Chapter 16

Short Questions:

1. What is sciatica? (OR) What is sciatica and its causes? (LB-2009, 2010, 2016)

It is characterized by stabbing pain radiating over the course of sciatic nerve. 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. This may result in a number of lower limb impairment depending on the precise nerve root injured. When sciatic nerve is completely transected, the legs become nearly useless. They cannot be flexed and all foot-ankle movement is lost. Recovery from sciatic injury is usually slow and incomplete.

2. What is foreman triosseum? (OR) What is foreman triosseum? How it is formed? (LB-2010, 2015)

The lifting action of birds is possible because the tendon of the supra- coracoid muscles passes through an opening the formen triosseum formed between the scapula coracoid and clavicle bones and is attached to the upper surface of the humerus.

3. What is the role of vascular cambium? (LB-2011, 2012)

Secondary growth occurs due to cell division in : (i) Vascular cambium (ii) Cork cambium.
Vascular cambium first appears as a cylinder of actively dividing cells between primary xylem and primary phloem. Vascular cambium gives rise to two new tissues, one is the secondary xylem next to the inner surface of the vascular cambium, the other is the secondary phloem appearing outer to the vascular cambium.

4. What is axial skeleton? (LB-2012)

The axial skeleton includes the skull, the vertebrae, ribs and the sternum.
Skull: It is made up of cranium and facial bones. The cranium consists of 8 bones (Fig 16.4), 4 unpaired and 2 paired which protect the brain. there are 14 facial bones
of which 6 are paired and 2 unpaired.

Vertebral column: Extends from the skull to the pelvis to form backbone,which protects the spinal cord. Normally the vertebral column has 4 curvatures, which provide more strength than does the straight column. The vertebral column consists of 33 vertebrae.

Rib cage : It is composed of twelve pairs of ribs that articulate with the thoracic vertebrae. Ten of them connect anteriorly with sternum, either directly or through the costal arch. The lower two pairs of ribs are called “floating ribs” because they do not attach to the sternum

5. **What are synovial joints? (LB-2014)**

These joints contain a cavity filled with fluid and are adapted to reduce friction between the moving joints. The joint is surrounded by a layer of connective tissue called “fibrous capsule” and their inner layer the synovial membrane. Some parts of capsule may be modified to form distinct ligament, holding the bones together.

Based on structure and movements allowed, the synovial joints can be classified further into two major categories:

- Hing joints
- Ball and socket joints

5. What is meant by passive and active flight? (OR) Differentiate between active and passive flight. (LB-2012, 2013)

Active flight	Passive flight
● When little or no support can be gained from upward air currents, the same effect can be achieved by lapping the wings. ● As the birds moves through the air, the air lows more quickly over the curved upper surface than over the lower surface. ● This reduces the air pressure on the top of the wing, compared with air pressure below the wing. There is, therefore, a net upward pressure on the wing which gives lift to the bird.	● When birds glide, the wings act as aerofoils. An aerofoils is any smooth surface which moves through the air at an angle,to the airstream. ● The air lows over the wing in such a way that the bird is given lift; the amount of lift depends on the angle at which the wing is held relative to the airstream.

6. What is rickets? Give its causes and cure. (OR) How is rickets produced? (LB-2012)

Rickets is another disease in children with bowed legs and deformed pelvis. It is caused by deficiency of calcium in diet or vitamin ‘D’ deficiency. It is treated by vitamin ‘D’ fortified milk and exposing skin to sunlight.

7. What is herniation of discs? (OR) Define disc-slip. (OR) What are the causes of herniation of discs?(LB-2010, 2011, 2013)

Each intervertebral disc is a cushion - like pad composed of an inner semi fluid nucleus pulposus which acts as rubber ball to give a disc its elasticity and compressibility and a strong outer ring of fibrocartilage, the annulus fibrosus. The annulus fibrosus holds together successive vertebrae.

