



CHAPTER 16

Support and Movement



- **Exercise Short Answers**
- **Important Short Answers**
- **Exercise MCQ's**
- **Important Additional MCQ's**
- **Past MDCAT MCQ's**

Exercise Short Answers

Q:1 What is the cause of cramps?

Ans: Causes of cramps:

- Low blood sugar
- Electrolyte depletion
- Dehydration
- Irritability of spinal cord
- Neurons

Q:2 What is the difference between Tetanus and Muscle Tetany?

Tetanus	Muscular Tetany
• It is an acute infections disease caused by anaerobic bacterium <i>Clostridium tetani</i>. • It results in persistent painful spasms of some skeletal muscles. Initially it causes lock jaw, then spasm of trunk and limb muscle, usually fatal due to respiratory failure. • It is major killer in developing countries where mortality rate is 40%.	• It is the disease caused by low calcium in blood. • It increases the excitability of neurons and results in loss of sensation. • Muscle twitches and convulsions occur. • If untreated, may lead to spasm of larynx, respiratory, paralysis and ultimately death occurs.

Q:3 What is a ligament?

Ans: Ligament:

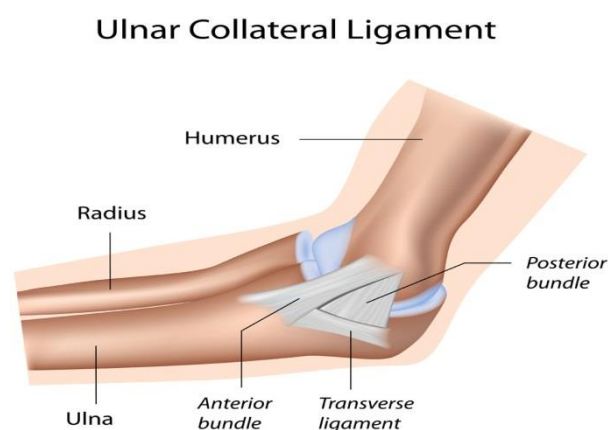
Ligaments attach bone to bone and are slightly elastic.

OR

Ligaments are tough but elastic bands of connective tissues that hold the bones together at a joint.

Example:

Ligaments holding ulna and radius with the humerus.



Q:4 What is nutation?

Ans: Nutation:

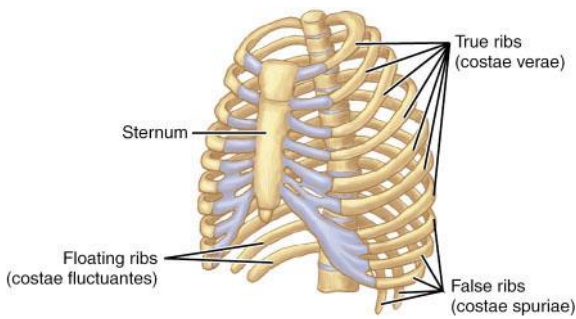
The growing tip of young stem moves in a zig-zag fashion due to alternate changes in growth on opposite side of the apex. This mode of growth is called nutation.



Q: 5 How many ribs do not attach with the sternum?

Ans:

Two pairs of ribs do not attach with the sternum. These two pairs of ribs are called as floating ribs.



Q:6 How rickets produced?

Ans:

Rickets is a disease in children with bowed legs and deformed pelvis. It is caused by deficiency of calcium in diet or vitamin D deficiency.

Q:7 What is the cause of tetanus?

Ans: Cause of tetanus:

Tetanus is an acute infections disease caused by anaerobic bacterium Clostridium tetani.

Q:8 How muscle fatigued is produced?

Ans: Muscle fatigued is produced:

- Muscle fatigue results from relative deficit of ATP.
- When no ATP is available contractures or states of continuous contraction result because the cross bridges are unable to detach.
- Excess accumulation of lactic acid and ionic imbalance also contribute to muscle fatigue. Lactic acid, which causes muscle pH to drop (and the muscle to ache) causes extreme fatigue by breaking glucose.

Q:9 Distinguish between the following:

Ans:

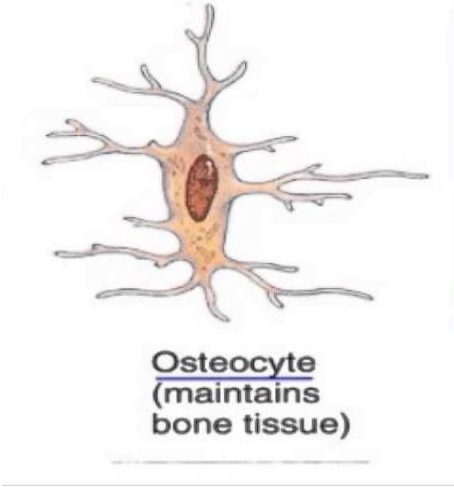
(a) Axial skeleton and Appendicular skeleton:

Axial skeleton	Appendicular skeleton
• The axial skeleton is consists of the skull, vertebra, ribs and sternum.	• Appendicular skeleton consists of pectoral girdle with appendages (fore limb) and pelvic girdle with appendages (hind limb).
• Function: ▪ It forms main axis of body. ▪ It protects head, neck and chest.	• Function: ▪ It forms extension of main axis. ▪ It forms lever system which gives mobility to body.
Figure 7-1b The Axial Skeleton Anterior (left) and posterior (right) views of the axial skeleton. The individual bones associated with the skull are not visible. p. 208 © 2015 Pearson Education, Inc.	Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

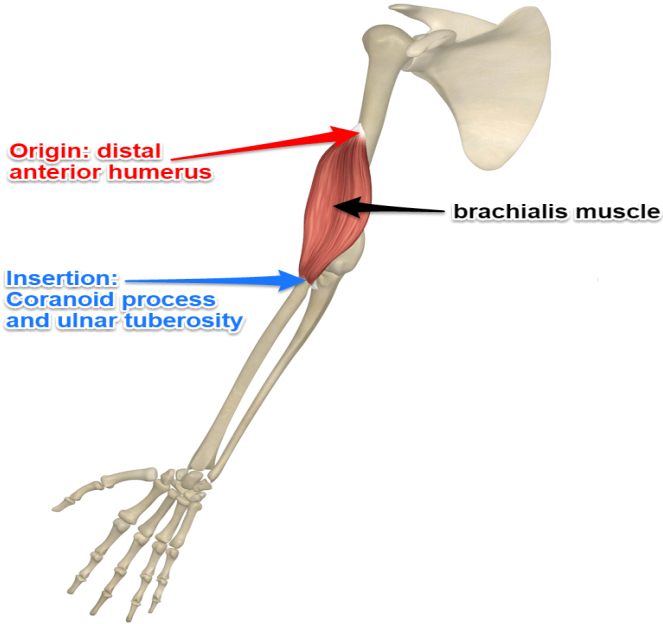
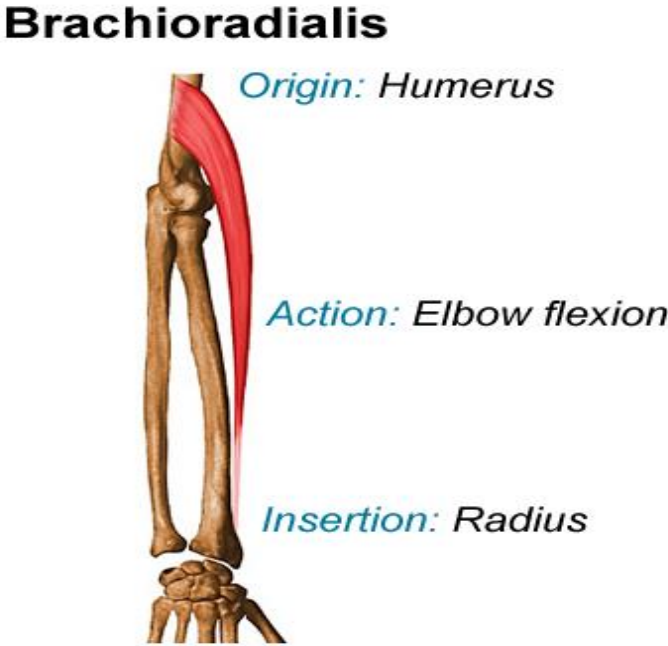
(b) Phototactic and Chemotactic stimulus.

Phototactic stimulus	Chemotactic stimulus
Phototactic stimulus is light stimulus.	Chemotactic stimulus is chemical stimulus.
Example: For example passive movement of chloroplast.	Example: For example movement of sperms of liverworts, mosses, ferns toward archeogonium.

(c) Osteocyte and Osteoblast.

Osteocyte	Osteoblast
They are called mature bones cell.	They are called bone forming cells.
	

(d) Brachialis and Brachioradialis.

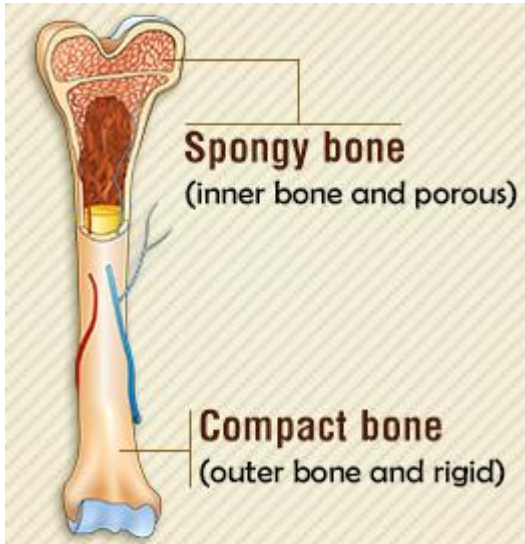
Brachialis	Brachioradialis
Muscles inserted in ulna are brachialis.	Muscles inserted in radius are brachioradialis.
It is attached to immovable bone.	Its origin is humerus and is inserted in the radius.
	

(e) Origin and insertion muscles.

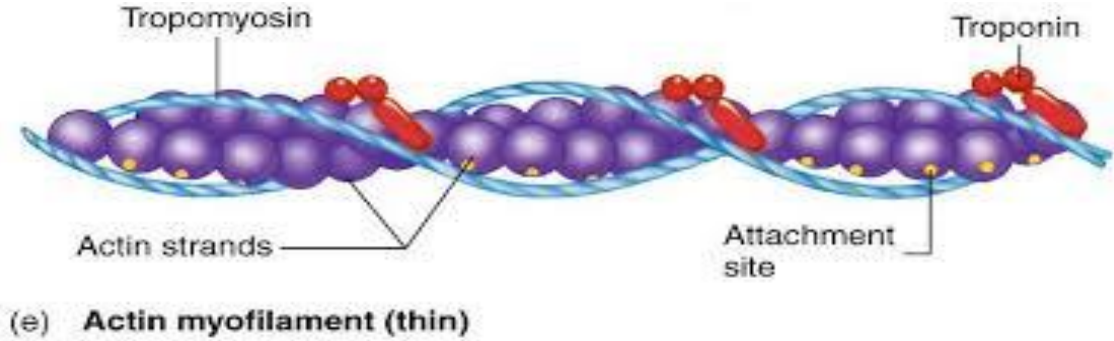
Origin	Insertion
- Origin is the end of muscle which remains fixed when muscle contracts. - OR - Origin is the end that does not move when the muscle moves.	- Insertion is the end of the muscle that moves the bone. - OR - Insertion is the end that does move when the muscle move.

• Origin tends to be more proximal.	• Insertion tends to be more distal.
• Origin of a muscle attaches to a less movable bone.	• Insertion of a muscle attaches to a more moveable bone.

(f) Bone and cartilage:

Bone	Cartilage
• Bone is the most rigid form of connective tissue.	• It is a form of connective tissue, softer than bone.
• Bones are hardened by deposition of calcium phosphate in collagen fiber.	• Cartilage is not hardened by deposition of calcium phosphate.
• Bones give support to the body.	• Cartilage cover ends of bones at joints and provide support to flexible portion of nose and ear.
• The living cells of bone are osteocytes.	• The living cells of cartilages are chondrocytes.
• Blood capillaries penetrate into bone.	• Blood capillaries do not penetrate into bones.
• Bones grow faster.	• Cartilages grow slower.
• Bones produce red and white blood cells.	• Cartilages produce no red and white blood cells.
	

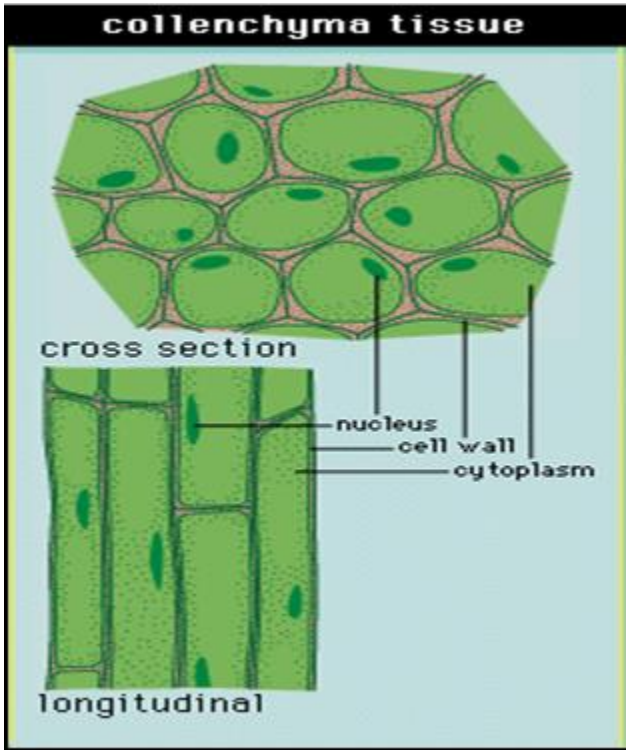
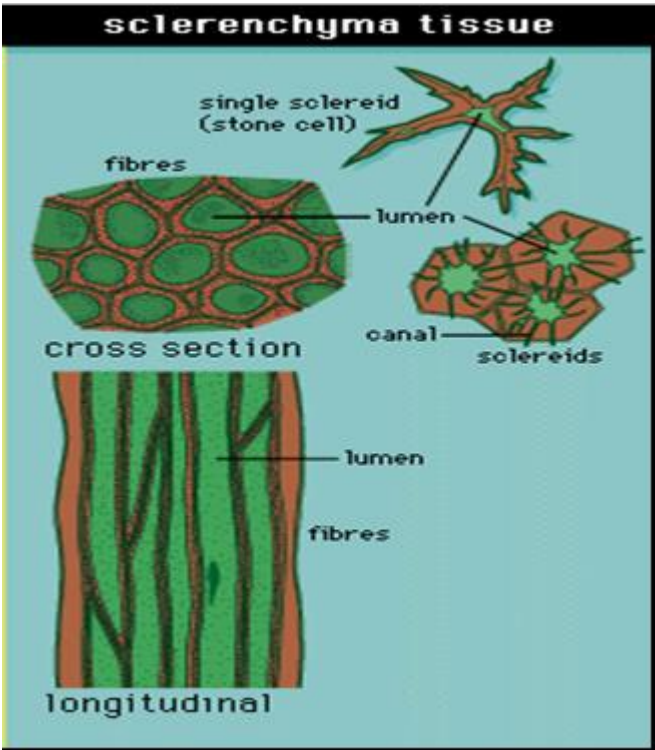
(g) Troponin and Tropomyosin:

Troponin	Tropomyosin
• It is a protein consisting of three polypeptide complex found in a skeletal muscle fiber.	• It is a protein consisting of two polypeptides twisted around the actin protein in a muscle fiber.
• Out of the three polypeptides one binds to actin, another binds to tropomyosin while third binds to calcium ion.	• It covers actin binding sites on troponin.
	

