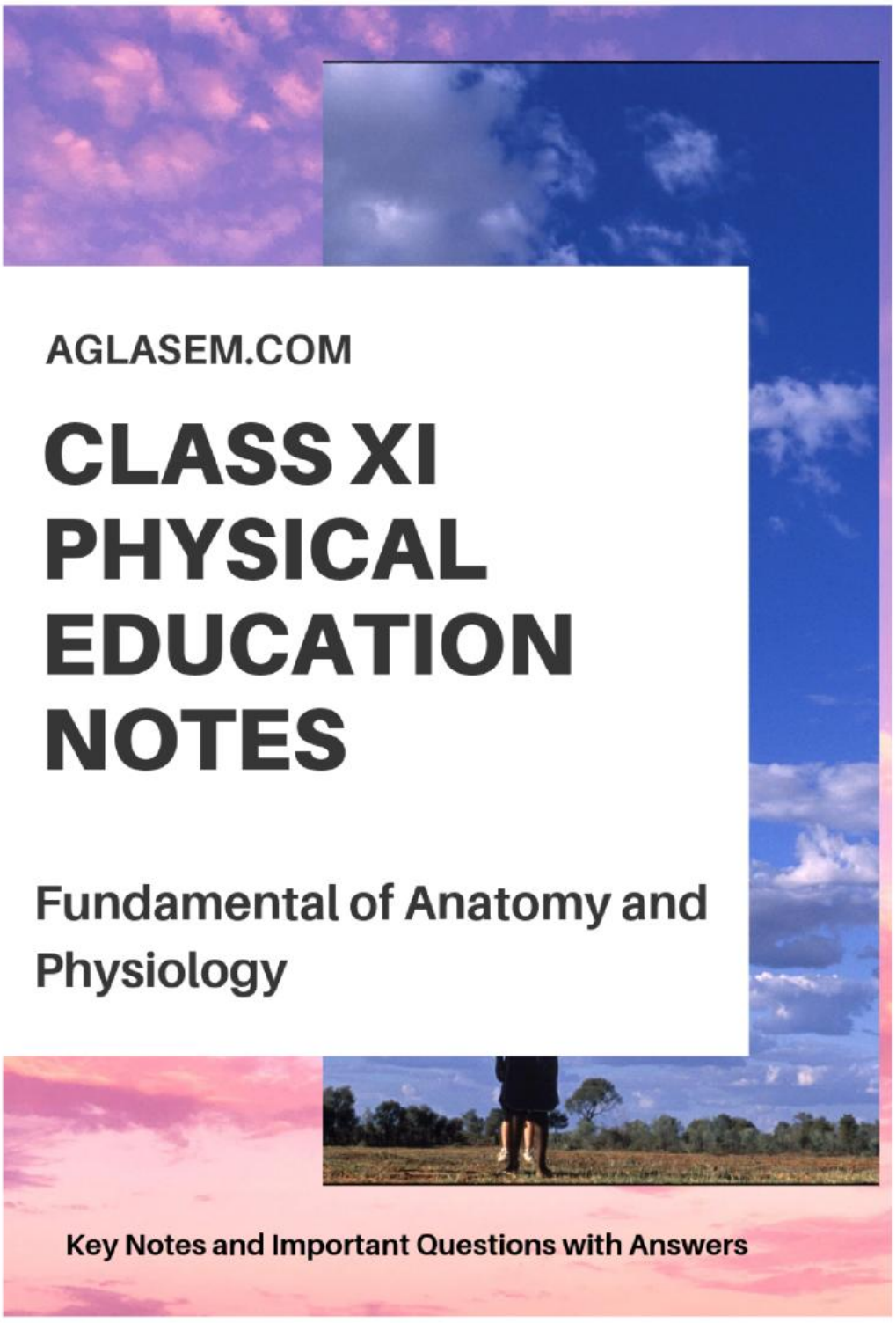

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CLASS XI PHYSICAL EDUCATION NOTES