The discs act as shock absorber during walking, jumping, running and to lesser extent bend laterally. 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 discs. The herniated disc (commonly known slipped disc) usually involves rupture of annulus fibrosus followed by protrusion of the spongy nucleus pulposus. If protrusion presses on spinal cord or on spinal nerves exiting from spinal cord, generate severe pain or even destruction of these nervous structure. Disc slip is treated with bed rest, traction and painkiller. If this fails disc may be removed surgically.

8. What is the difference between tetanus and muscle tetany? (LB-2018)

Tetany	Tetanus
● Tetany is the disease caused by low calcium in the blood. ● It increases the excitability of neurons and results in loss of sensations. ● Muscle twitches and convulsion occur. If untreated the system progresses to spasm of larynx, respiratory paralysis and ultimately death occurs.	● The term tetanus is used for an acute infectious disease caused by anaerobic bacterium **Clostridium tetani** resulting in persistant painful spasms of some skeletal muscles. ● Typically begins gradually with stiffness of jaws and neck muscles and progresses to fixed rigidity of jaws (lock jaw) and spasms of trunk and limb muscles, usually fatal due to respiratory failure

9. What are the sources of energy for muscle contraction? (LB-2012)

Energy for muscle contraction comes from the ATP. Supply of ATP is maintained by the aerobic breakdown of glucose in muscle cell, which comes from stored glycogen in the cell. When more energy is required due to high metabolism, it is provided by another energy storing substance called creatine phosphate. Sometime during oxygen deficiency or very high metabolic activity such as (prolonged or strenuous muscular activity), ATP requirement is met by anaerobic breakdown of glucose into

Lactic acid. Lactic acid accumulation causes muscle fatigue. At rest, 1/5 of the lactic acid is broken aerobically and its energy is used to change the remaining 4/5 lactic acid into glucose.

10. What is the difference between exoskeleton and endoskeleton? (OR) What is the composition of exoskeleton? (LB-2015)

An exoskeleton is hardened outer covering to which internal muscles are attached. The exoskeleton is inert and non-living. It is secreted by the ectoderm in animal cells.

It is composed of two layers.

The epicuticle is the outer most layer. Because it is made up of waxy lipoprotein, it is impermeable to water and serves as a barrier to microorganisms in insects. The bulk of exoskeleton is below the epicuticle and is called the procuticle.

Procuticle consists of an outerlayer exocuticle and inner layer of endocuticle. The procuticle is composed of chitin, tough, leathery, polysaccharide and several kinds of protein. It is further hardened by sclerotization and sometimes by impregnation with calcium carbonate.

11. What is the hematoma formation? (LB-2016)

Hematoma Formation : When a bone breaks, the blood vessels in the bone itself, and perhaps in surrounding are torn resulting in hemorrhage. As a result, a hematoma, a mass of clotted blood, forms at the fracture site. Soon after, bone cell deprived of food begin to die and the tissue at the fracture site becomes swollen and hence painful.

12. What is effective and recovery stroke? (OR) Differentiate between effective and recovery stroke. (LB-2016)

Effective stroke	Recovery stroke
five out of nine (5/9) double fibrils contract or slide simultaneously with the result that cilium bend or shorten	The four out of nine(4/9) double fibrils contract and cilium becomes, straight. It is called recovery stroke.

14. What are plantigrade and unguligrade? (OR) What are plantigrade, digitigrade and unguligrade mammals? (LB-2017)

1. Plantigrade : In this mode of locomotion the mammals walk on their soles with palm, wrist, and digits all resting more or less on ground, such as monkeys, apes, man and bear etc.

2. Digitigrade : Some mammals tend to walk on their digits only. They run faster than plantigrade animals. In these mammals, irst digit usually reduces or completely lost as in rabbit, rodents etc.

3. Unguligrade : These mammals walk on the tips of toes modified into hoof as deer, goat. It is the most swift type of locomotion.

15. Characterize collenchyma cells. (LB-2011, 2012)

Collenchyma cells have protoplasts and usually lack secondary walls. They have angular thickening in their primary walls. They are usually grouped in strands or cylinders. Collenchyma cells provide support to young herbaceous parts of the plant. Young stems, for instance, often have a cylinder of collenchyma just below their surface. Collenchyma cells are elastic, elongate with the growth of stems and leaves.

