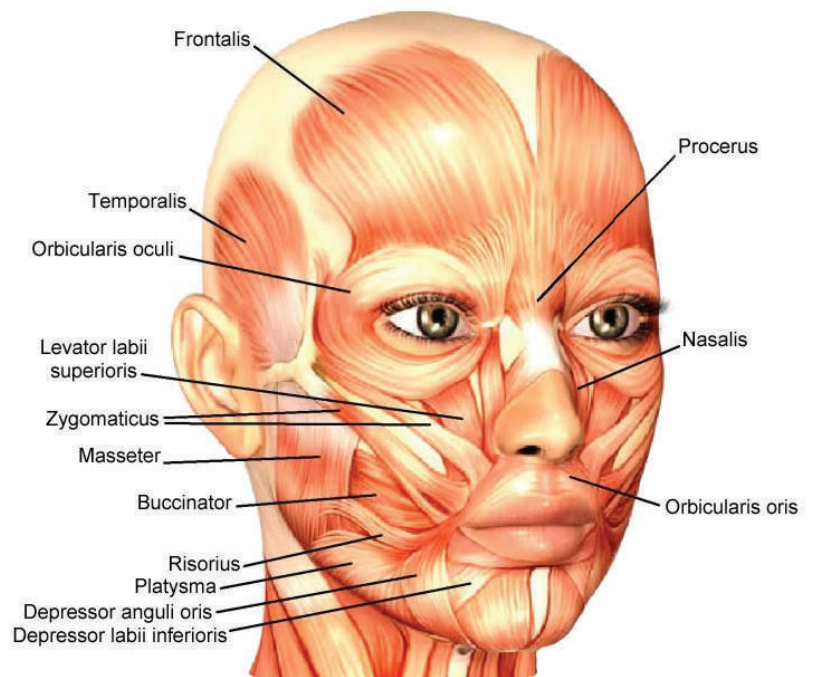


Figure: Facial Muscles

Head and Face Muscles		
Name	Placement	Functions
Frontalis	Front of scalp, forehead, root of nose	Raises eyebrows, draws scalp back, wrinkles brow
Occipitalis	Back of scalp	Draws scalp back
Superior auricularis	Above ear	Draws ear upward
Posterior auricularis	Behind ear	Draws ear backward
Temporalis	Beneath superior auricularis	Opens & Closes jaw during chewing
Masseter	Back of jaw	Closes jaw
Orbicularis Oculi	Encircles eyes	Closes eyelids
Corrugator	Eye brow	Pulls eyebrows down
Procerus	Between eyebrows	Pulls forehead down
Nasalis	Bridge of nose	Opens & closes nostrils
Posterior & Anterior dilator Naris	Skin in nostrils	Opens nostrils
Depressor septi nasi	Membrane dividing nostrils	Closes nostrils
Quadratus labii	Above upper lip	Lifts upper lip
Quadratus labii inferioris	Below lower lip	Pulls down lower lip
Mentalis	Tip of chin	Raises lower lip, wrinkle chin
Buccinators	Sides of mouth between upper & lower jaws	Compresses cheeks aids in chewing
Zygomaticus	Corner of mouth to zygomatic bone	Draws mouth up & back
Triangularis	Sides of chin from corner of mouth	Draws mouth down

Upper Extremities (Shoulders, Arms & Hands)		
Deltoid	Upper arm & shoulder	Lifts, extends, rotates arms
Biceps	Front of upper arm	Raise fore arm & turn palm outward
Triceps	Back of upper arm	Extend fore arm
Pronators	Fore arm	Turn hand, palm & face back
Supinators	Fore arm	Turn hand, palm & face forward
Extensors	Fore arm	Straiten wrist & hand points forward
Flexors	Fore arm	Bend wrist & clenched fist backward
Adductors	Base of fingers & thumb	Draw fingers together
Adductors	Base of fingers & thumb	Separate fingers

Neck, Chest, Back & Abdominal		
Platysma	Runs from chin to shoulders & chest	Draws down lower jaw
Sternocleidomastoid	Runs from collar & chest bones to behind ears	Draws head forward, back & side ways

Pectoralis major	Runs across chest from breast bone to upper arms	Draws arm across chest, elevates ribs
Pectoralis minor	Underneath & below pectoralis major	Draws shoulder muscles to forward
Trapezius	Back of neck & upper part of back	Raises & lowers shoulders
Rectus Abdominus	Expands to the whole length of abdomen	Support the abdominal organs & flexes vertebral column