Fundamental of Anatomy and Physiology

Key Notes and Important Questions with Answers

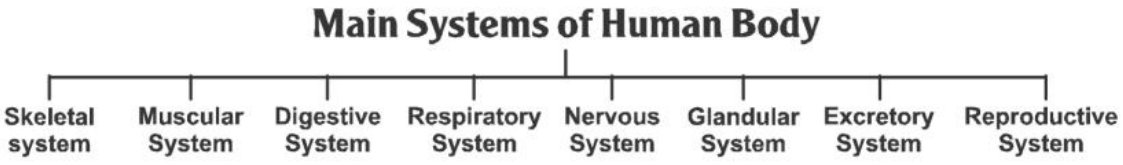
Unit - 8

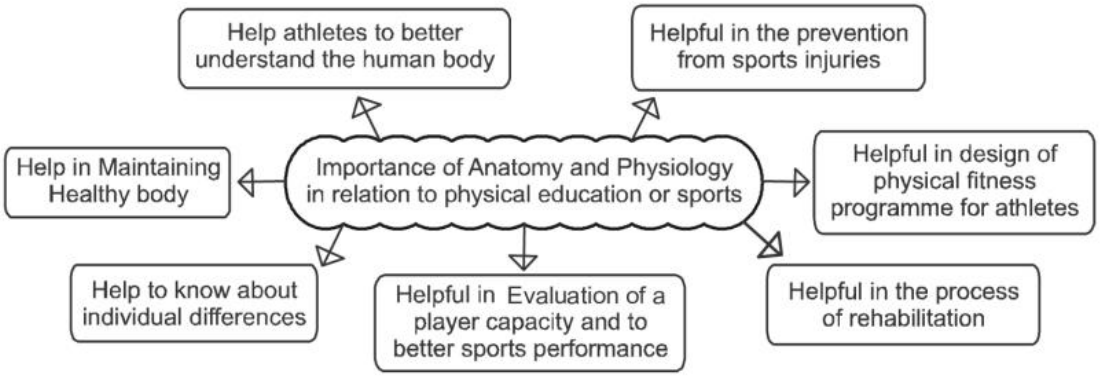
Fundamentals of Anatomy and Physiology

- 8.1 Definition of Anatomy, Physiology and its importance
- 8.2 Functions of skeleton system, classification of bones and types of joints
- 8.3 Function and structure of Respiratory system
- 8.4 Structure of Heart and Introduction to circulatory system

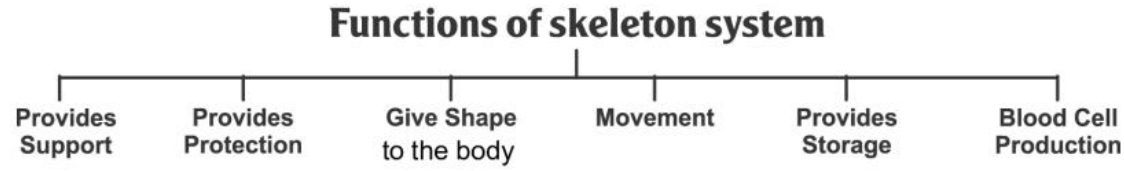
8.1 **Anatomy :** Anatomy is the study of the shape and structure of the body

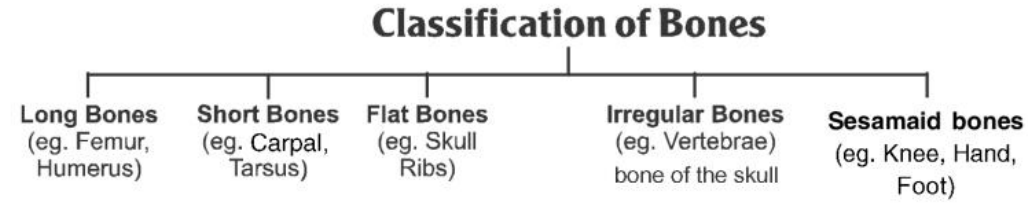
Physiology: It is the study of functions and systems of human body.





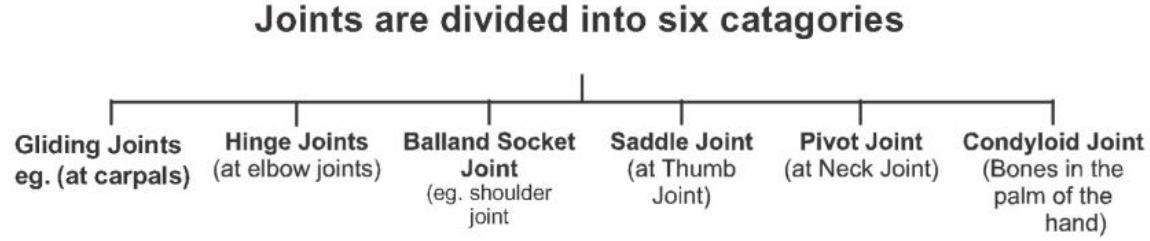
8.2 **Skeleton System:** This is the bony frame work of body consisting of numbers of bones. Total bones in human body are 206.