16. Compare phototropism and geotropism. (LB-2017)

Phototropism	Geotropism
Phototropism : It is the movement of part of plant, in response to stimulus of light and is caused by the differential growth of part of a plant like stem or root,	Geotropism : It is the response to gravity. Roots display positive geotropism and shoots negative geotropism.

17. Compare hinge joint with ball and socket joint. (LB-2012, 2018)

Hing Joints	Ball and Socket joints
The joint that allows the movements in two directions. These are at elbow and knee. At these joints, pair of muscles are arranged in the same plane as that of joints. One end of each muscle, the origin is fixed to the immovable bone on one side of joint and the other end of muscles, the insertion is attached to the far side of the joint.	The joint that allows the movement in several directions. Such joints have at least two pairs of muscles present perpendicular to each other. They provide maximum flexibility. Hip joint and shoulder joint are the examples of ball and socket joints.

18. Discuss hematoma formation. (LB-2010)

Hematoma Formation : When a bone breaks, the blood vessels in the bone itself, and perhaps in surrounding are torn resulting in hemorrhage. As a result, a hematoma, a mass of clotted blood, forms at the fracture site. Soon after, bone cell deprived of food begin to die and the tissue at the fracture site becomes swollen and hence painful.

19. Define photonasty and thermonasty. (LB-2016)

Photonasty : The principal stimulus is the photoperiod. The lowers open and close due to light intensity.

Thermonasty : 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.

20. Define haptonastic movement. (LB-2014)

Haptonastic movements occur in response to contact. Examples include the action of the Venus fly trap.

21. Define antagonistic movement of muscles. (LB-2018)

At joint, these muscles work against each other by contraction. This relationship is called antagonism. The best example is the movement of elbow joint by biceps and triceps. The biceps bends the arm at the elbow joint, and triceps straightens it.

The biceps brachii muscle arises by the two heads from scapula and is inserted into the medial surface of the radius bone. The other two muscles lie below the biceps brachi. The two muscles are brachialis and brachioradialis.

The brachialis is inserted in the ulna, while brachioradialis is inserted in the radius. When these muscles contract they lift radius and ulna and bend the arm at the elbow. When triceps contracts it straightens arm at elbow.

In the antagonistic pairs one muscle reverses the efect of the other and they do not contract simultaneously.

22. Define ecdysis. (OR) What is the process of ecdysis (moulting). (LB-2012)

The animal needs to shed its exoskeleton periodically and replace it with one of the larger size. This process is known as “ecdysis or moulting.”

Ecdysis is divided into four stages:

1. Enzymes, secreted from hypodermal glands, begin digesting the old endocuticle. This digestion separates hypodermis and the exoskeleton.
2. The old exoskeleton is split and pores are formed.
3. The digestion of endocuticle is followed by secretion of new procuticle and epicuticle.
4. Finally, the new exoskeleton is hardened by deposition of calcium carbonate. During the

hardening process, the arthropod is vulnerable to predators and remains hidden. All these changes are controlled by the nervous system and the hormone ecdysone.

23. Discuss two main types of cartilage. (LB-2013)

(i) Hyaline Cartilage : It is the most abundant type in human body. It is found at the movable joints.

(ii) Elastic Cartilage: It has matrix containing bundles of collagens ibers. It forms external pinnae of ears and the epiglottis.

24. Differentiate between sclerenchyma and collenchyma cells. (LB-2013, 2019)

Sclerenchyma Cells	Collenchyma cells
● They have thick secondary cell walls usually impregnated with lignin, an organic substance that makes the walls tough and hard. Most of the sclerenchyma cells are non-living. ● Their primary function is to provide support to the plant parts. ● There are three types of sclerenchymatous cells. ● (i) Fibers (Tracheids): These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps. ● (ii) Sclereides: These are shorter than ibers and are found in seed coats and nut shells and provide protection. ● (iii) Vessels (Tracheae): Long tubular structures, join end to end to form long water conducting pipe in xylem.	● Collenchyma cells have protoplasts and usually lack secondary walls. ● They have angular thickening in their primary walls. ● They are usually grouped in strands or cylinders. ● Collenchyma cells provide support to young herbaceous parts of the plant. ● Young stems, for instance, often have a cylinder of collenchyma just below their surface. ● Collenchyma cells are elastic, elongate with the growth of stems and leaves.