Important Short Answers

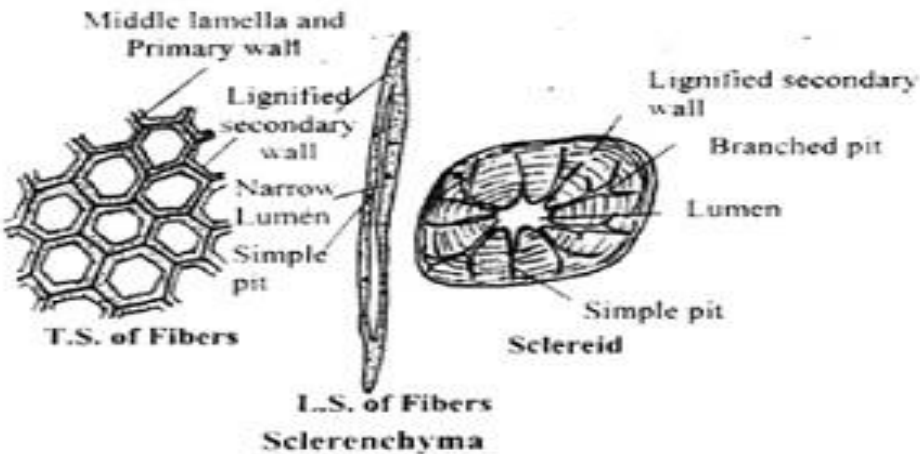
Q:1 Differentiate between Collenchyma and Sclerenchyma cells.

Ans:

Collenchyma cells	Sclerenchyma cells
The living supporting cells with angular thickening in primary walls.	The non-living supporting cell with highly lignified thick secondary wall.
They have protoplast.	They have mostly non-living cells and contain lignin.
They are present in the cortex in the form of strands or cylinder and provide support to young and herbaceous parts of plants.	They are present in xylem tissues and their primary function is to provide support to plant parts. They are seen only in woody dicots.
Collenchyma cells are elastic, elongate with the growth of stems and leaves.	These are rigid, elongate, circular cells promoting growth of stems and leaves.
	

Q:2 Differentiate between Fiber and Sclerides.

Ans:

Fiber	Sclerides
These are long and cylindrical.	These are shorter than fiber type of sclerenchyma.
They are present in the form of solid bundle in xylem or bundle cap.	These are found in seed coat and nut shells.
They provide support to xylem tissues.	They provide protection to seed.
Generally unbranched.	May be branched or unbranched.
	

Q:3 What does growth ring indicates?

Ans:

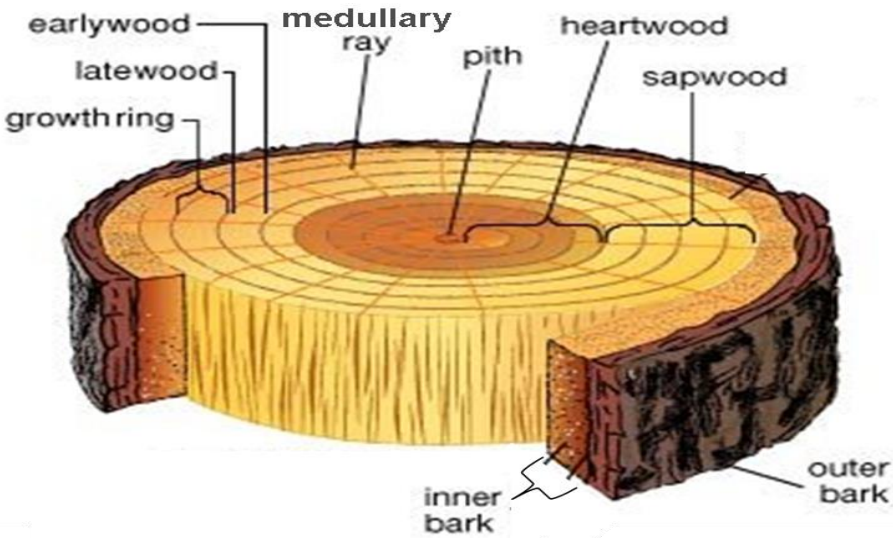
Since one growth ring is formed in one year, a count of the rings at the base of trunk indicates the age of trees at the time it was cut.



Q: 4 Differentiate between Sap wood and Heart wood.

Ans:

Sap wood	Heart wood
The active and conductive portion of wood is called sap wood.	The inactive and non-conductive part of the wood is called heart wood.
Located on the outer side (younger portion of wood/xylem) of stem.	Located on the inner side (center) of the stem.
It conducts water and minerals.	It doesn't conduct water and minerals. It store resins, oil, gums and tannins.
It is susceptible to decay and insect attack.	It is resistance to decay and insect attack.



Q:5 What provides support in plants and animals?

Ans:

- The collenchymatous cells in plants give support to the baby plants and sclerenchymatous cells to the adult plants.
- In animals muscles, cartilage and bones provide support.

Q:6 What is Bundle cap?

Ans:

In the stem of some plants, for example, sunflower, the vascular bundles are strengthened by additional sclerenchyma fibers, which form bundle cap.

Q:7 Define secondary growth?

Ans: Secondary growth:

Growth due to lateral meristem or cambium is called secondary growth.

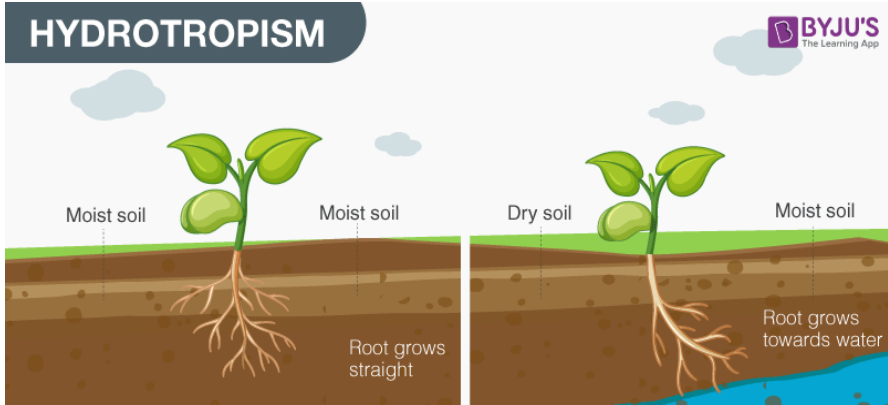
OR

An increase in plant growth due to the activity of vascular cambium is called secondary growth.

- The result of secondary growth is most evident in woody, perennial plants like trees, shrubs and vine.
- Secondary growth occurs due to cell division in vascular cambium and cork cambium.

Q:8 Differentiate between Hydrotropism and Geotropism.

Ans:

Hydrotropism	Geotropism
- The movement of plant parts in response to stimulus of water is called hydrotropism. - The growth of roots toward water is due to positive hydrotropism. - The growth of shoot away from the water is due to negative hydrotropism.	- It is response to gravity. - Roots display positive geotropism. - Shoots show negative geotropism.
	

Q:9 Differentiate between Nyctinasty and Thermonasty.

Ans:

Nyctinasty	Thermonasty
- The nyctinasty movements are shown by the organs in response to external stimuli leading to differential growth - These are due to turgor and growth changes.	- It is due to temperature. - The flowers of tulip close at night because of rapid growth in the lower side by upward and inward bending of the petals.

Q:10 Differentiate between Hyponasty and Epinasty.

Ans:

Hyponasty	Epinasty
- In hyponasty, the upper surface of leaf in bud condition shows more growth as compared to lowered surface. - In this case bud remains closed. - It is due to gibberellins.	- In epinasty, the upper surface of leaf in bud conditions shows more growth as compared to lower surface. - This leads to opening of bud. - It is due to auxins.

Q:11 Differentiate between Photonasty and Thermonasty.

Ans:

Photonasty	Thermonasty
- The principal stimulus is the photoperiod. - The flowers open and close due to light sensitivity.	- It is due to temperature. - The flowers of tulip close at night because of rapid growth in the lower side by upward and inward bending of the petals.

Q:12 What is callus or wood tissue? Give its importance.

Ans: An important function of the cambium is to form callus or wood tissue on or over the wound. Soft parenchymatous tissues are rapidly formed on or below the damaged surface of stems and roots. The callus unites the branches during budding and grafting.

Importance:

- It heals wounds.
- It helps in budding and grafting.

Q:13 What is turgor pressure. Give its importance.

Ans: Turgor pressure:

The living cells of epidermis, cortex and pith take in water by osmosis. Thus an internal hydrostatic pressure called turgor pressure develops. This pressure keeps them rigid, resistant to bending and maintains the turgidity.

- If these cells lose turgidity due to exosmosis of water herbaceous stem wilts.

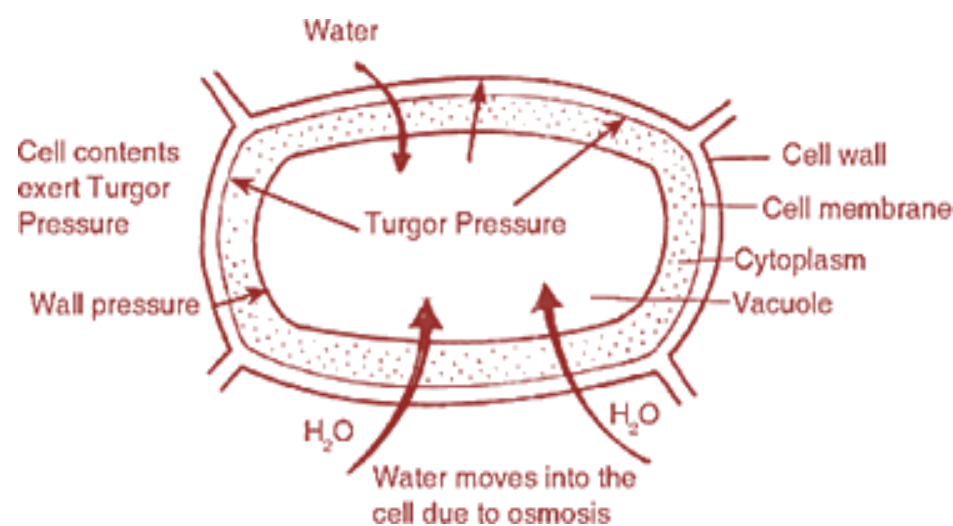
Significance of turgor: It provides

- Turgidity
- Mechanical support to soft tissues of plants

Q:14 How turgor pressure is generated?

Ans:

- Turgor pressure is generated by high osmotic pressure of the cell vacuole.
- The membrane that bounds vacuole is called tonoplast which contains a number of active transport systems that pump ions into the vacuole.
- Vacuole compartments pump ions in despite the higher concentration than that of extracellular fluid.
- Because of higher ionic concentration, water enters the vacuole.



Q:15 What is difference between animal and plant movements?

Ans:

- Animals move in response to external stimuli by motion, similarly plants also show movements.
- Animals change their location in response to stimulus. Plants are fixed therefore they change their growth pattern.

Q:16 What are main types of movements in plants?

Ans: There are two types of movements:

- **Autonomic movements:** are spontaneous due to internal causes.
- **Paratonic movements:** are due to external causes.

Q:17 What are autonomic movements. Also give their main types.

Ans: Autonomic movements:

Autonomic movements are spontaneous movements due to internal causes.

Types of autonomic movements: Autonomic movements are of three types:

- 1) Tactic movements
- 2) Turgor movements
- 3) Growth movements

Q:18 Define tactic movements.

Ans: Tactic movements:

These are the movements of an entire cell or organism i.e. locomotion due to external stimulus.

- The tactic movements may be positive if it is towards the stimulus or negative if it is away from the stimulus.
- Tactic movements are the movements of locomotion.
- They are further classified on the basis of the nature of the stimulus.
 - 1) Phototactic movements
 - 2) Chemotactic movements

Q:19 Differentiate between Phototactic and Chemotactic movements.

Phototactic movements	Chemotactic movements
It is a movement in response to stimulus of light.	The movements in response to stimulus of chemicals is called chemotactic movements.
The best example of positive tactic movements is the passive movements of chloroplast due to cyclosis. This movement helps the chloroplast to absorb maximum light for CO₂ fixation.	The movements shown by sperms of liver-worts, mosses, ferns towards archegonia in response to stimulus of nucleic acid released by the ovum are such examples.

Q:20 What is turgor movements?

Ans: Turgor movements:

Turgor movements are due to differential changes in turgor and size of cells a result of gain or loss of water.

Example:

Rapid movements of leaflets in “touch me not” plant and sleep movements of the plants fall under this category of movements.

Q:21 What are sleep movements?

Ans: Sleep movements:

Bean plants and some members of legume family lower their leaves in the evening and raise them in the morning. These are known as sleep movements.

Q:22 What are growth movements?

Ans: Growth movements:

Growth movements are due to unequal growth on two sides of plants organs like stem, root, tendrils, buds etc.

There are three types of growth movements:

- 1) Epinasty
- 2) Hyponasty
- 3) Nutation

Q:23 What is skeleton? What are different types of skeleton?

Ans: Skeleton:

The skeleton is tough and rigid framework of the body of animals which provides protection, shape and support to the body organs.

Types of skeleton in animals:

Three main types of skeleton in animals:

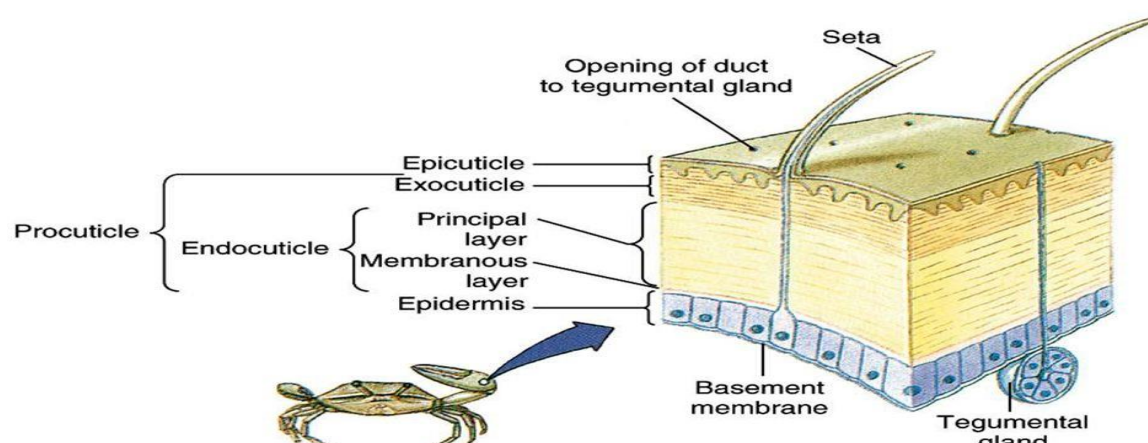
- Hydrostatic Skeleton
- Exoskeleton
- Endoskeleton

Q:24 What is the composition of exoskeleton?