Types of Joints

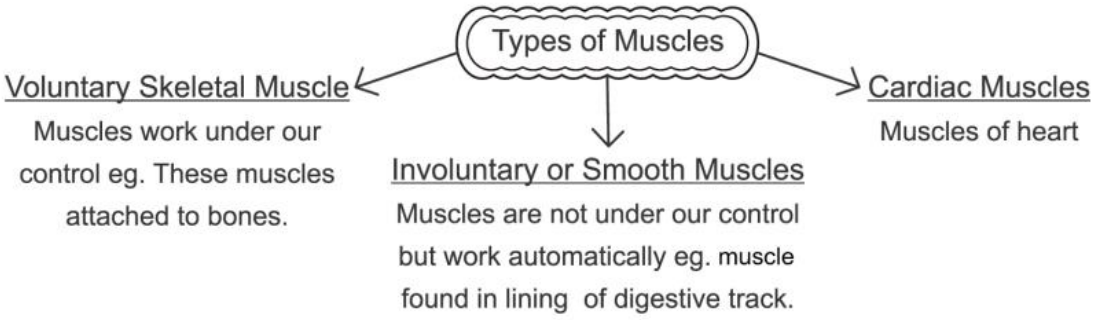
1. Immovable Joints: These joints are fixed and do not move eg. skull Joint
2. Slightly Movable Joints: The movement of such joints is very limited eg. Inter-vertibrations.
3. Freely Movable Joints: Such joints are freely movable.

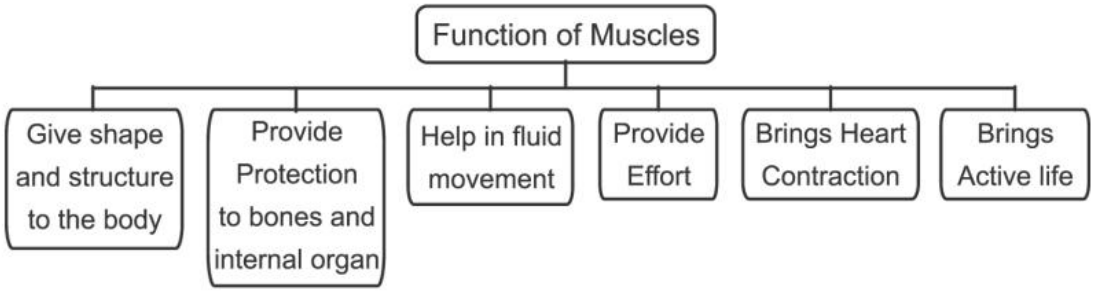


8.3 Muscular System :- Properties of Muscles

Defination of Muscle : Muscle is the tissue composed of fibers capable to effect bodily movement or muscle is the body tissue that can contract to produce movement.

- Movement is possible in the human body due to the contraction and expansion of muscles.
- Human muscular system is made up of approx 600 muscles which act in group.
- The study of muscles is known as 'Myology'
- They also give shape to the individual.
- 40% to 50% of body weight is the weight of muscles in the body.
- Muscles also assist in the circulation of blood.





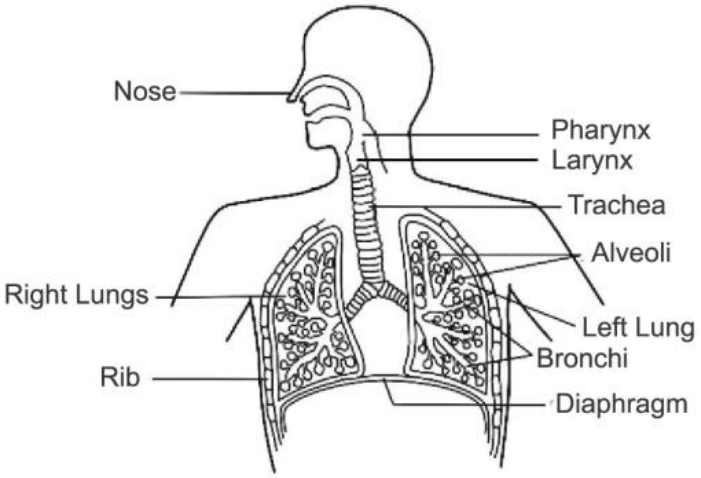
Structure of Muscle : Every muscle fibre made up of very large number of microscopic threads called myofibril. Each myofibril consists of protein molecules called Actine and myosin.

8.3 Structure and functions of Respiratory system:

— Respiratory System: The Respiratory system is a system which regulates the exchange of gases.