Lower extremities (Thighs & Legs)		
Quadriceps(Anterior thigh)	On the front of the thigh	Extend the length & flex the hip
Tensor fascia lata (Lateral aspect of thigh)	Sides of thigh	Rotates the thigh inward
Hamstrings(Posterior aspect of thigh)	Group of three muscles on back of the thigh	Flexes the knee & extends the hip
Gluteus maximus (the buttocks)	Lower part of back forming buttocks	Rotates thigh laterally
Gluteus medius	Lateral part of buttocks	Rotate medially femur & anterior fibers
Gluteus minimus	Lateral part of buttocks beneath gluteus medius	Rotate medially abducts femur & anterior fibres
Tibialis Anterior	Down the shine bone (dorsi flexes)	Lifts up & Inverts the foot
Extensors of the toes	Down front of lower leg	Extend toes & dorsi flex foot
Peroneus	Down the outside of lower leg	Stability to the foot
Soleus	Back of lower leg	Flexion of the foot

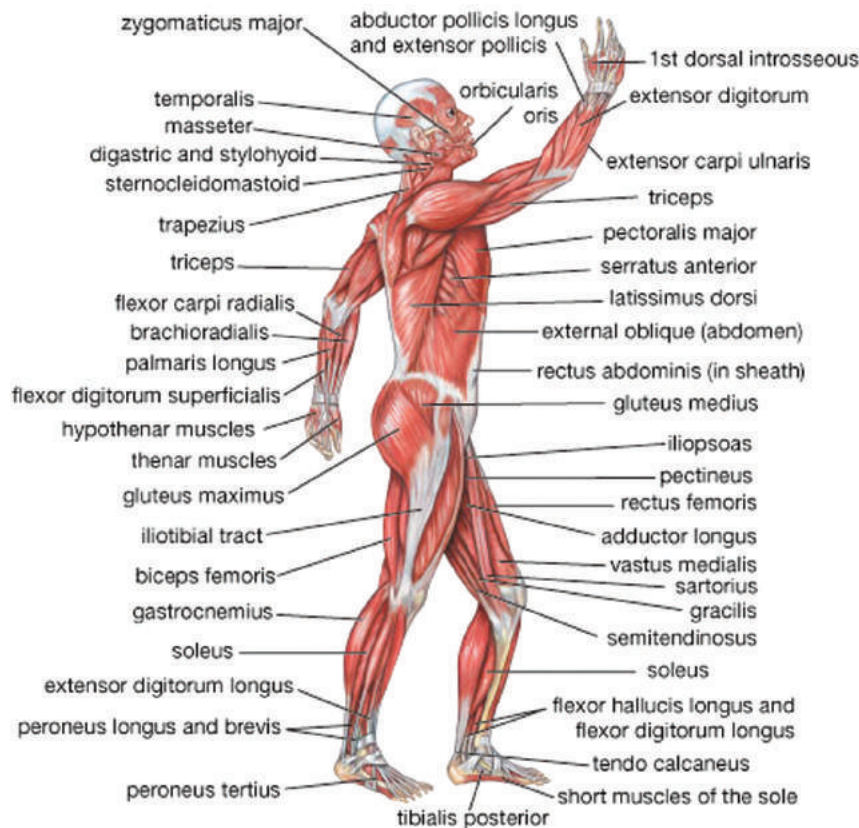


Figure: An Overview of Human Muscular System

Functions of Muscular System:

1. Movement of body parts: Skeletal muscles are responsible for all voluntary movements of human body parts.
2. Provide stability and posture: Skeletal muscles stabilize human skeleton and give a proper posture to human beings.
3. Heat production: Heat produced by muscles is very important during cold climates to regulate body temperature.
4. Circulation: The regular pumping of heart keeps the blood in motion and nutrients are readily available to every tissue of human body.
5. Help in digestion: Smooth muscles of organs like stomach and intestine help the digestive system in the process of digestion of food.

Review Questions:

- Q1. Define muscular system?
- Q2. Write the types of muscles?
- Q3. Write three functions of muscular system?
- Q4. What is the study of muscles called?

1.4 Summary:

The study of Anatomy & physiology of the body will help students to understand basic processes of the body. In the study of beauty & hair, student are required to understand cell, tissues, structure of skull & various types of muscles with their working and their placement. All the systems of the body work together for good health & beauty of an individual.

Exercise Question

- Q1. What do you understand by cell? Write its parts & functions?
- Q2. Explain tissues and its types with the help of illustrations?
- Q3. Write the functions of the skeleton system?
- Q4. What are the basic types of joints in the human body?
- Q5. Name the muscles of the face & its placement?