Ans: Composition of exoskeleton:

It is composed of two layers. The epicuticle is the outermost layer and is made up of waxy lipoprotein. The bulb of exoskeleton is below the epicuticle and is called procuticle which is composed of chitin, tough, leathery, polysaccharide and several kinds of proteins.

Cuticle (Exoskeleton)



Q:25 What is the composition of endoskeleton?

Ans: Composition of endoskeleton:

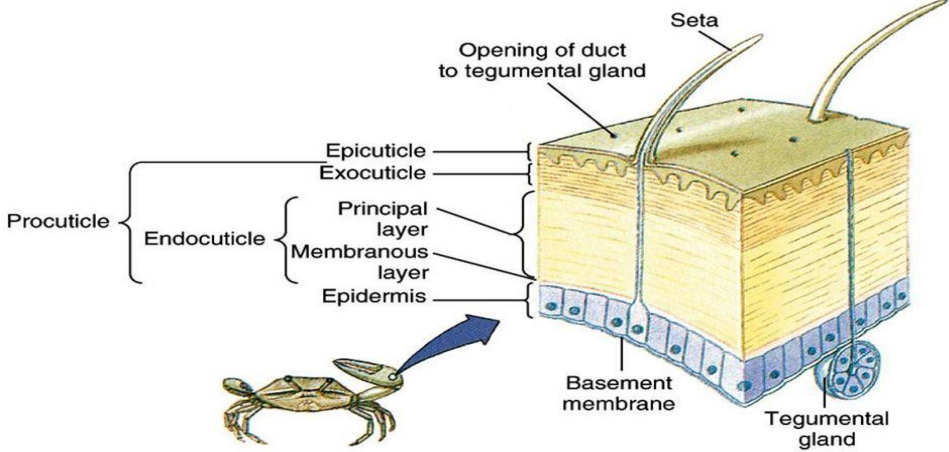
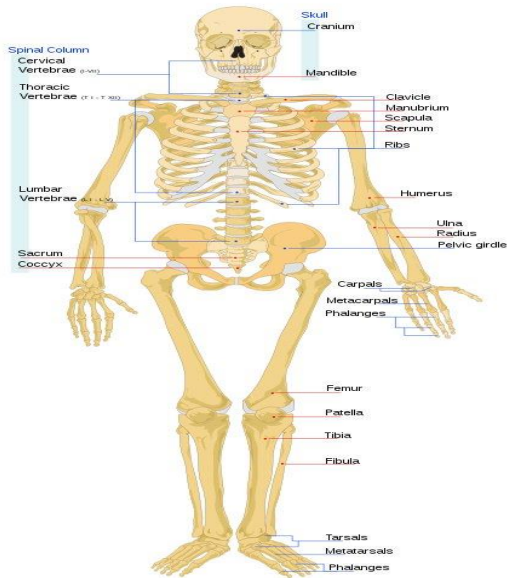
The endoskeleton is primarily made up of two types of tissues.

- Bones
- Cartilage

Both bones and cartilage are types of rigid connective tissue. Both consist of living cells embedded in the matrix of protein called collagen.

Q:26 Differentiate between Exoskeleton and Endoskeleton.

Ans:

Exoskeleton	Endoskeleton
• An exoskeleton is an outer covering to which internal muscles are attached.	• If internal muscles are attached and cover the skeleton then it is called endoskeleton.
• The exoskeleton is inert and nonliving.	• It is living.
• It is secreted by the ectoderm in animal cells.	• It is secreted by the mesoderm in animal cells.
• It is composed of an outer layer called epicuticle and an inner layer the procuticle in arthropods.	• It is made up to two types of tissues, bones and cartilage. Both consist of living cells embedded in matrix of collagen fibers.
• Does not grow with the body and has to be shed.	• Grows as the body grows.
Cuticle (Exoskeleton) 	

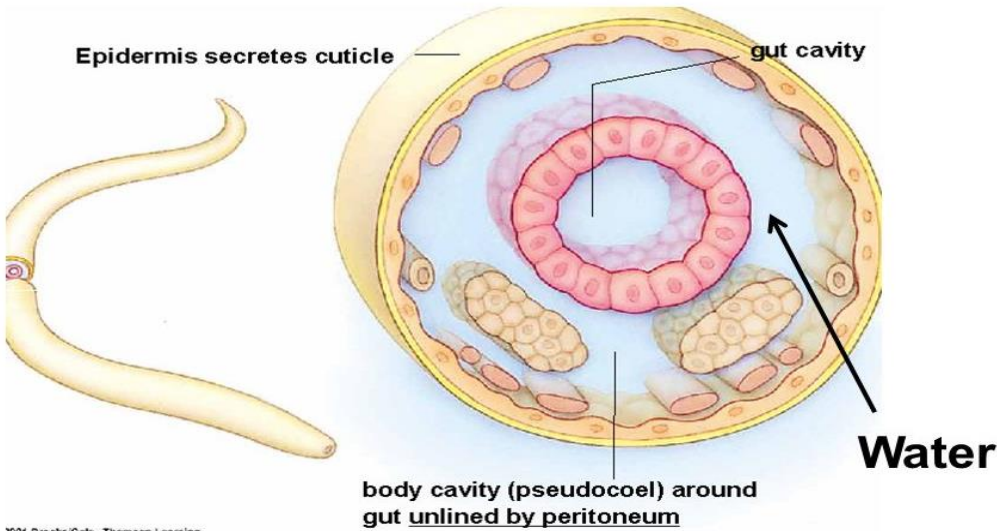
Q:27 What is hydroskeleton?

Ans: Hydroskeleton:

In animal that lack a hard skeleton, a fluid filled astrovascular cavity or coelom can act as hydrostatic skeleton.

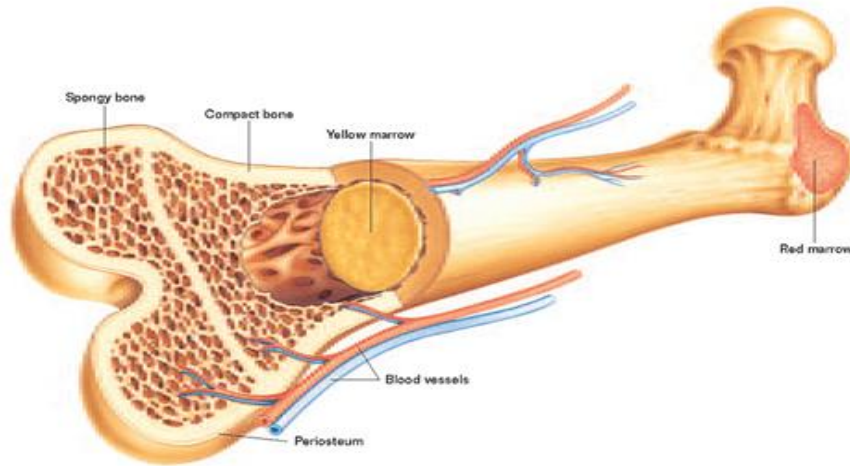
- Hydroskeleton provides support and resistance to the contraction of muscles so that motility results.
- It is found in cnidarians, annelids and other soft-bodied invertebrates.

Hydrostatic skeleton: “Water” skeleton



Q:28 Differentiate between Compact bone and Spongy bone.

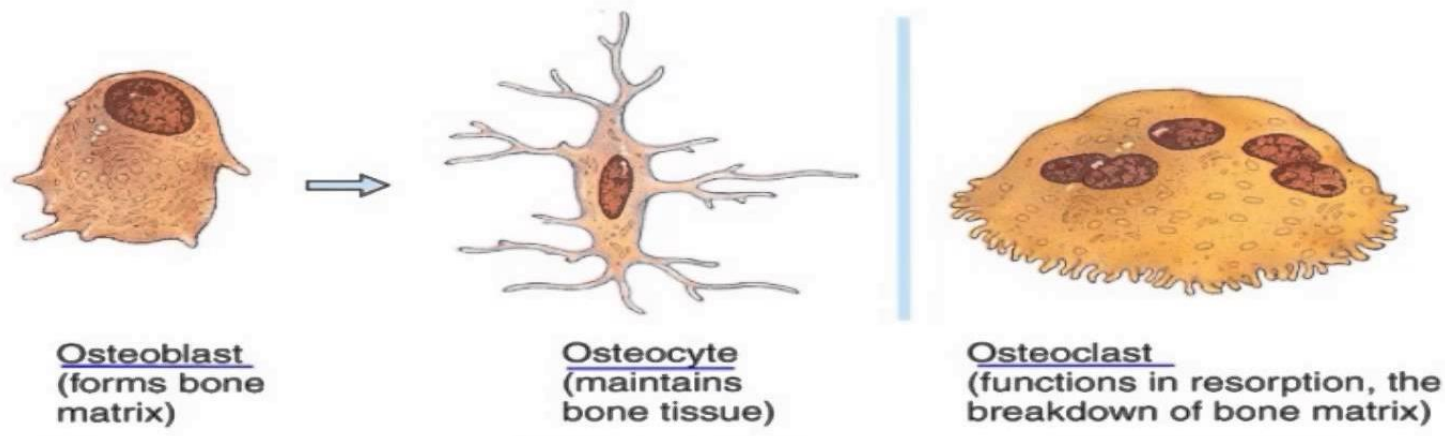
Compact bone	Spongy bone
It is dense, strong and outer portion of bone.	It is light, weak and highly porous portion of bone.
It provides an attachment site for a muscle.	It provides cavities that contain bone marrow where blood cells are formed.
It is smooth.	It is spongy.
It is not provided with blood capillaries.	It is provided with blood capillaries.



Q:29 Name the cells associated with bone?

Ans: There are three types of cells associated with bone:

- 1) Bone forming cells (Osteoblasts)
- 2) Mature bone cells (Osteocytes)
- 3) Bone dissolving cells (Osteoclasts)



Q:30 What is moulting or ecdysis? Give its importance.

Ans: Ecdysis:

When arthropods have to grow they need to shed exoskeleton periodically and replace it with one of the larger size. This process is known as Ecdysis or moulting.

Importance of ecdysis:

- Helps in growth
- Helps in movement
- Helps in survival
- Helps in attaining maturity

Q:31 Name the bones of cranium.

Ans: Bones of cranium:

- Parietal and temporal are paired bones
- Frontal, occipital, sphenoid and ethmoid are unpaired bones.

Q:32 Name the bones of facial region?

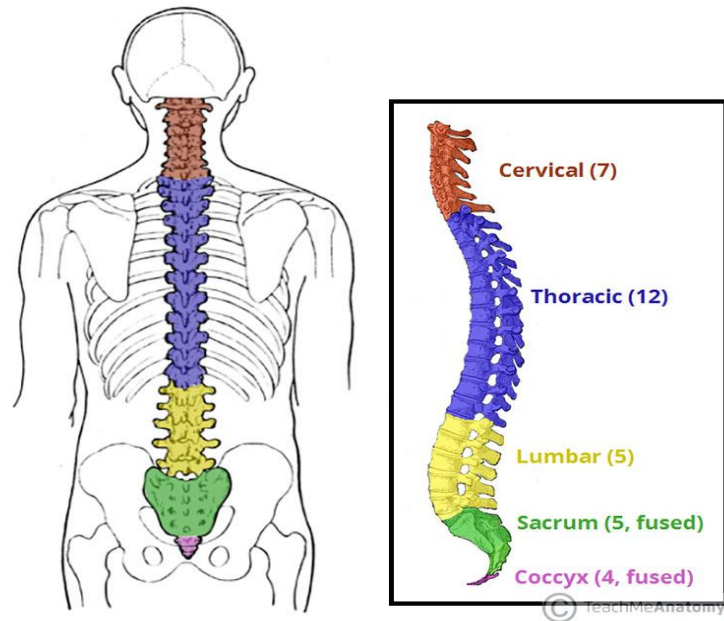
Ans: Bones of facial region:

- The paired facial bones are maxilla, zygomatic, nasal, lacrimal, palatine and inferior concha.
- The unpaired facial bones are mandible and vomer.

Q:33 What is vertebral column?

Ans: Vertebral column:

Vertebral column extends from skull to the pelvis to form backbone, which protects the spinal cord. It consists of 33 vertebrae. The vertebrae are named according to their location in the body, viz, cervical, thoracic, lumbar and pelvic.



Q:34 Enlist some of the functions of skeleton.

Ans: Functions of skeleton:

- Provides shape and support to body
- Provides protection e.g. to brain, spinal cord, heart, lungs
- Helps in body movement by muscle attachment
- Helps to maintain mineral contents through negative feedback mechanism e.g. calcium, phosphorus, sodium etc.
- RBC and WBC are produced in bone marrow of endoskeleton

Q:35 Differentiate between Hyaline and Fibro cartilage.

Ans:

Hyaline cartilage	Fibro cartilage
• It is most abundant type of cartilage in human body.	• It is in less abundance than hyaline cartilage in human body.
• It is found at the movable joints at end of bones, nose, trachea and embryonic skeleton.	• It is found in intervertebral discs, pubic symphysis and knee joints.
• It is glassy in nature and has fine thin collagen fibers.	• It has more matrix containing bundles of collagen fibers.
• It is firm and resilient.	• It is very tough and shock absorber.

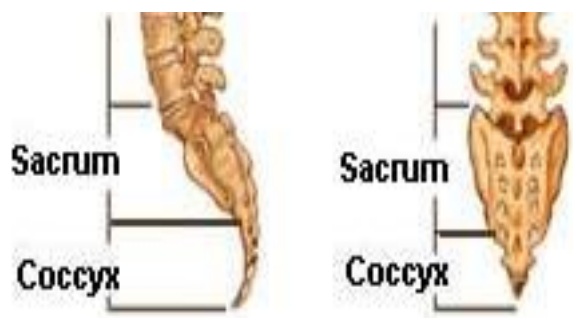
Q:36 What are sacrum and coccyx?

Ans: Sacrum:

Sacrum is formed by the fusion of anterior five vertebrae present in the pelvic region.