Structure of the respiratory system involves the following organs in human beings





Types of Respiration

1. External Respiration
2. Internal orTissues Respiration

Functions of Respiration System

— To provide oxygen to blood

— Removal of waste products from the body eg. CO_2

— Maintain body temperature

— It affects circulation of blood

8.5 Structure of Heart and introduction of circulatory system

Circulatory System : Circulatory system serves the function of transporting materials in the body. It consist of heart and blood vessels (arteries, veins, capillaries)

Heart: The human heart is a hollow cone-shaped muscular organ. It is a pumping system inside the body.

Structure of Heart: The heart is divided into four chambers. A septum divides it into a left and right side. Each side is further divided into an upper and lower chambers. The upper two chambers called auricles and the bottom chambers are ventricles.

Function of Heart :
- Systemic Circulation
- Pulmonary Circulation

Arteries - Arteries are blood vessels that take blood away from the heart, except for pulmonary artery, which carries deoxygenated blood from the heart to the lungs.

Classification of Arteries



Veins	:	Veins are blood vessels that return blood to the heart.
Capillaries	:	Exchange of material take-place in capillaries.
Blood	:	Blood is a special mixture of fluid which acts as a medium of transporting nutrients and gases from one part of body to another.
Heart Rate	:	It is number of pumping of heart in one minute.
Stroke Volume	:	It is the volume of blood pumped by heart in one beat. It is approximately 80 ml per beat in normal adult, whereas trained players have 100 ml per beat as stroke.
Cardiac Output	:	Stroke volume x heart rate. It is 5 to 6 liters at basal level.
Blood Pressure	:	It is the force exerted by the blood on the walls of the bloodvessels
Second Wind	:	The breathlessness caused due to prolonged exercises is removed automatically by our body. It is called as second wind.
Oxygen Debt	:	The amount of oxygen taken by an athlete during the recovery period after strenuous activity is called oxygen debt.

MODEL QUESTIONS AND ANSWERS

VERY SHORT ANSWER 30 (WORDS -1 mark)

Q.1 Define anatomy.

Ans. Anatomy is the study of the structure of human body. The term anatomy comes from Greek words: ANA means apart and TOMY means to cut. It is because anatomy was first obtained through dissection.

Q.2 Define physiology.

Ans. Physiology is the study of functions of human body. In other words physiology is the science of mechanical, physical, bioelectrical, biochemical functions of human organs and the cells of which they are composed of.

Q.3 Name any four physiological systems of human body.

Ans. (i) Skeletal System (ii) Muscular System

(iii) Digestive System (iv) Respiratory System

Q.4 Define skeletal system.

Ans. The skeletal system is the bony framework of our body. It consists of all the bones of the body. It supports the body and gives it a shape.

Q.5 What do you understand by joint?

Ans. Joint is the place at which two or more bones meet in the skeleton of the body. Joint may be fixed or movable.

Q.6 Which is the longest and the smallest bone in human body?

Ans. The longest bone in human body is Femur (thigh bone). And the smallest bone in the human body is stapes (ear bone).

Q.7 What is a muscle?

Ans. Muscle is the tissue composed of fibers capable of contracting for effective bodily movements or muscle is the body tissue that can contract and produce movement.

Q.8 Enlist types of muscles.

Ans. (i) Voluntary/skeletal/striated muscle

(ii) Involuntary or smooth or spindle muscle

(iii) Cardiac muscle

Q.9 Which is the hardest working muscle in our body?

Ans. Cardiac muscle is the hardest working muscle in our body.

Q.10 Which is the strongest muscle in our body?

Ans. Jaw muscle is the strongest muscle in our body.

Q.11 How many bones are there in a Child and an Adult?

Ans. Achild has 213 bones and an adult has 206 bones.

Q.12 What is tidal volume?

Ans. It is the volume of air that is taken in or given out during normal breathing.

Q.13 What is vital capacity?

Ans. It is the volume of air that can be breathed out by force expiration after taking a deep breath. It is about 4800 cc in males and about 3100 cc in females.

Q.14. What is heart rate?

Ans. It is the number of pumping/contractions of heart in one minute. It is about 72 times per minute under normal conditions in an adult.

Q.15 What is stroke volume?

Ans. It is the volume of blood pumped out by heart in one beat contraction. It is approximately 80 ml/beat in normal adult, whereas trained players have 110 ml/beat as stroke volume.

Q.16 What is cardiac output?