25. Differentiate between fibers and sclereids. (LB-2014)

Fibers (Tracheids)	Sclereides:
These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps.	These are shorter than ibers and are found in seed coats and nut shells and provide protection.

26. Differentiate between compact bone and spongy bone. Give only two differences. (LB-2018)

- Compact bone is dense and strong and provides an attachment site for a muscle.
- Spongy bone is light, rich in blood vessels, and highly porous. The cavities of spongy bone contain bone marrow where blood cells are formed.

27. Distinguish between axial skeleton and appendicular skeleton. (LB-2008, 2014)

Axial Skeleton

The axial skeleton includes the skull, the vertebrae, ribs and the sternum.

Skull: It is made up of cranium and facial bones. The cranium consists of 8 bones (Fig 16.4), 4 unpaired and 2 paired which protect the brain. Parietal and temporal are paired bones, whereas frontal, occipital, sphenoid and ethmoid are unpaired bones. Besides that there are 14 facial bones of which 6 are paired and 2 unpaired.

Vertebral Column : Vertebral column extends from the skull to the pelvis to form backbone,

Rib cage : It is composed of twelve pairs of ribs that articulate with the thoracic vertebrae.ch protects the spinal cord.

Appendicular Skeleton

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

Pectoral Girdle and Fore Limb : Pectoral girdle comprises scapula, suprascapula, and clavicle. The clavicle connects scapula with sternum.

Pelvic Girdle and Hind Limb : 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. The pelvic girdle supports the pelvic region.

28. Differentiate between skeletal and smooth muscles. (LB-2012)

Smooth Muscles	Skeletal Muscles
● Smooth muscles were the earliest form of muscle to evolve and it is found throughout animal kingdom. ● Smooth muscles are long and spindle shape with each containing a single nucleus. ● It has no striations. It is not under the voluntary control.	● The muscles that are attached to the skeleton and are associated with the movement of bones are called skeletal muscles. ● The skeletal muscles are consciously controlled and therefore, are called voluntary muscles.

● We describe smooth muscle tissue most precisely as visceral, non-striated and involuntary. ● These muscles are found in the blood vessels, digestive tract and many other organs	● Skeletal muscles are also called striped or striated muscles because they show alternate light and dark bands, e.g., triceps and biceps. ● Generally, each end of the entire muscle is attached to bone by a bundle of collagen, non-elastic ibres, known as tendons.

29. Differentiate between Osteoporosis and Osteomalcia. (LB-2016)

Osteoporosis	Osteomalacia (soft bones)
● Osteoporosis is a group of diseases in which bone resorption out paces bone deposit. ● In this case bone mass is reduced and chemical composition of the matrix remains normal. ● Osteoporosis mostly occurs in aged women, which is related to decreased estrogen level. ● Other factors which may contribute include, insuicient exercise, diet poor in calcium and protein, smoking, etc. ● Estrogen replacement therapy (ERT) ofers the best protection against osteoporotic bone fractures.	● Osteomalacia (soft bones) includes a number of disorders in which the bones receive inadequate minerals. ● In this disease, calcium salts are not deposited and hence ones soften and weaken. ● Weight bearing bones of legs and pelvis bend and deform. ● The main symptom is the pain when weight is put on affected bones.

30. Distinguish between the phototactic and chemotactic movements. (OR) What is phototacticmovement?(OR) What is chemotactic movement? (LB-2015, 2019)

Phototactic movement	Chemotactic movement
● It is a movement in response to stimulus of light. The movement may be towards the source of light (positive) or away from the source of light (negative). ● The best example of positive tactic movement is the passive movement of chloroplast due to cyclosis. ● This movement helps the chloroplast to absorb maximum light for C02 fixation.	● The movement in response to stimulus of chemicals is called chemotactic movement. ● The movements shown by sperms of liver-worts, mosses, ferns towards archegonia in response to stimulus of nucleic acid released by the ovum is one such example.