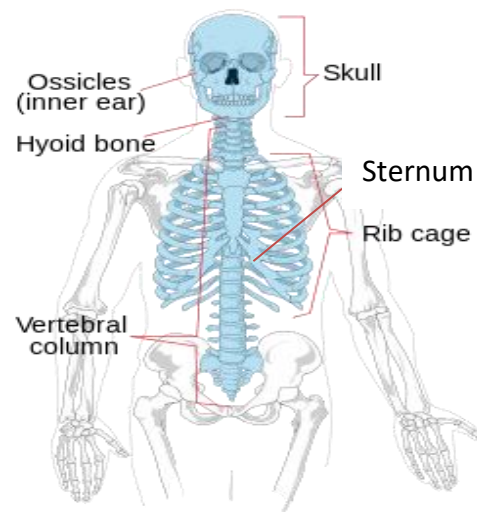
Coccyx:

Coccyx is formed by the fusion of four posterior vertebrae present in the pelvic region.



Q:37 What is axial skeleton?

Ans: The skeleton that includes the skull, the vertebrae, and the ribs and the sternum is called axial skeleton.



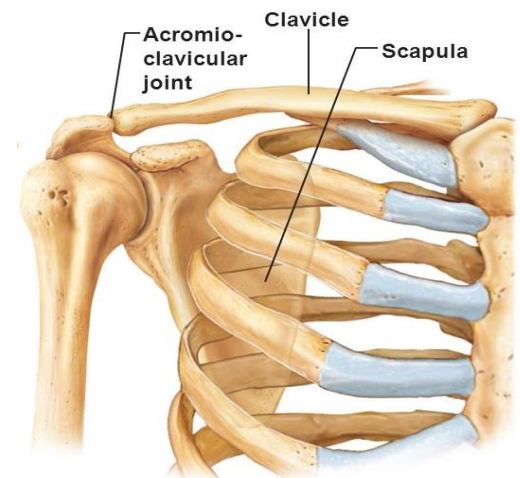
Q:38 What is appendicular skeleton? What does pectoral girdle comprise?

Ans: Appendicular skeleton:

The skeleton that consists of pectoral girdle and appendages (fore limbs) and pelvic girdle and appendages (hind limbs) is called appendicular skeleton.

Pectoral girdle:

- Pectoral girdle attaches the arms to the trunk.
- It comprises scapula and clavicle.
- The clavicle connects scapula with sternum.

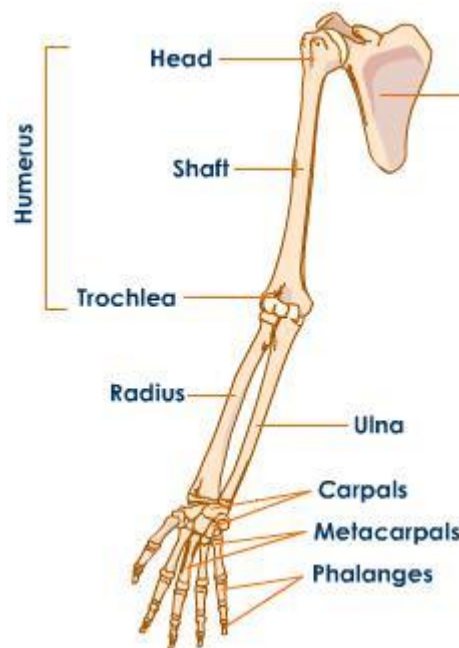


(a) Articulated pectoral girdle

Q: 39 Name different bones of fore limb.

Ans: The fore limb consists of:

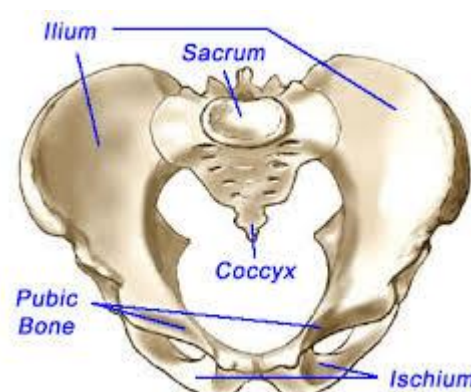
- Humerus
- Radius
- Ulna
- 8 carpals
- 5 metacarpals
- 14 phalanges.



Q:40 What are important features of pelvic girdle?

Ans:

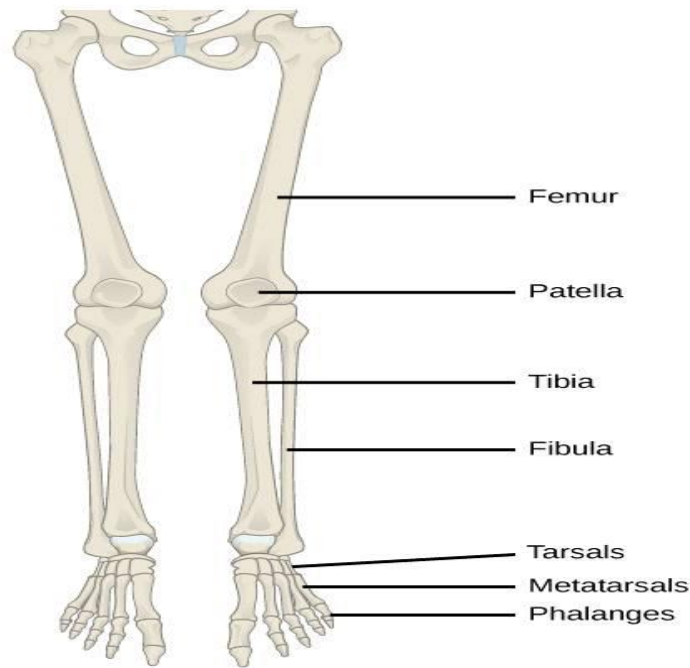
- Pelvic girdle attaches the hind limb to the vertebral column.
- It consists of two coxal bones. Each is formed by the fusion of three bones ilium, ischium and pubis.



Q:41 Name different parts of hind limb.

Ans: The hind limb consists of:

- One femur
- Tibia
- Fibula
- 8 tarsal
- 5 metatarsals
- 14 phalanges.



Q:42 How many steps are involved in repairing of broken bones? Name them.

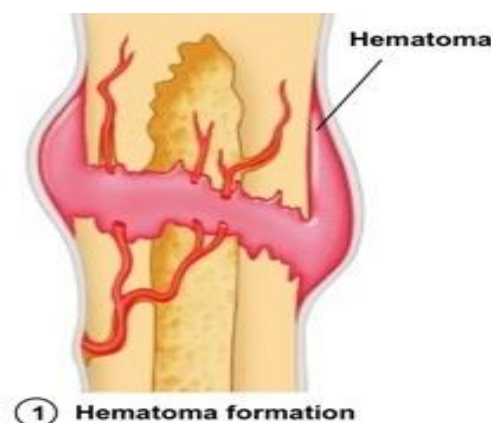
Ans: The repair process of a simple fracture takes place in four phases:

- Haematoma formation
- Callus formation
- Bony callus formation
- Remodelling

Q:43 Explain hematoma formation.

Ans:

- When the bone breaks, blood vessels in bone itself and in surrounding are torn, resulting hemorrhage.
- As a result, a hematoma, a mass of clotted blood, forms at the fracture site.
- Soon after, bone cell deprived of blood begin to die and the tissue at the fracture site becomes swollen and painful.
- These clots are removed by the body itself (close reduction) or by surgery (open reduction).



Q:44 What are closed reduction and open reduction?

Ans: Close reduction:

In closed reduction the bone end is coaxed back to their normal position by physician's hand.

Open reduction:

In open reduction surgery is performed and the bone ends are secured together with pins or wires.

Q:45 what is herniation of disc? Give its effect and cure.

Ans: Herniation of disc:

- Severe or sudden physical trauma to spines for example from bending forward while lifting a heavy object may result in herniation of one or more disc.
- The herniated or slipped disc usually involves rupture of annulus fibrosus followed by protrusion of the spongy nucleus pulposus

Effects:

- If protrusion presses spinal cord or on spinal nerves, it generates severe pain or even destruction of these nervous structures.



Cure:

- Disc slip is treated with bed rest, traction (pulling) and painkiller. If this fails disc may be removed surgically.

Q:46 What is rickets? Write its cause and cure.

Ans: Rickets:

- Rickets is a disease in children with bowed legs and deformed pelvis.

Cause:

- It is caused by deficiency of calcium in diet or vitamin D deficiency.

Cure:

- Disc slip is treated with bed rest, traction (pulling) and painkiller. If this fails disc may be removed surgically.

Q:47 What is sciatica? Write its causes, effects and recovery.

Ans: Sciatica:

- It is characterized by stabbing pain radiating over the course of sciatic nerve.

Causes:

- It results due to injury of proximal sciatic nerve, which might follow a fall, a herniated disc or improper administration of an injection into the buttock.

Effects:

- This may result a number of lower limb impairment depending on the precise nerve root injured.
- When sciatic nerve is completely transected, the les become nearly useless.
- They cannot be flexed and all foot-ankle movement is lost.

Recovery:

- Recovery from sciatic injury is usually slow and incomplete.

Q:48 What is arthritis?

Ans: Arthritis: Arthritis covers over 100 different types of inflammatory or degenerative diseases that damage the joints.

- It results in pain, stiffness, of the joints. Friction is increased.
- Acute form of arthritis results from bacterial invasion and is treated by antibiotics.
- Chronic arthritis includes osteoarthritis, rheumatoid and gouty arthritis.

Q:49 Differentiate between Osteoporosis and Osteomalcia.

Osteoporosis	Osteomalcia
• Osteoporosis is a group of diseases in which bone resorption outpace the bone deposit, so bone mass is reduced. • It occurs mostly in aged women due to decease in estrogen level. • It can be treated by ERT (Estrogen replacement process). • May be caused due to insufficient exercise, diet poor in calcium and proteins, smoking.	• Osteomalcia (soft bone) includes a number of disorders in which the bone receive inadequate minerals • In this disease calcium salts are not deposited and hence bones soften and weaken. • Weight bearing bones of legs and pelvis bend and deform. • Its main symptom is the pain when weight is put on effected bone.

Q:50 Define joints? What different classes of joints on the basis of structure?

Ans: Joints:

The point at which two or more bones meet (not fuse) is called joint or articulation.

OR

Joints occur where bones meet.

- They not only hold our skeleton together, but also give it the mobility.

Joints are also classified on the basis of structure:

- 1) Fibrous Joints
- 2) Cartilaginous Joints
- 3) Synovial Joints

Q:51 How joints are classified on the basis of movement? Name them.

Ans: Joints are classified on the basis of the amount of movements allowed by them, into three categories:

- 1) Immovable joints
- 2) Slightly movable joints
- 3) Freely movable joints

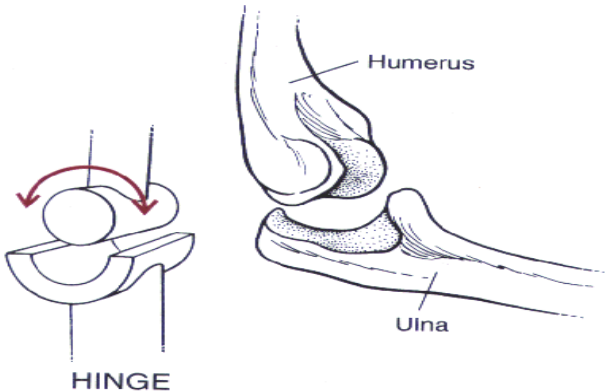
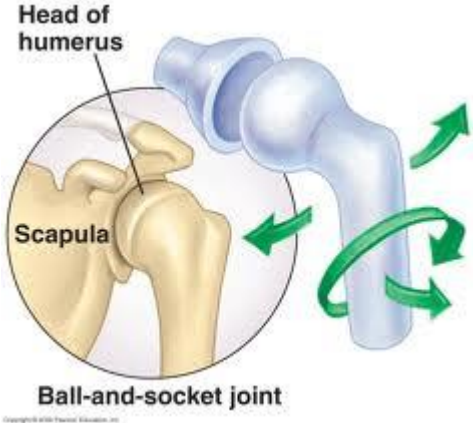
Q:52 Define synovial joints. Compare hinge joints and ball and socket joints.

Ans: Synovial joints:

These joints contain a cavity filled with synovial fluid to reduce the friction between the moving joints.

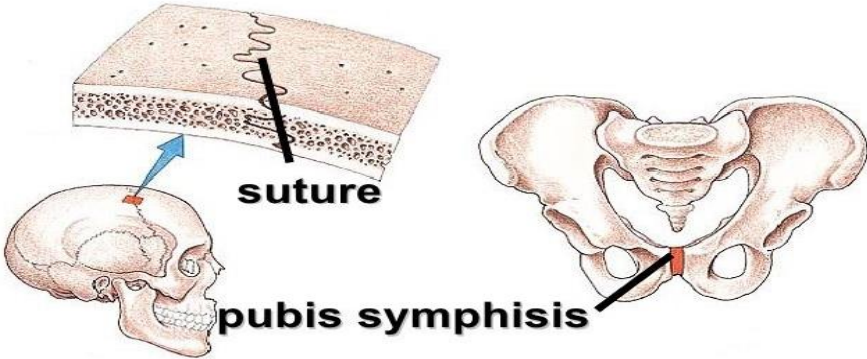
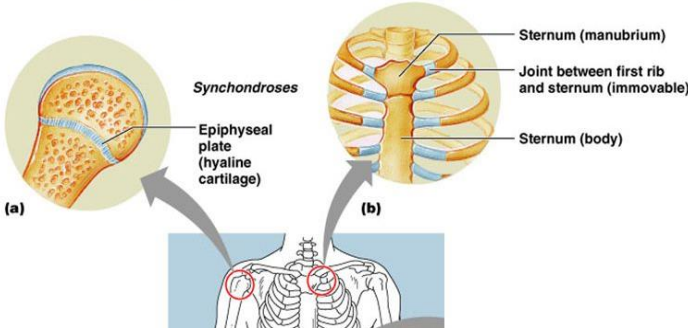
These joints allow free movement:

- Hinge joints
- Ball and socket joints

Hinge joints	Ball & socket joints
• The joint that allows the movements in two directions is called hinge joint.	• The joint that allows movements in several directions is called ball & socket joint.
• At these joints, pair of muscles is arranged in the same plane as that of joints.	• Such joints have at least two pairs of muscles present perpendicular to each other.
• These are at elbow and knee.	• Hip joint and shoulder joint are the examples of ball and socket joints.
• They provide less flexibility.	• They provide maximum flexibility.
	

Q:53 Differentiate between fibrous and cartilaginous joints.

Ans:

Fibrous joints	Cartilaginous joints
• These joints are held together by short fibers embedded in connective tissue.	• Cartilage forms joint between growing bones.
• These joints allow no movements.	• These joints allow little or no movements.
• Such joints are present in the skull, and fixing teeth into the jaw.	• Joints between vertebrae, point where coxal bones meet in front of the pelvis and growing bones.
• These are immovable joints.	• These are slightly movable joints.
	

Q:54 What are muscles? Name different types of muscles in vertebrates.