Ans. Cardiac Output = stroke volume x heart rate. It is 5 to 6 liters at basal level. In untrained person, it can go unto 20 liters and in trained athletes it can go unto 40 liters.

Q.17 Where is tricuspid valve situated?

Ans. Tricuspid valve is situated in the right half of the heart.

Q.18 Which is the main artery of circulation:?

Ans. The main artery of circulation is Aorta. It carries pure blood to various parts of the body.

Q.19 What do you mean by axial skeleton system?

Ans. Axial skeleton system transmits weight from head, trunk the upper limbs down to the hip joints. It is responsible for the upright position of the human being.

VIJAY GUPTA ° ° °

Q.20 What do you mean by appendicular skeleton system?

Ans. The appendicular skeleton system makes locomotion possible. It also protects organs of digestion, reproduction and excretion.

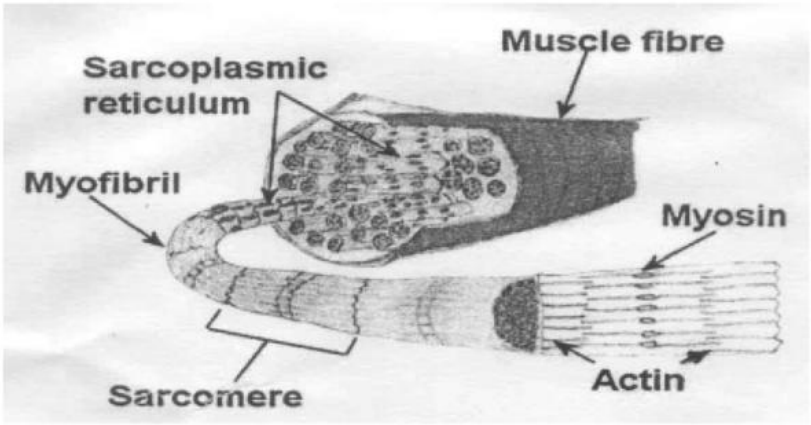
Q.21 Where are hinge joints found in human body?

Ans. Hinge joint are found in the elbow joints, knee joints and phalanges in finger in the human body.

SHORT ANSWER TYPE (60 WORDS - 3 MARKS)

Q.1 Explain structure of the muscle with the help of a diagram.

Ans. There are about 600 voluntary muscles in the body. Each muscle is made up of thousands of long and narrow muscle cells called muscle fibers. These muscle fibers are arranged in bundles and enclosed within a tough layer of connective tissue called epimysium (sarcolemma). Every muscle fiber is made up of very large number of microscopic threads called myofibril. Myofibril consists of protein molecules called actin and myosin.



2. Explain external and internal respiration.

Ans. Inhalation and exhalation are the two processes of external respiration. This breathing process oxygenate to the blood. It gets purified as carbon dioxide is removed from the blood. External respiration takes place in the lungs. Internal respiration is the process of respiration that takes place in the tissues and cells. Blood full of oxygen reaches the tissue where oxygen is used up during energy production process and carbon dioxide is then taken by the blood to the lungs.

Q.3 Define the phenomenon of second wind. What are its causes and symptoms?

Ans. The breathlessness caused due to prolonged exercise is removed automatically by our body within short span of time of such exercise. This sense of relief is called 'second wind'.

Causes of second wind: When we perform strenuous exercise, our body takes some time to adjust according to the increased demand of energy. So, the second wind occurs before the adjustment.

Symptoms of second wind:

i. Faster breathing

ii. Signs of tension and worry on the face

iii. Headache

iv. Suffocation in the chest appears

v. Pain in muscles

vi. Condition of giddiness appears. These painful feelings disappear with the onset of second wind.

Q.4 What are the functions of respiratory system?

Ans. The main functions of respiratory system are given as under:

i. To exchange oxygen and carbon dioxide between the air and blood,

ii. To produce sound, it helps vocal chords to produce sound,

iii. To regulate blood PH level.

iv. To protect against some micro organism. Respiratory system blocks the entry of microorganism in the body at various levels, thus it provides protection against harmful microorganisms like virus, bacteria, etc.

Q.5. Explain the functions of heart.

Ans. The main functions of heart are given below.

i. It circulates the pure blood to all parts of the body. This is called systemic circulation.

ii. It carries the impure blood from all parts of the body to the lungs for purification. This is called pulmonary circulation.

iii. It regulates the blood pressure.

iv. It regulates the heart rate.

v. Regular exercise improves the efficiency of the heart.