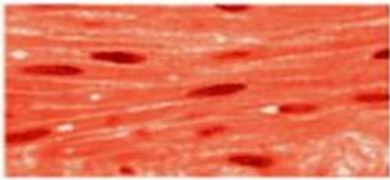
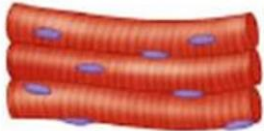
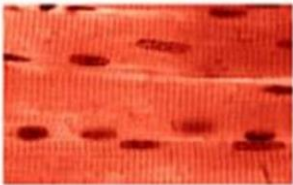
Ans: Muscles:

Many multicellular animals have evolved specialized cells muscles for movement. They contain numerous filaments of special proteins, actin and myosin.

The vertebrates possess three kinds of muscles:

- 1) Smooth muscles
- 2) Skeletal muscles
- 3) Cardiac muscles

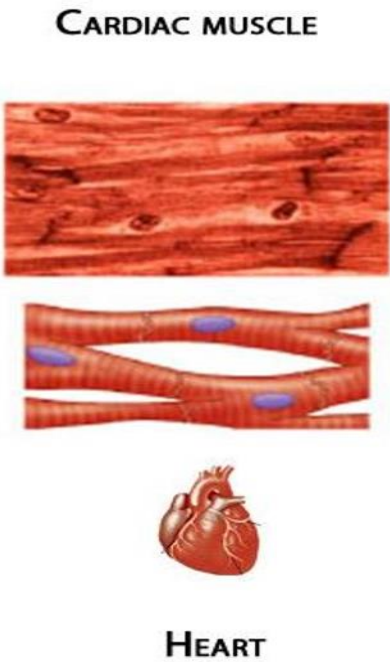
Q:55 Differentiate between smooth muscles and skeletal muscles.

Smooth muscles	Skeletal muscles
These are present in visceral organ like stomach, intestine, blood vessels etc.	The muscles attached with skeleton and associated with movements.
They are long and spindle shape.	They are spindle and cylindrical shape cells.
They are involuntary muscles and not under conscious control.	These are voluntary muscle and under conscious control.
They are non-striated muscles.	They are striated muscles.
They have one nucleus per cell.	They have many nuclei per cell.
SMOOTH MUSCLE  INTERNAL ORGANS	SKELETAL MUSCLE  LEG

Q:56 What are cardiac muscles?

Ans: Cardic muscles:

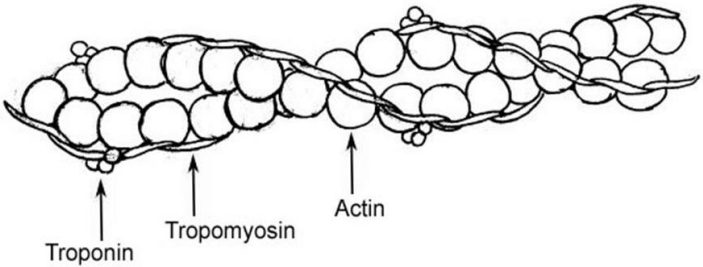
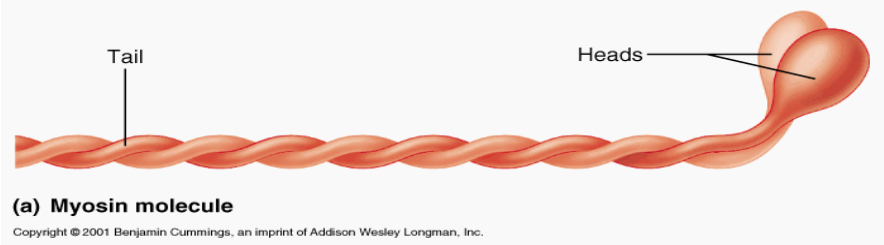
- These are muscles of the heart.
- Heart muscles are composed of chains of single cell, each with its own nucleus.
- The chain of cells is organized into fibres that are branched and interconnected.
- The cardiac muscles are striated and involuntary.



Q:57 Differentiate between Sarcoplasm of muscle cell and Cytoplasm of other cells.

Sarcoplasm of muscle cell	Cytoplasm of other cells
It contains large amount of stored glycogen.	These cells do not contain large amount of stored glycogen.
It also had red pigments myoglobin that stores oxygen in muscle.	These cells have no red pigments myoglobin.
It has modified reticulum called sarcoplasmic reticulum without ribosomes.	These cells have endoplasmic reticulum with ribosomes.
The membrane of muscle cell is called sarcolemma.	The membrane is called plasma membrane.

Q:58 Differentiate between Actin and Myosin.

Actin	Myosin
Actin filaments are thin filament.	Myosin filaments are thick filaments.
Actin forms both A and I bands.	Myosin forms only A band.
ATP does not bind to actin.	ATP only binds to myosin ‘head’.
It is of 7nm.	It is of 16nm.
	 (a) Myosin molecule Copyright © 2001 Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.

Q:59 What is sliding filament model? And who gave this model?

Ans: Sliding filament model:

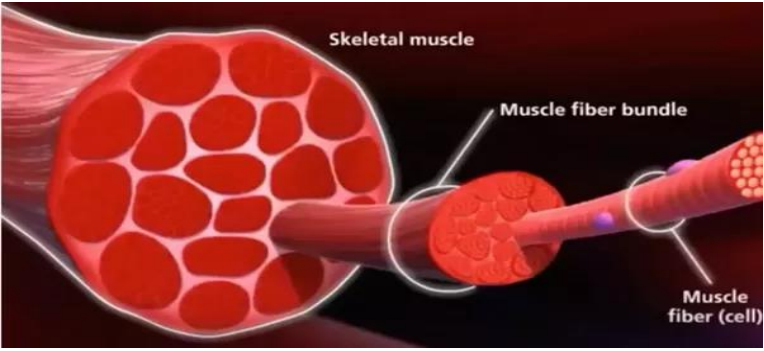
According to this model the thin filament slide past the thick one’s so that actin and myosin filaments overlap to greater degree.

- H. Huxley and A.F. Huxley and their colleagues suggested a hypothesis in 154 to explain all events in muscle contraction, this is called sliding filament model.

Q:60 What is muscle fibre?

Ans: Muscle fibre:

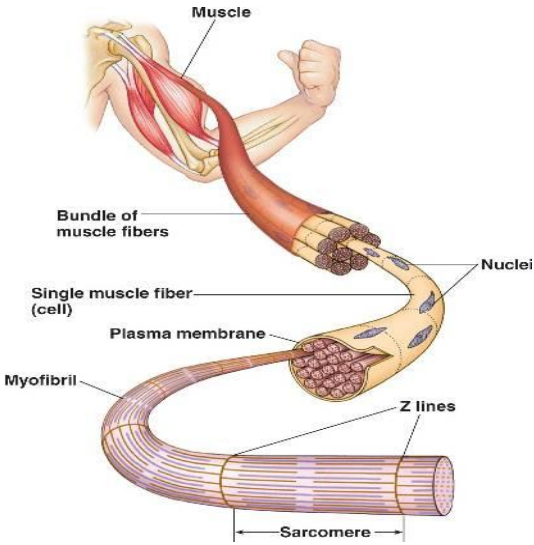
- Each muscle consists of muscle bundles, which are further composed of fibres or cells.
- Each muscle fibre is long cylindrical cell with multiple oval nuclei arranged just beneath its sarcolemma.
- Their diameter is 10-100 micro meter.



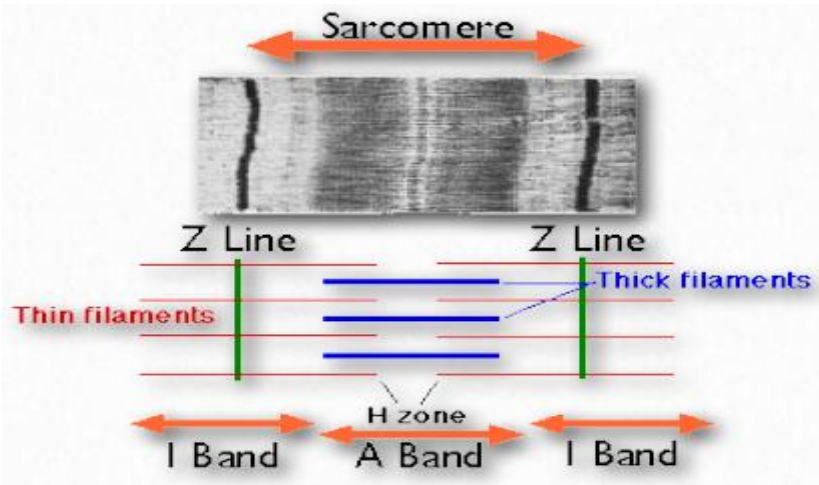
Q:61 What are myofibrils?

Ans: Myofibrils:

- When viewed in high magnification, each muscles fiber is seen to contain a large number of myofibrils.
- They run in parallel fashion and extend the entire length of the cell.
- They are 1-2 mm in diameter.



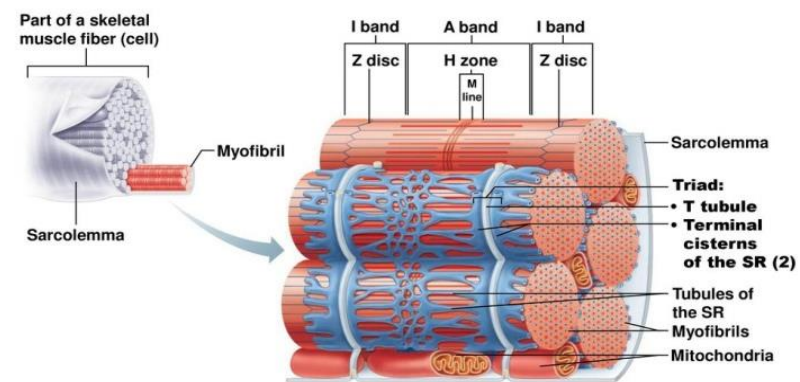
Q:62 Differentiate between A-band and I-band.

A-band	I-band
- This is dark band. - It is anisotropic i.e. it can polarize visible light. - Both thick and thin filaments present while in H-zone only thick ones. - H-zone is divided by a darker midline called M-line.	- This is light band. - It is isotropic or non-polarizing giving stripped appearance to cell. - Only thin filaments are present. - I-band has midline called Z-line. - Distance between two Z-lines is called sarcomere.
	

Q:63 What is T-tubule?

Ans: T-tubule:

- It is an invagination of sarcolemma at Z-line or A and I junction.
- The sarcolemma of muscle fiber (muscle cell) penetrates deep into the cell to form hollow, elongated tube the transverse tubules called T-tubules.
- Lumen of T-tubules is continues with extra cellular fluid.
- Thousands of T-tubules of each muscle are collectively called T-system.



Q:64 What are dark and light bands in sarcoplasm?

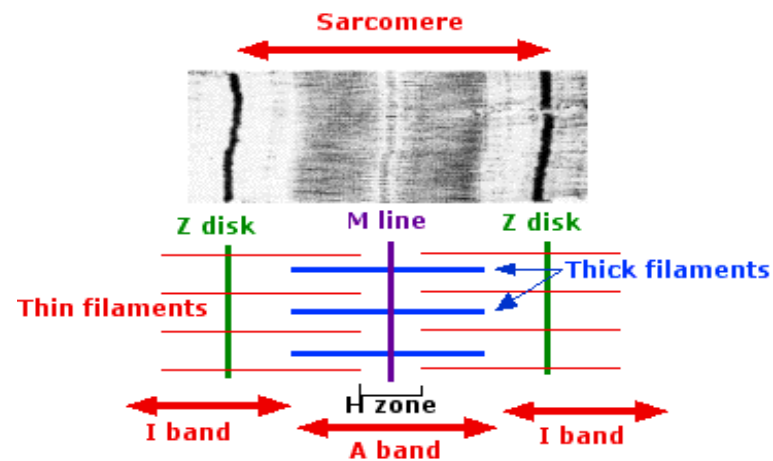
Ans:

- The dark bands are called A band because they are anisotropic that is they can polarize visible light.
- The light bands are called I band are isotropic or non-polarizing.

Q:65 What are H-zone and M-line in A band of sarcomere?

Ans:

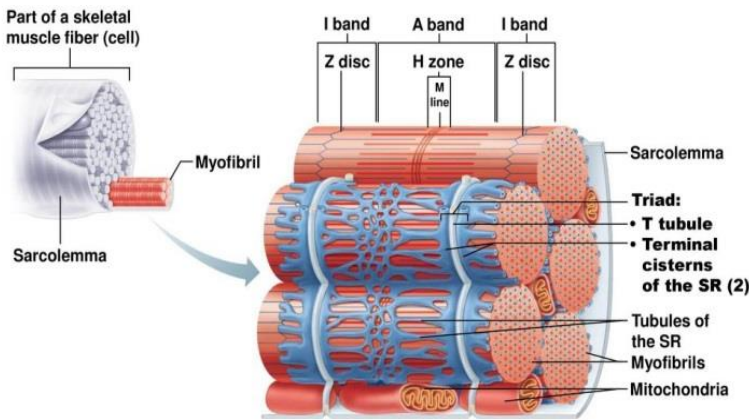
- Each A band has a lighter stripe in its midsection called H-zone (H stands for hele means bright).
- The H-zone is bisected by dark line called M-line.



Q:66 What are triads?

Ans: The T-tubule and terminal portion of the adjacent envelope of sarcoplasmic reticulum form triads at regular interval along the length of the myofibril.

- Calcium ions are stored in sarcoplasmic reticulum (SR).
- When the calcium gates of SR open releasing calcium into the cytosol.
- These calcium ions bind to troponin molecule of the thin filaments, so cross bridges are formed between thick and thin filaments.



Q:67 What is other sources of energy for muscle contraction in addition to glucose?

Ans: Other sources of energy for muscle contraction:

When more energy is required due to high metabolism, it is provided by another energy storing substances called creatine phosphate.

Q:68 Define sarcomere and describe light and dark band.

Ans: Sarcomere:

The myofibrils consist of smaller contractile units called sarcomere.

- It is the distance between two consecutive Z-lines.

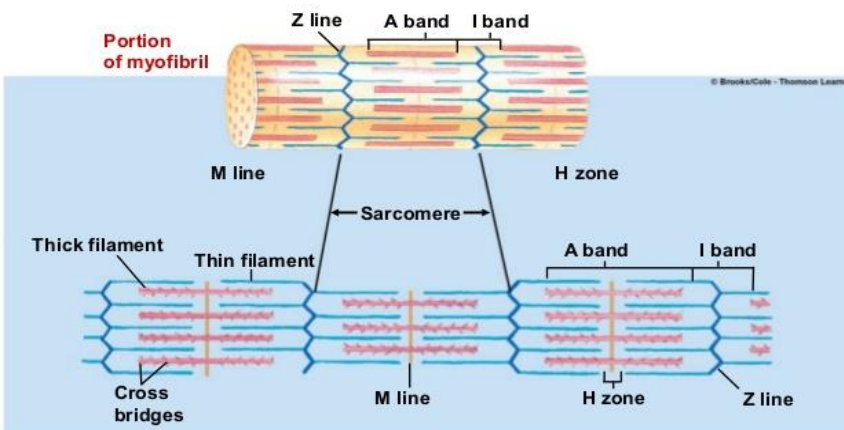
Light and dark bands:

In each sarcomere a series of light and dark bands are along the length of each myofibril.

- A-band: Each dark band is called A band, because it is anisotropic i.e. it can polarize visible light.
- I-band: The light band called I band is isotropic or non-polarizing. It gives the cell as a whole striped appearance.
- H-zone: Each A band has a lighter stripe in its mid-section called H-one (H stands for the hele meaning bright).
- M-line: The H-zone is bisected by dark line called M-line.
- Z-line: The I-bands have mid line called Z-line (Z for zwishen means between).

Q:69 Draw sarcomere and light & dark bends.

Ans:



Q:70 Differentiate between muscle fatigue and cramp.

Ans:

	Muscle fatigue	Cramp
Origin	• State of physiological inability to contract.	• Tetanic contraction of entire muscle. Lasts for just a few seconds to several hours.

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Cause/agent	- Deficit of ATP. - Accumulator: Lactic acid and ionic imbalance.	- Low blood sugar level - Electrolyte depletion - Dehydration - Irritability of spinal cord and neurons
Symptoms	- Contraction and states of continuous contraction results because the cross bridges are unable to detach. - Lactic acid cause muscle pH to drop.	- Muscles to become taut and painful. - Most common in thigh and hip muscles.
Treatment	Rest, painkillers and sprays are advised.	Rest, painkillers, saline water, fruit juices are advised.

Q:71 Describe term "Rigor Mortis"?

Ans:

- ATP is needed to break the link between the myosin bridges and the actin.
- After death, the amount of ATP in the body fails.
- Under these circumstances the bridges cannot be broken and so they remain firmly bound.
- This results in the body becoming stiff, a condition known as Rigor Mortis.

Q:72 What are antagonistic arrangement?

Ans: Antagonistic arrangement:

At joint the muscles work against each other by contraction. This relationship is called antagonistic arrangement.

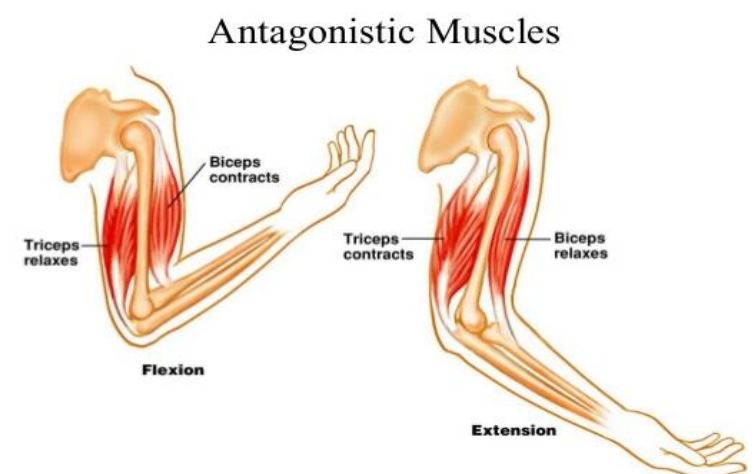
Example:

The best example is the movement of elbow joint by biceps and triceps.

Biceps: When contract, bend the arm and hence called flexor.

Triceps: When contract, extend the arm hence called Extensor.

- The biceps bend the arm at the elbow joint.
- Triceps straightens the arm.



Q:73 What are organs of locomotion in euglena, paramecium and amoeba?

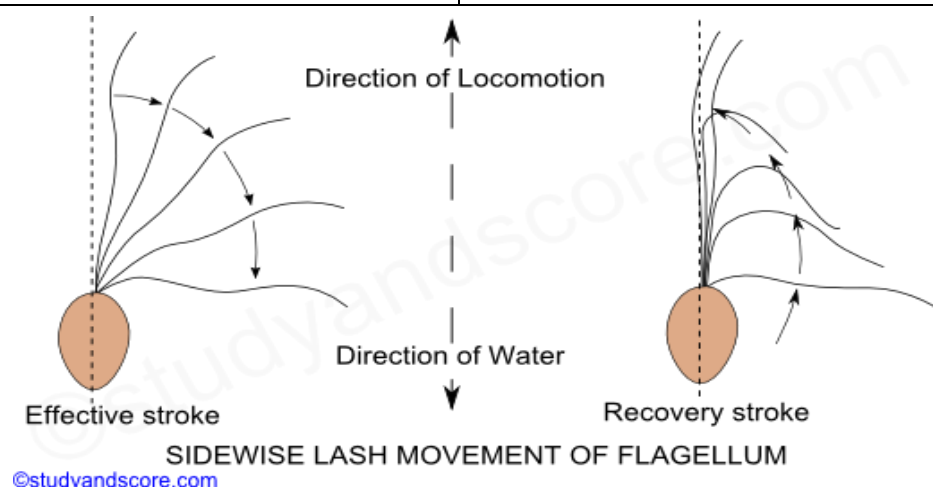
Ans:

- Euglena moves with the help of flagellum.
- Paramecium moves with the help of cilia.
- Amoeba moves by means of pseudopodia.

Q:74 Differentiate between Effective stroke and recovery stroke.

Ans:

Effective stroke	Recovery stroke
Five out of nine double fibrils contract or slide simultaneously with the result that cilia bend or shorten. It is called effective stroke.	The four out of nine double fibril contract and cilia become straight. It is called recovery stroke.
It is power stroke by which paramecium or euglena pulls it in water.	In it paramecium and euglena withdraws its flagella or cilia for exerting a power stroke.



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Q:75 Differentiate between active flight and passive flight.

Ans:

Active flight	Passive flight
When little or no support can be gained from the upward air currents, the same effect can be achieved by flapping the wings and is called active flight.	This doesn't need flapping of wings, they only glide.
This needs much energy consumption.	This does not need much energy consumption.
It is done when a little or no support can be gained from upward air currents.	It is done when a support can be gained from upward air currents.
In this case air pressure on top of decreases as compared to lower, which uplift the bird.	The wings act as aerofoil during gliding. An aerofoil is any smooth surface which moves through the air at an angle to the air stream. The air flows over the wing in such a way that the bird is given lift.
Example: Many garden birds like sparrows	Example: Gulls and other sea birds.

Q:76 How wriggling occurs in amphibians?

Ans:

Amphibians wriggle along the belly on the ground, with the help of segmentally arranged muscles as it swims on land with legs hardly touching the ground when moving deliberately.

Q:77 What is bipedal locomotion?

Ans: Bipedal locomotion:

Bipedal means that animals walked on hind limbs. Bipedal locomotion freed the front appendages, which become adapted for prey capture or flight in some animals.

Q:78 Differentiate between Plantigrade and digitigrade.

Ans:

Plantigrade	Digitigrade
In this mode of locomotion the mammals that walk on their sole are called plantigrade.	Mammals who walk on their digits only are called digitigrades.
During this locomotion palms, soles digits more or less rest on round.	In them, first digit usually reduces or completely lost.
They run slower than digitigrade.	They run faster than plantigrade.
Example: Monkey, apes, man, bear etc.	Example: Rabbits, rodents etc.

Q:79 What is unguligrade?

Ans: Unguligrade:

The mammals who walk on their tips of toes are called unguligrades.

- The toes are modified into hoof.
- It is also a swift type motion.
- Examples:** Deer, zebra, cow, goat and many cattle etc.

Q:80 What are adaptations in birds for flying?

Ans: Adaptation in birds: The different adaptations to aerial mode of life in birds are following:

- The skeletons** of birds are modified for flight.
- Light bones:** they have developed bones with large air spaces. It has made the bones lighter.
- Wings with strong pectoral muscles:** The forelimbs have been modified into wings they have strong pectoral muscles. These muscles pull the wings up and down.
- Keel (Boat like):** the sternum is modified to form keel. The keel is needed for the attachment of muscles and minimizes the air friction.
- Feathers:** The body is covered with feathers. The feathers also keep their body warm. Thus, they can produce enough energy to fly.
- Streamline body:** The body is streamlined to cut clearly through the air. The feather lies smoothly against its body, so that the air can easily flow over them.

Exercise MCQ's

❖ Encircle the correct answer from the multiple choices.

- 1) Which of these is a direct source of energy for muscle contraction?
a) ATP b) Creatine phosphate c) Lactic acid d) Both a & b
- 2) When muscle contract?
a) Sarcomere increase in size
b) Myosin slides past actin
c) Lactic acid is produced
d) Both a & b
- 3) Which of the following changes occur when skeletal muscle contracts:
a) The A band shorten
b) The I band shorten
c) The Z line slide farther apart
d) The actin filament contract
- 4) Thin filament in myofibril consists of:
a) Actin, tropomyosin, troponin
b) Z line
c) Myosin
d) Sacromere
- 5) The contraction of striated mussels is initiated by the release of energy in the presence of:
a) Acetylcholine b) calcium ion c) Chloride ion d) Iron
- 6) In mammalian skeleton there is a distinct synovial joint between the:
a) Bones of cranium
b) Humerus and ulna
c) Sacrum of ilium
d) Sternum and floating ribs
- 7) Which of the followings a bone of axial skeleton?
a) Rib b) Shoulder girdle c) pelvis d) femur e) all of the above
- 8) Vertebral column includes:
a) Sacrum
b) The coccyx
c) Cervical, thoracic and lumber vertebrae
d) All of the above
- 9) In mammals the number of cervical vertebrae are:
a) No definite number b) seven c) Eleven d) Varies with neck size
- 10) Brain is protected by:
a) Cranium b) skull c) Orbits d) Carnivores
- 11) Which of the following is plantigrade?
a) Rabbits b) monkeys c) Horse d) Carnivores
- 12) Brachioradialis uplift is caused by:
a) Radius b) Ulna c) Both a & b d) Humerus
- 13) Moulting occurs in arthropod at the:
a) Immature stage b) Mature stage c) Both stages d) Do not undergo molting
- 14) Muscle fatigue is caused by:
a) CO₂ b) Accumulation of lactic acid c) Fumaric acid d) Ethyl alcohol
- 15) Cardiac muscles are:
a) Voluntary b) Involuntary c) Both a & b d) None of these

Answer key:

1	a	2	b	3	b	4	a	5	b
6	b	7	a	8	d	9	b	10	a
11	b	12	a	13	c	14	b	15	b

Most Important MCQ's

❖ Encircle the correct answer from the multiple choices.

Plant portion

- 1) In terrestrial plants major mechanical stress is imposed by:
a) Gravity b) Temperature c) Wind d) Soil
- 2) Turgor pressure is generated by high osmotic pressure of the cell:
a) Cytoplasm b) Vacuole c) Mitochondria d) Chloroplast
- 3) The loss of water due to ex-osmosis from plant cells causes plants to become:
a) Turgid b) Wilt c) Swell d) Deplamsolysed
- 4) The membrane that bounds vacuole is called:
a) Epiblast b) Tonoplast c) Chloroplast d) Hypoblast
- 5) Collenchyme cells have protoplast and usually lack:
a) Primary wall b) Secondary wall c) Middle lamella d) Vacuole
- 6) Which of the following cells have angular thickening in their primary walls:
a) Collenchyma b) Sclerenchyma c) Fibers d) Vessels
- 7) Which of the following belong to Collencyma cells?
a) Fibers b) Sclereides c) Vessels d) None of these
- 8) Among the followings which is the longest supportive cell?
a) Tracheids b) Sclereids c) Trachea d) Collenchyma cells
- 9) Sclerenchyma cells found in seed coats and nut shells are the:
a) Fibers b) Vessels c) Trachieds d) Sclereides
- 10) Fibers, sclereides and vessels are three types of:
a) Collenchyma b) Sclerenchyma c) Parenchyma d) Cambium
- 11) Bundle caps in sunflower stem, are formed by:
a) Sclerenchyma b) Parenchyma c) Mesencyma d) Collenchyma
- 12) Higher turgor pressure in a plant cell is maintained by:
a) Large number of vacuoles in a plant cell
b) Higher ionic concentration inside vacuoles resulting from active pumping of ions at their tonoplastic membrane
c) Higher osmotic pressure of the cell vacuole
d) both b and c
- 13) Secondary cell wall of sclerenchyma cells is impregnated with:
a) Cellulose B) Peptidoglycan & murein c) Lignin d) Pectin
- 14) Cambium is an example of:
a) Apical meristems b) Intercalary meristems c) Lateral meristems d) Apex
- 15) An increase in plant girth due to the activity of vascular cambium is called:
a) Primary growth b) secondary growth c) Sap wood d) Heart wood
- 16) The place of attachment of leaf with the shoot is called:
a) Pith b) Pit c) Pulvinus d) Ecdysone
- 17) The heart wood accumulates the chemical:
a) Cellulose b) Absciscic acid c) Chitin d) Resins
- 18) In old tress the active conducting portion of the wood is called:
a) Sap wood b) Heart wood c) Cedar wood d) Bark
- 19) Vascular Cambium initially appears as actively dividing cells between:
a) Primary Xylem and secondary xylem
b) Primary xylem and secondary phloem
c) Primary xylem and primary phloem
d) Secondary xylem and secondary phloem
- 20) The inactive non-conducting wood is called:
a) Heart wood b) Sap wood c) Cork d) Bark
- 21) This type of wood is most resistant to decay and insect attack:
a) Callus b) Hard wood c) Heart wood d) Sap wood
- 22) Plant movements due to external causes are:
a) Paratonic b) Tactic c) Growth d) Turgor
- 23) The movement shown by sperms of liverworts towards archegonia is called:
a) Chemotactic b) Sleep movement c) Nutrition d) Chemotropism
- 24) The hyphae of the fungi show movements:
a) Thigmotropism b) Chemotropism c) Hydrotropism d) Geotropism
- 25) The sleep movement of plants fall under the category of:
a) Growth b) Tactic c) Turgor d) Tropic
- 26) Rapid movement of leaves of mimosa on touching is an example of :
a) Turgor movement b) Nastic movement c) Tropic movements d) Growth movement

27) Action of Venus fly trap is:

- a) Nyctinasty b) Photonasty c) Hyponasty d) Thermonasty

28) Which is stimulus for thigmotropism?

- a) Water b) Light c) Touch d) Chemicals

29) Hyponasty caused by:

- a) Absciscic acid b) Cytokinins c) Gibbereillins d) Auxins

30) Roots of a plant show:

- a) Positive phototropism and negative geotropism
b) Negative phototropism and positive geotropism
c) Negative tactic movement and positive tropic movement
d) Positive geotropism of stem and roots

31) Epinasty is controlled by:

- a) Gibberellins b) Abscisins c) Auxins d) Cytokinins

32) The type of Nastic movement which occurs in response to contact is called:

- a) Haptonastic b) Photonasty c) Thermonasty d) Nyctinasty

33) Haptonastic movement occur in response to:

- a) Contact b) Chemical c) Temperature d) Water

34) Gibberellins is an example of:

- a) Growth inhibitor b) Growth stimulator c) Growth hormone d) None of these

35) Sperms of liverworts, mosses, ferns move towards archegonia, in response to nucleic acid released by the ovum. This is an example of:

- a) Chemotropic movement b) Chemotactic movement c) Chemosastic movement d) Haptonastic movement

36) The word Tropic is derived from Greek word trop meaning:

- a) Sticky b) Turn c) Attractive d) Growth

37) Which is stimulus for thigmotropism?