Short Answer Question (80-100 words carrying 3 marks)

Q.6 Write down the main functions of muscles

Ans. Function of muscles :- Muscles are machine for converting chemical energy into mechanical work. The contractions and relaxations of muscles due to certain chemical changes in our body are:

1. To produce and control movements of the body
2. To maintain natural posture of the body acting on the bony structure
3. Helping in the economy of effort by working in association with long levers and pulleys.

Q.7 Write difference between slow twitch fibre and fast twitch fibre.

Ans. Slow twitch fibre are also know as red fibers which contract slowly. These play significant role in aerobic activities as we may see in long distance and cross country races. Fast twitch fibers: These fibers are also known as white fibers. These fibers contract quickly and provide strength and speed but they fatigue more quickly. Those individuals who need intense burst of energy for shorter duration as in boxing, jumping events or throws need more percentage of fast twitch fibers.

Value based question

Arjita is studying in class 8th She has started playing football recently. While chasing the ball, she feels breathlessness and hardness in muscles so, she takes some rest. After a short while she feels comfortable and started playing again.

Q.1 While running we feels breathlessness and after resting we feel better. Write the process behind this phenomenon.

Ans. Second wind.

Q.2 What should be done to avoid this process?

Ans. One should do continuous training.

Q.3 Football players needs which components of physical fitness more?

Ans. Speed, strength and endurance.

LONG ANSWERS QUESTIONS
(150 WORD CARRYING 5 MARKS)

Q.1 What are the functions of blood?

Ans. Important functions of blood are given as under:

i. Transport of oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs.

ii. It carries food material absorbed from the intestines to the tissue, cells for growth, energy and repair process.

iii. It carries the waste products of cellular activity and carries them to kidneys, lungs and intestines for excretion.

iv. It carries hormones, vitamin and other chemicals to the place of need.

v. It helps to maintain water balance in the body.

vi. It regulates the body temperature.

vii. White blood cells of the blood acts as a defensive mechanism

Q.2 What are the functions of skeletal system?

Ans. Main functions of skeletal system are given below.

(i) **Shape and structure** : The boney framework gives human being its shape and structure like tall or small, thin or stout

(ii) Support : It gives support to the body. The bones provide support to our muscular system.

(iii) Protection : Bones protect our vital organs. Example: skull protects brain, thoracic cage protects heart, lungs and pancreas.

(iv) Lever : Bones act as a lever like a simple machine. For example while lifting a weight, movable joints like elbow joint acts like fulcrum and length of arm bone acts like crow bar to reduce effort and helps to lift weight-

(v) Storehouse : The hollow space of bones acts like a storehouse of different minerals and salts like calcium, potassium, iron, etc.

(vi) Production of RBCs : Red blood cells are produced in the bone marrow. It is the factory to produce RBCs.

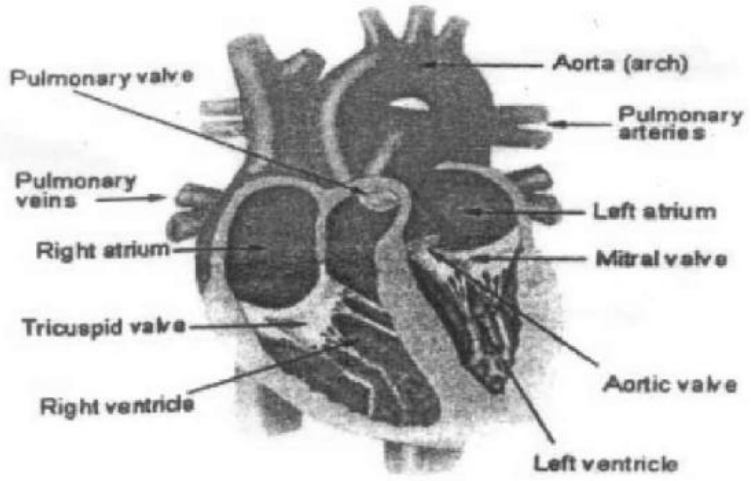
(vii) Junction : Bones provide junction or attachment to skeletal muscle that helps in visible movement.

(viii) Self-repair : Whenever bones are damaged, they are capable of doing self repair.

Q.3 Explain the structure of heart with the help of diagram.

Ans. The human heart is a four chambered muscular organ shaped and sized roughly like a man's closed fist with two-thirds of the mass to the left of midline, self repair.

Internal View of the Heart



Chambers of the Heart

The internal cavity of the heart is divided into four chambers:

* Right atrium
* Right ventricle
* Left atrium
* Left ventricle

The two atria are thin - walled chambers that receive blood from the veins. The two ventricles are thick- walled chambers that forcefully pump blood out of the heart.