- a) Water b) Light c) Touch d) Chemicals

38) Positive geotropism of root is due to:

- a) Auxin b) Giberellins c) Absciscic acid d) Ethene

39) Pick the paratonic movement from the followings:

- a) Nastic b) Growth c) Turgor d) Tactile

40) Which of the following plays the major role in providing support to young herbaceous parts of the plant:

- a) Living cells of epidermis with higher turgor pressure
b) Living cells of cortex and pith with higher turgor pressure
c) Collenchyma cells
d) All of these

Skeleton

41) Which of the following has hydrostatic skeleton:

- a) Man b) An insect c) Sea anemone d) Fish

42) Moulting is controlled by the nervous system and hydrostatic skeleton:

- a) Aldosterone b) Androgen c) Ecdysone d) Oxytocin

43) The living cells of cartilage are called:

- a) Cindrocytes b) Chondrocytes c) Nematocysts d) Blastocytes

44) Bone dissolving cells are:

- a) Osteoblasts b) Stem cells c) Osteocytes d) Osteoclasts

45) Mature bone cells are called:

- a) Osteocytes b) Osteoclasts c) Chondrocytes d) Blastocytes

46) Which bone provides attachment site for muscles:

- a) Compact bone b) Spongy bone c) Soft bone d) Cartilage

47) Which one of the following is made up of the bones and cartilage?

- a) Endoskeleton b) Hydrostatic skeleton c) Exoskeleton d) Both a & b

48) The most abundant type of cartilage found on movable joints is:

- a) Bone b) Fibro cartilage c) Hyaline cartilage d) Bone & fibro cartilage

49) Human skeleton and mammalian skeleton can be divided into two parts, axial and:

- a) Appendicular skeleton b) Exoskeleton c) Endoskeleton d) Hydroskeleton

50) Brain is protected by:

- a) Cranium b) Skull c) Orbits d) Zygomatic bone

51) Which one is not the bone of axial skeleton:

- a) Ribs b) Sternum c) Pelvic d) Cranium

52) Which one of the following is not an unpaired bone:

- a) Mandible b) Vomer c) Sphenoid d) Nasal

53) The number of cervical vertebrae are:

- a) 7 b) 12 c) 33 d) 22

54) Which one of the following is avascular structure?

- a) A compact bone b) A spongy bone c) Cartilage d) All of these

55) Number of cervical vertebrae in male camel (Mammal):

- a) 7 b) 11 c) 22 d) No definite number

56) Seven vertebrae lie in neck region, called:

- a) Lumber region b) Thoracic region c) Pelvic region d) Cervical region

57) The first cervical vertebrae is called:

- | | | | |
|----------|----------|---------|-----------|
| a) Atlas | b) Nasal | c) Axis | d) Sacrum |
|----------|----------|---------|-----------|

58) The number of lumbar vertebrae are:

- | | | | |
|------|-------|-------|-------|
| a) 5 | b) 12 | c) 33 | d) 22 |
|------|-------|-------|-------|

59) Which one is the one of hind limb?

- | | | | |
|-----------|---------|-----------|-----------|
| a) Radius | b) Ulna | c) Tarsal | d) Carpal |
|-----------|---------|-----------|-----------|

60) The fusion of four posterior vertebrae present in pelvic region form:

- | | | | |
|-----------|-----------|-----------|---------------|
| a) Sacrum | b) Lumbar | c) Coccyx | d) Chest cage |
|-----------|-----------|-----------|---------------|

61) Which of the following is a bone of axial skeleton:

- | | | | |
|------------|----------|----------|--------|
| a) Humerus | b) Femur | c) Tibia | d) Rib |
|------------|----------|----------|--------|

62) The 12 vertebrae in the second curve of vertebral column are known as:

- | | | | |
|-----------------------|-----------------------|---------------------|---------------------|
| a) Thoracic vertebrae | b) Cervical vertebrae | c) Sacral vertebrae | d) Lumbar vertebrae |
|-----------------------|-----------------------|---------------------|---------------------|

63) Pelvic girdle is composed of three pairs of fused bones:

- a) Ilium, ischium and pubis
- b) Ilium, ischium and frontal
- c) Clavicle, scapula and pubis
- d) Malus, Incus and stepes

64) Which of the following items gives its correct total number?

- a) Thoracic vertebrae in human-11
- b) Floating ribs in human-4
- c) Metacarpals in human-8
- d) Facial bones in human-12

65) In thoracic regions, the number of vertebrae are:

- | | | | |
|-------|-------|------|------|
| a) 12 | b) 15 | c) 5 | d) 4 |
|-------|-------|------|------|

66) All of the following bones are associated with coxal bone, except:

- | | | | |
|----------|------------|----------|-------------|
| a) Ilium | b) Ischium | c) Pubis | d) Clavicle |
|----------|------------|----------|-------------|

67) Last four vertebrae in humans are fused to form a structure called:

- | | | | |
|-----------|----------|-----------------------|-----------|
| a) Sacrum | b) Pubis | c) Cervical vertebrae | d) Coccyx |
|-----------|----------|-----------------------|-----------|

68) How many bones are involved in the formation of each half of pelvic girdle:

- | | | | |
|------------|------------|------------|------------|
| a) 3 bones | b) 2 bones | c) 4 bones | d) 5 bones |
|------------|------------|------------|------------|

69) The vertebral column consists of:

- | | | | |
|-------|-------|-------|-------|
| a) 33 | b) 28 | c) 30 | d) 38 |
|-------|-------|-------|-------|

70) Clavicle connect scapula with:

- | | | | |
|----------|------------|----------|----------|
| a) Skull | b) Sternum | c) Femur | d) Tibia |
|----------|------------|----------|----------|

71) Joints that are held together by short fibers embedded in connective tissue:

- | | | | |
|-------------------|-------------------------|--------------------|-----------------|
| a) Fibrous joints | b) Cartilaginous joints | c) Synovial joints | d) Hinge joints |
|-------------------|-------------------------|--------------------|-----------------|

72) Which of the following bone is not present in the hind-limb?

- | | | | |
|----------|----------|-----------|-----------|
| a) Femur | b) Tibia | c) Radius | d) Fibula |
|----------|----------|-----------|-----------|

73) Which of the following bones are present in the palm of hand?

- | | | | |
|------------|----------------|--------------|----------------|
| a) Carpals | b) Metacarpals | c) Phalanges | d) Metatarsals |
|------------|----------------|--------------|----------------|

74) How many bones are present in the wrist?

- | | | | |
|------------|------------|------------|-------------|
| a) 4 bones | b) 6 bones | c) 8 bones | d) 14 bones |
|------------|------------|------------|-------------|

75) How many vertebrae are present in coccyx?

- | | | | |
|------|-------|------|------|
| a) 7 | b) 12 | c) 9 | d) 4 |
|------|-------|------|------|

76) How many vertebrae are in sacrum?

- | | | | |
|------|-------|------|------|
| a) 7 | b) 12 | c) 5 | d) 4 |
|------|-------|------|------|

77) Which of the following bones are present in pectoral girdle?

- | | | | |
|-------------|------------|------------------|------------------|
| a) Clavicle | b) Scapula | c) Both of these | d) None of these |
|-------------|------------|------------------|------------------|

78) A joint formed between humerus, radius and ulna is an example of:

- | | | | |
|--------------------|---------------------------|-------------------------|------------------|
| a) Immovable joint | b) Slightly movable joint | c) Freely movable joint | d) Fibrous joint |
|--------------------|---------------------------|-------------------------|------------------|

79) Joint between two parietal bones, which is infect immovable one is an example of:

- | | | | |
|-------------------|-------------------------|--------------------|------------------|
| a) Fibrous joints | b) Cartilaginous joints | c) Synovial joints | d) None of these |
|-------------------|-------------------------|--------------------|------------------|

80) Fibrous capsule surrounding synovial joints may be thickened at some places to form:

- | | | | |
|----------------------|--------------|------------|-----------|
| a) Synovial membrane | b) Ligaments | c) Muscles | d) Tendon |
|----------------------|--------------|------------|-----------|

81) In which of the following joint muscles are arranged in the same plane as that of joint?

- a) Between radius and ulna
- b) Between ulna and scapula
- c) Between humerus and scapula
- d) Between femur and tibia

82) Which of the following joints between the ribs and sternum and the pubis symphysis tend to be slightly:

- | | | | |
|-------------------------|-------------------|-----------------|-------------------------|
| a) Cartilaginous joints | b) Fibrous joints | c) Hinge joints | d) Ball & socket joints |
|-------------------------|-------------------|-----------------|-------------------------|

83) Ball and socket joint allows the movement in:

- | | | | |
|------------------|-------------------|--------------------|-----------------------|
| a) One direction | b) Two directions | c) Four directions | d) Several directions |
|------------------|-------------------|--------------------|-----------------------|

84) Hinge joints allows the movement of bones in:

- | | | | |
|------------------|--------------------|-------------------|-------------------|
| a) Two direction | b) Three direction | c) Four direction | d) All directions |
|------------------|--------------------|-------------------|-------------------|

85) The joints allow the movements in two directions is called:

- | | | | |
|------------------------|-------------------|----------------|-------------------------|
| a) Cartilaginous joint | b) Synovial joint | c) Hinge joint | d) Ball & socket joints |
|------------------------|-------------------|----------------|-------------------------|

86) The joints that allow movements in several directions is called:

- a) Cartilaginous joint b) Synovial joint c) Hinge joint d) Ball & socket joint

87) Neck has type of joints:

- a) Ball and socket b) Hinge c) Pivot d) Fibrous

88) Skeletal disease which causes immobility and fusion of vertebral joints is called:

- a) Disc slip b) Sciatica c) Arthritis d) Spondylosis

89) Osteoarthritis is the most common chronic arthritis which is a degenerative joint disease also caused by:

- a) Genetic defect b) Hormonal defect c) Nutritional cause d) Environmental cause

90) Which one of the following is not a joint disease:

- a) Arthritis b) Sciatica c) Disc slip d) Spondylosis

91) A condition in which Palatine processes of maxilla and palatine fail to fuse is called:

- a) Cleft palate b) Microcephaly c) Myxoedema d) Cretinism

92) Which is not connected to arthritis?

- a) Haematoma b) Inflammation c) Degeneration d) Stiffness

93) Bowed legs and deformed pelvis are the symptoms of which disease in children?

- a) Rickets b) Disc slip c) Sciatica d) Haematoma

94) Which of the following hormone is predominantly responsible for bone weakening in older women?

- a) Progesterone b) Oestrogen c) Parathyroid hormone d) Calcitonin

95) Collagen fibers of bone are hardened by deposition of:

- 1) Ca & PO₄ b) CaCO₃ c) CaSO₄ d) SiO₂

96) Which of the following statement about osteoporosis is incorrect?

- a) It results from estrogen deficiency
b) Bone eating process takes over bone formation process.
c) There is reduction of bone mass and change in chemical composition of the matrix
d) It is common in old age.

97) Acute form of arthritis usually result from:

- a) Bacterial invasion b) Viral invasion c) Fungal invasion d) Osteoarthritis

98) Sciatica is characterized by stabbing pain radiating over the course of:

- a) Sciatic artery b) Sciatic nerve c) Sciatic vein d) Sciatic capillary

99) Which disease causes immobility and fusion of vertebral joints?

- a) Sciatica b) Disc slip c) Spondylosis d) Rickets

100) Which of the following cells are involved in soft callus formation?

- a) Fibroblast and osteoblast b) Osteoblast and osteoclast c) Osteoclast and osteocyte d) Osteocyte and osteoblast

101) Bony callus formation completes in:

- a) 2-3 weeks b) 3-4 weeks c) 2-3 months d) 3-4 months.

102) Which of the following statements about fractures in old age is incorrect?

- a) They are more common than in adult age
b) Occur as a result of bone being thin and weak
c) Due to good blood supply it results in quick healing
d) It involves osteoblasts and osteocytes

103) If two ends of fractured bone are opened and kept united via screws and wires drilled in bone substance. This step in fracture repair is called:

- a) Open reduction b) Closed Fixation c) Open fixation d) Immobilization

104) A fracture hematoma has:

- a) Healing properties b) Destructive properties c) Neutralizing properties d) Dead cells

Muscles

105) Muscles in the gut wall are:

- a) Smooth b) Skeletal c) Cardiac d) Voluntary

106) Which of the following is a uni-nucleated cell?

- a) A smooth muscle cell b) A cardiac muscle cell c) A skeletal muscle cell d) All of these

107) The contraction of which of the following muscle fibers, is controlled by hormones:

- a) A smooth muscle b) A cardiac muscle c) A skeletal muscle d) All of these

108) Why skeletal muscles are called striated muscles?

- a) They appear darker than smooth muscles by naked eye
b) Alternating dark and light bands appear on their surface when visualized by naked eye
c) Alternating dark and light bands appear on their surface when visualized via a microscope
d) All of these

109) Cardiac muscles are the muscles of:

- a) Liver b) Heart c) Stomach d) Kidney

110) Each muscle fiber is surrounded by a membrane which is called:

- a) Sarcomere b) Twitch fiber c) Sarcolemma d) Capsule

111) Twisting around actin chain there are 2 strands of another protein i.e.