The right atrium receives deoxygenated blood from systemic veins; the left atrium receives oxygenated blood from the pulmonary veins.

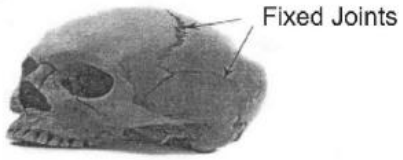
Valves of the Heart

Pumps need a set of valves to keep the fluid flowing in one direction and the heart is no exception. The heart has two types of valves that keep the blood flowing in the correct direction. The valves between the atria and ventricles are called atrioventricular valves (also called cuspid valves), while those at the bases of the large vessels leaving the ventricles are called semilunar valves. When the ventricles contract, atrioventricular valves close to prevent blood from flowing back into the atria. When the ventricles relax, semilunar valves close to prevent blood from flowing back into the ventricles.

Q.4 Explain different types of joints in human body.

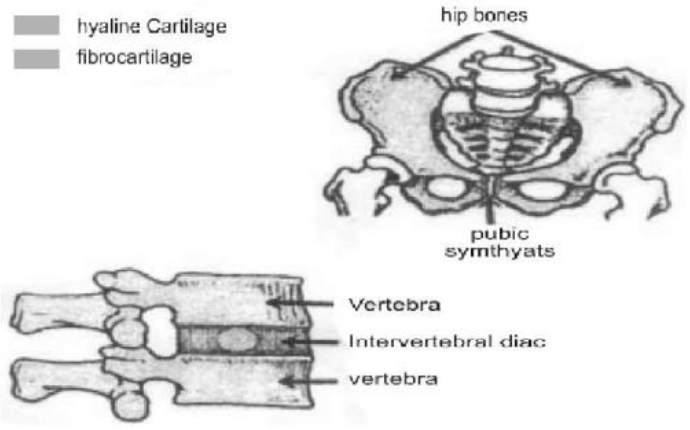
Ans. Following are the different types of joints,

(i) Immovable or fibrous joints: They are fixed joints. They never move. Example: joints of skull.



(ii) Slightly movable or cartilaginous joints:

These joints provide very little movement. Example: backbone joints, pelvic joints.



(iii) Freely movable or synovial joints.

These joints provide different movements. There are five main types of movable joints,

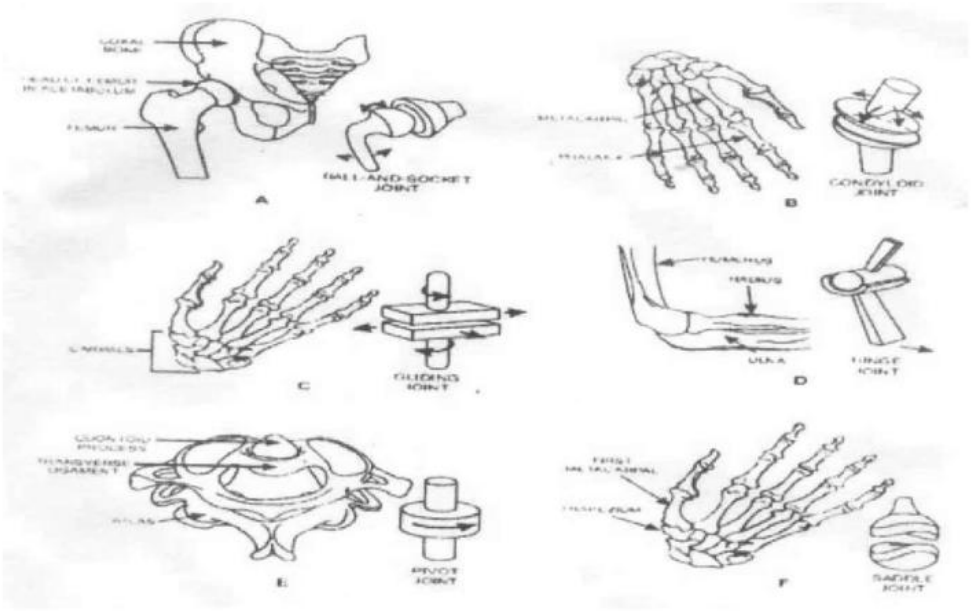
a. **Hinge joint.** These joints allow a forward and backward movement. Example; knee joints, elbow joints.

b. **Pivot joint.** These joints give a rotation movement. Such as the movement of neck.

c. **Ball and socket joint.** In these joints one bone has ball like shape and other has a socket like shape. They are fit together to make a free movable joint. Example shoulder joint and hip joint.

d. **Saddle joint.** It is a joint where one of the bones forming the joint is shaped like a saddle with the other bone resting on it like a rider on a horse. Example: wrist joint.

e. **Gliding joint.** It is a joint in which articulation of contiguous bones allows only gliding movements, as in the wrist and the ankle.



Q5. Write in detail about classification of bones.

Ans. Classification of Bones

1. Long bones: They are long and wide. They act as lever. They are found in legs and arms. Example: humerus, femur, tibia and fibula.

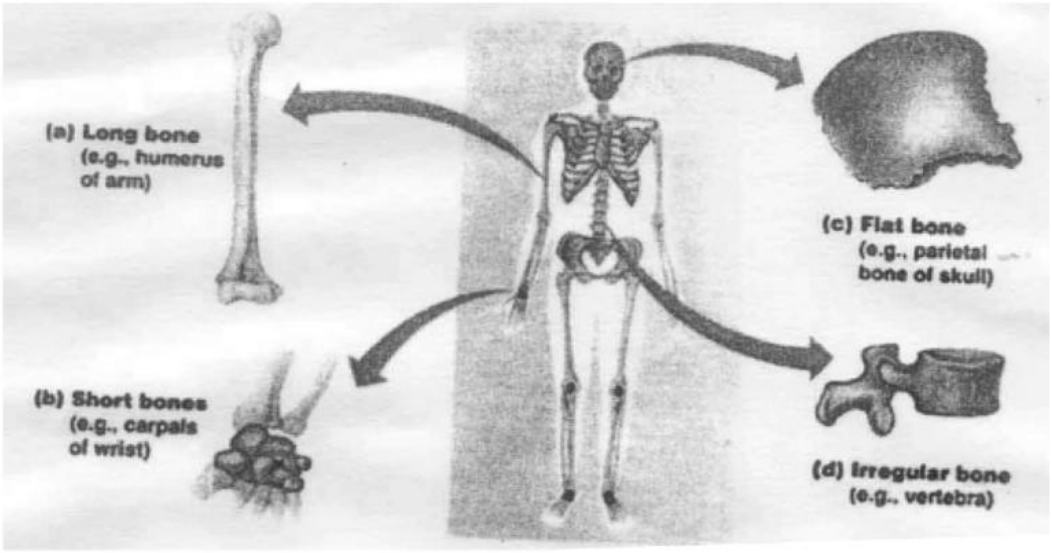
2. Short bones: They are short in size and cube shaped. They are found in wrist and phalanges. Example: metatarsal and carpal.

3. Flat bones: These bones are flat and thin. They are composed of a central layer of sponge bone fixed between two outer layers of compact bone. Example: ribs and shoulder.

4. Sesamoid bones: These bones are seed like shaped and developed in the tendons where there is more friction. Example: palms of hands, sole of feet and knee caps,

5. Irregular bones: These bones have in complete shaped as compared to other types. The bones of spinal column and skull are examples of these bones.

   They are situated in Sutura points in the skull.



Q.6 Elucidate the importance of anatomy and physiology in the field of sports.

Ans. Study of anatomy and physiology plays very important role in the field of sports because of following reasons.

(i) Helps in physical fitness: Strong and fit body is an inevitable asset in the field of sports. Study of anatomy and physiology helps a sport person to understand the structure and function of different parts of human body and to acquire a fit and healthy body.

(ii) Provides knowledge about body structure; on the basis of knowledge of body structure, a sports person knows about the strength and weakness of his body and accordingly they can develop forte in the field of game which is suitable for the sports person as per their body structure.

(iii) Helps in selection of games: on the basis of knowledge of body structure, the coach and player can choose an appropriate sport/ game which is suitable for a particular sport. Like tall students can be selected for basketball and volleyball. And short and stout students can be selected for weight lifting.

(iv) Protects from sports injuries: on the basis of anatomy, sports equipments are designed that help in safe play.

(v) Helps in the process of rehabilitation: knowledge of ligaments, tendons and muscles helps in rehabilitation from the injuries sustained during the game or sport.

(vi) Helps in maintaining healthy body: study of anatomy and physiology provides detailed knowledge about all body parts, their nature and functions. This helps the player to adopt good, safe and healthy use of body.

(vii) Helps to know about individual differences: there is a lot of difference between the body of male and female. The knowledge of anatomy and physiology helps in understanding these individual differences. On the basis of these differences, the size of the court, time of game and equipment are designed differently for male and female players.