- a) Myosin b) Tropomyosin c) Troponin d) Creatine

112) Thick filament in myofibril is made up of:

- a) Myosin b) Actin c) Tropomyosin d) Troponin

- 113) A smallest contractile unit of muscle contraction called sarcomere is the area between two:
a) H- zone b) M- Line c) Z- Line d) A band
- 114) Diameter of thick filament is:
a) 7 nm b) 8 nm c) 16nm d) 10-100 nm
- 115) The thick filament which are 16 nm in diameter are composed:
a) Actin b) Myosin c) Tropomyosin d) Troponin
- 116) The most important function of troponin is:
a) To bind with actin
b) To bind with tropomyosin
c) To bind with Ca^{2+} ions
d) All of these
- 117) If a cross section of a sarcomere is seen, each myosin is surrounded by how many actin molecules:
a) 9 b) 5 c) 6 d) 7
- 118) What happens during muscle contraction to the length of each myosin and action filament?
a) Z- lines get closer
b) A band becomes short
c) I band elongates
d) There is no change in sarcomere
- 119) Calcium ions released from sarcoplasmic reticulum bind with During muscle contraction:
a) Tropomyosin b) Cytosol's ions c) Sarcomere d) Troponin
- 120) Diameter of skeletal muscle fiber is:
a) 2-50 μm b) 10-100 μm c) 30-90 μm d) 1-80 μm
- 121) Lining of digestive system contains:
a) Skeletal muscle b) Cardiac muscle c) Skeletal & cardiac muscle d) Smooth muscle
- 122) Disease appearing due to low Ca^{+2} level in blood:
a) Cramp b) Arthritis c) Spondylosis d) Tetany
- 123) Muscle fatigue is caused by:
a) CO_2 b) Fumaric acid c) Ethyl alcohols d) Lactic acid
- 124) Which of the following statement about fatigue is correct?
a) The major event in it is accumulation of lactic acid
b) Lactic acid accumulation turns pH in acidic range leading to muscle ache.
c) Ionic imbalance may also cause it
d) All of these
- 125) Cramp is also known as:
a) Tetany b) Titanic contraction c) Muscle fatigue d) Tetanus
- 126) What is the mortality rate in developing countries due to tetany:
a) 35% b) 40% c) 45% d) 50%
- 127) Tetanus is caused by:
a) Bacteria b) Virus c) Fungi d) Protists
- 128) The problem in which contraction of entire muscle takes place and it lasts for just a few second to several hours is:
a) Muscle fatigue b) Tetany c) Cramp d) Tetanus
- 129) Complete immobilization of muscle leads to:
a) Increase in capillaries b) Increase in mitochondria c) Severe atrophy d) Resistance to fatigue
- 130) Muscle connection to bone by:
a) Tendon b) Ligament c) Z-line d) Cross bridges
- 131) Which is the end of muscle which remains fixed when muscle contracts?
a) Insertion b) Origin c) Tendon d) Belly
- 132) Bone to bone attachment is by:
a) Tendon b) Nerves c) Muscles d) Ligaments
- 133) Generally, each end of the entire muscle is attached to bone by bundle of collagen, non-elastic fibers known as:
a) Tendons b) Ligaments c) Brachialis d) Origin
- 134) Insertion of Biceps is on:
a) Ulna b) Radius c) Olecranon process of ulna d) Scapula
- 135) Slightly elastic connective tissues that attach bone to bone are called:
a) Tendons b) Brachialis c) Brachioradialis d) Ligament
- 136) Which of the following muscle is an antagonistic member of Biceps brachii?
a) Bracheoradialis b) Brachialis c) Intercostal d) Triceps
- 137) The connective tissue which attached the bones together is called:
a) Ligaments b) Tendons c) Sarcolemma d) Myofibrils
- 138) Muscle is connected to bone by:
a) Cross bridges b) Ligament c) Z-line d) Tendon
- 139) Rigor mortis i.e., stiffening of body after death results from:
a) Accumulation of rigid proteins molecules in sarcoplasm
b) Unavailability of ATP, which is necessary to break the link between actin and myosin
c) Decrease in body temperature after death
d) Death of tissue due to unavailability of O_2

Animal movement

- 140) Euglena moves with the help of:**
 a) Cilium b) Pseudopodium c) Myonemes d) Flagella
- 141) Which animal moves by jet-propulsion:**
 a) Earthworm b) Star fish c) Snail d) Jelly fish
- 142) Birds, which has long narrow wings:**
 a) Gull b) Owl c) Crow d) Eagle
- 143) The superacoracoid muscles provide power for the:**
 a) Upward stroke b) Downward stroke c) Recovery Stroke d) Neutral stroke
- 144) Mammals showing digitigrade mode of locomotion?**
 a) Bear b) Deer c) Rabbit d) Horse
- 145) Which of the following is not unguligrade?**
 a) Bear b) Man c) Rabbit d) Goat
- 146) Plantigrade mode of locomotion is observed in:**
 a) Monkey b) Rabbit c) Goat d) Rodents
- 147) Which one of the following is not plantigrade?**
 a) Man b) Ape c) Bear d) Rabbit
- 148) Most efficient way of supporting the body is seen in:**
 a) Fishes b) Aves c) Reptiles d) Mammals
- 149) In an annelids, the contraction of circular muscle results in:**
 a) Lengthening of the body b) Shortening of the body c) Widening of body d) Thinning of body
- 150) Which of the following statement is incorrect about Molluscans?**
 a) They are surrounded by single or double pieces of hard skeleton
 b) Their shell grows as the animal grows
 c) They have hydrostatic skeleton
 d) They move by tube feet
- 151) Which one of the following forms the bulk of exoskeleton of an arthropod?**
 a) Epicuticle b) Procuticle c) Ectocuticle d) None of these
- 152) Exoskeleton of a marine snail is composed of:**
 a) CaPO_4 b) CaCO_3 c) CaSO_4 d) SiO_2
- 153) Which of the following statement about an arthropod exoskeleton is incorrect?**
 a) It permits gaseous exchange
 b) It contains joints, for the same purpose as present in human skeletal system
 c) It provides muscle attachment
 d) Like all the other types of exoskeleton, they lack sensation
- 154) Ecdysone is:**
 a) An enzyme that digest endocuticle during an arthropodal ecdysis
 b) A newly formed exoskeleton in authropods
 c) A hormone that regulates moulting in arthropods
 d) A process that involves moulting
- 155) Endoskeleton is secreted by:**
 a) Ectoderm b) Endoderm c) Mesoderm d) All of these
- 156) Which of the following animal uses Setae and Muscles for their locomotion?**
 a) Cockroach b) Snail c) Earthworm d) Star fish
- 157) Which of the following is the swiftest form of the locomotion?**
 a) Plantigrade b) Digitigrade c) Unguligrade d) Hopping
- 158) Which of the following vertebrates have a fish-like body?**
 a) Reptiles b) Aves c) Amphibians d) Mammals
- 159) Which of the following pairs of fins in a fish body are paired?**
 a) Dorsal and ventral b) Pectoral and Pelvic c) Tail and anal d) All of these
- 160) Among the following organisms which shows the best adaptations for locomotion?**
 a) Amoeba b) Earthworm c) Reptiles d) Amphibians
- 161) S-band locomotion is characteristically seen in:**
 a) Bony fish b) Cartilaginous fish c) Fish like mammals d) All fishes

Answer key:

1	a	2	b	3	b	4	b	5	b	6	a	7	d	8	a	9	d	10	b
11	a	12	d	13	c	14	c	15	b	16	c	17	a	18	a	19	c	20	a
21	c	22	a	23	a	24	b	25	b	26	a	27	b	28	b	29	b	30	b
31	c	32	a	33	a	34	b	35	b	36	b	37	c	38	a	39	a	40	d
41	c	42	c	43	b	44	d	45	a	46	a	47	a	48	c	49	a	50	b
51	c	52	d	53	a	54	c	55	a	56	d	57	a	58	a	59	c	60	c
61	d	62	a	63	a	64	b	65	a	66	d	67	d	68	a	69	a	70	b
71	a	72	c	73	b	74	c	75	d	76	c	77	c	78	c	79	a	80	b
81	d	82	a	83	d	84	a	85	c	86	d	87	c	88	d	89	a	90	b
91	a	92	a	93	a	94	b	95	a	96	c	97	a	98	d	99	c	100	a
101	c	102	c	103	a	104	d	105	a	106	a	107	a	108	c	109	b	110	c
111	b	112	a	113	c	114	c	115	b	116	d	117	c	118	a	119	d	120	b
121	d	122	d	123	d	124	d	125	b	126	b	127	a	128	c	129	c	130	a
131	b	132	d	133	a	134	b	135	d	136	d	137	a	138	d	139	b	140	d
141	d	142	a	143	a	144	c	145	a	146	a	147	d	148	d	149	d	150	d
151	b	152	b	153	b	154	c	155	c	156	c	157	c	158	c	159	b	160	c
161	b																		

Past MDCAT MCQ's

2008

- 1) Which disease is caused by low calcium in the blood?
a) Tetany b) Muscle fatigue. c) Cramp d) Sciatica
- 2) Which disease causes immobility and fusion of vertebral joint?
a) Sciatica b) Disc slip. c) Spondylosis d) Rickets
- 3) Which form of anaerobic respiration occurs in muscle cell of humans and other animals during extreme physical activities?
a) Alcoholic fermentation b) Glycolysis c) Lactic acid fermentation d) Pyruvic acid oxidation.
- 4) Which of the following is made up of bones and cartilage?
a) Endoskeleton b) Hydrostatic skeleton c) Exoskeleton d) Both a & b
- 5) Which one of the following is most slender in structure?
a) Microtubules b) Intermediate filaments c) Micro filaments d) Both a& b

2009

- 6) The joints that allow movements in several directions are:
a) Hinge Joints b) Fibrous Joints c) Ball and Socket Joints d) Cartilaginous Joints
- 7) The collagen fibers of bone are hardened by deposit of:
a) Calcium phosphate b) Calcium carbonate c) Calcium oxalate d) Calcium bicarbonate

2010

- 8) The living cells of cartilage are called:
a) Chondrocytes b) Osteocytes c) Osteoblasts d) Osteoclasts
- 9) The disease which causes immobility and fusion of vertebral joints is:
a) Osteomalacia (soft bones) b) Arthritis c) Disc slip d) Spondylosis
- 10) During muscle contraction:
a) I-band shortens b) Actin filaments shorten c) Myosin filaments shorten d) Z-line disappears

2011

- 11) Muscle is made up of many cells which are referred to as:
a) Myofilaments b) Sarcolemma c) Myofibrils d) Muscles Fiber
- 12) The length of myofibril from one Z-band to the next is known as:
a) Sarcomere b) Sarcoplasm c) Sarcolemma d) Muscle Fiber
- 13) Calcium ions released during a muscle fiber contraction attach with:
a) Myosin b) Tropomyosin c) Actin d) Troponin
- 14) A muscle condition resulting from the accumulation of lactic acid and ionic imbalance is:
a) Tetany b) Cramp c) Muscle Fatigue d) Tetanus
- 15) The pigment which stores oxygen in muscles is:
a) Hemoglobin b) Myosin c) Myoglobin d) Actinomyosin

2012

- 16) Each muscle fibre is surrounded by membrane which is called:
a) Sarcomere b) Twitch fibre c) Sarcolemma d) Capsule
- 17) When calcium ions are released from the sarcoplasmic reticulum they bind withduring muscle contraction:
a) Tropomyosin b) Cytosol's ions c) Sarcolemma d) Troponin
- 18) Human and mammalian skeleton can be divided into two parts, axial skeleton and.....:
a) Appendicular skeleton b) Endoskeleton c) Exoskeleton d) Hydrostatic skeleton
- 19) Last four vertebrae in humans are fused to form a structure called:
a) Sacrum b) Pubis c) Cervical vertebrae d) Coccyx
- 20) How many bones are involved in the formation of each half of pelvic girdle?
a) 3 bones b) 2 bones c) 4 bones d) 1 bone

2013

- 21) The length of myofibril from one Z-band to the next is described as:
a) Sarcolemma b) Sarcomere c) Sarcoplasm d) Muscle fiber
- 22) The Ca^{++} ions released during a muscle fiber contraction attach with:
a) Myosin b) Troponin c) Actin d) Tropomyosin
- 23) The joint that allows the movement in several directions is called:
a) Hinge joint b) Cartilagous joint c) Ball and Socket joint d) Fibrous joint
- 24) Where can we find H zone in the figure of fine structure of skeletal muscle's myofibril?
a) In the mid of A band b) Besides the Z-line c) In I-band d) Along the I-band
- 25) First vertebra of cervical region of vertebral column is known as:
a) Atlas b) Thoracic c) Sacral d) Axis

2014

- 26) In a human vertebral column, the number ofvertebrae is 7.
a) Cervical b) Lumber c) Thoracic d) Sacrum
- 27) Which one of the following structures holds the bones together?
a) Joints b) Fibrous capsules c) Cartilages d) Ligaments
- 28) Which one of the following cartilages is the most abundant in the human body?
a) Elastic cartilage b) Fibrous Cartilage c) Chondrous cartilage d) Hyaline Cartilage
- 29) The repeated protein pattern of myofibrils is called:
a) Sarcomere b) Sarcolemma c) Zyomere d) Cross bridges
- 30) When more energy is required in muscle contraction then that energy can also be produced byas a secondary source.
a) Glucose b) Fructose c) Phosphocreatine d) Lactic acid

2015

- 31) The total number of cervical and thoracic vertebrate in human vertebral column is:
a) 7 b) 14 c) 19 d) 33
- 32) A sarcomere is the region of a myofibril between two successive:
a) M-lines b) I-bands c) Z-lines d) T-tubules
- 33) The sarcolemma of muscle fiber folds inwards and forms a system of tubes which runs through the sarcoplasm called:
a) Myofilaments b) Z-lines c) Sarcoplasmic reticulum d) Transverse tubules
- 34) According to sliding filament theory, when muscle fibers are stimulated by nervous system, which of the following changes occurs?
a) I-bands shorten
b) Z-lines move further apart
c) H-zone becomes more visible
d) A-bands shorten
- 35) If lactic acid builds up in thigh muscles, it causes muscle tiredness and pain. This condition is called:
a) Muscle Fatigue b) Cramps c) Tetany d) Oxygen debt in muscles

2016

- 36) Brain is protected and enclosed in:
a) Lumbar vertebrae b) Vertebral column c) Coccyx d) Cranium
- 37) Longest bone in the human skeleton is:
a) Ulna b) Tibia c) Fibula d) Femur
- 38) Hips and shoulder joints are examples of:
a) Hinge Joints b) Synovial Joints c) Ball and Socket Joints d) Cartilaginous Joints
- 39) In pelvic region of human body, sacrum is formed by the fusion of:
a) 4 Vertebrae b) 6 Vertebrae c) 5 Vertebrae d) 3 Vertebrae
- 40) Each muscle fiber is surrounded by a modified cell membrane called:
a) Sarcolemma b) Myosin Filament c) Sarcomere d) Myofilament

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- 41) Spongy bone is always surrounded by:
a) Compact bone b) Cartilage c) Osteoblast cells d) Osteoclast cells
- 42) Bone matrix is hardened by the:
a) Haversian canals b) Canaliculfs c) Bone marrow tissues d) Calcium phosphate

43) The number of bones forming skull in man is:

- a) 8 b) 20 c) 14 d) 22

44) The spine consists of linear series of :

- a) 33 bones b) 12 bones c) 24 bones d) 7 bones

45) W.O.F changes occurs when skeletal muscles contract:

- a) I-band shortens only
b) A-band shortens and Z-lines move apart
c) I-band shortens and Z-lines come close to each other
d) Actin filament contracts

Answer key:

1	a	2	d	3	c	4	a	5	d
6	c	7	a	8	a	9	d	10	a
11	d	12	a	13	d	14	c	15	c
16	c	17	d	18	a	19	d	20	a
21	b	22	b	23	c	24	a	25	a
26	a	27	d	28	d	29	a	30	b
31	c	32	c	33	c	34	d	35	a
36	a	37	d	38	d	39	c	40	c
41	a	42	a	43	d	44	d	45	a
46	c								