● The light intensity and direction both affect the intra cellular distribution of chloroplasts	

31. Differentiate between brachialis and brachioradialus. (LHR 2018)

The biceps brachii muscle arises by the two heads from scapula and is inserted into the medial surface of the radius bone. The other two muscles lie below the biceps brachi. The two muscles are brachialis and brachioradialis. The brachialis is inserted in the ulna, while brachioradialis is inserted in the radius.

32. Differentiate between origin and insertion of muscle. (LHR 2018)

- Origin is the end of muscle which remains fixed when muscle contracts.
- Insertion is the end of the muscle that moves the bone.

33. Differentiate between bone and cartilage. (LHR 2018,2019)

Bone : It is the most rigid form of connective tissue. The collagen fibers of bone are hardened by deposit of calcium phosphate. Bones supporting your arms and legs consist of an outer shell of compact bone, with spongy bone in the interior. Compact bone is dense and strong and provides an attachment site for a muscle. Spongy bone is light, rich in blood vessels, and highly porous. The cavities of spongy bone contain bone marrow where blood cells are formed. There are three types of cells associated with bone:

Bone-forming cell (osteoblast), mature bone cell (osteocyte), and bone dissolving cells (osteoclast)

Cartilage : It is much softer than bone. It is a form of connective tissue. It covers ends of the bone at the joint, and also supports the flexible portion of nose and external ears. The living cells of cartilage are called chondrocytes. These cells secrete flexible, elastic, non-living matrix collagen that surrounds the chondrocytes. No blood vessels penetrate into this cartilage. There are three main types of cartilage.

(i) Hyaline Cartilage:

(ii) Elastic Cartilage:

(iii) FibroCartilage:

34. Differentiate between troponin and tropomyosin.

Twisting around the actin chains are two strands of another protein, **tropomyosin.**

The other major protein in thin filament is **troponin**. It is actually t**hree polypeptide complex**, one binds to **actin**, another binds to **tropomyosin** while third binds **calcium ions**.

35. Differentiate between heartwood and sapwood. LHR (2019)

When Tree grows older only few annual growth rings are active in conduction at one time. The active portion is called sap wood. The inactive nonconducting wood is called heartwood.

In most species, the heartwood accumulates a variety of chemicals such as resins, oils, gums and tannins. These provide a resistance to decay and insect attack, for example, in red cedar and Conifers

36. Differentiate between vessel and tracheids. (LHR 2019)

(i) Fibers (Tracheids): These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps.

(iii) Vessels (Tracheae): Long tubular structures, join end to end to form long water conducting pipe in xylem.

37. Differentiate between ligament and tendon. (LB-2018)

Ligaments	Tendons
Ligaments attach bone to bone and are slightly elastic.	Tendons attach muscles to bones and are non-elastic.

38. Explain two types of nastic movements. (OR) Compare epinasty and hyponasty. (LB-2012, 2013, 2016)

- **Nastic Movements :** These are the non-directional movements of parts of plant in response to external stimuli.

These are of two types:

(i) Nyctinasty : The nyctinastic movements are shown by the organs in response to external stimuli leading to deferential growth. These are due to turgor and growth changes. It may be of two types:

(a) **Photonasty :** The principal stimulus is the photoperiod. The flowers open and close due to light intensity.

(b) **Thermonasty** : It is due to temperature. The flowers of tulip close at night because of rapid growth in the flower side by upward and inward bending of the petals.

(ii) Haptonastic movements occur in response to contact.

- (a) Epinasty: It is shown by leaves, petals etc. The upper surface of leaf in bud condition shows

more growth as compared with the lower surface. This leads to opening of buds.

- (b) Hyponasty: If growth in the lower surface of the leaf in bud condition is more than that of the upper surface then the bud will remain closed

Examples include the action of the Venus fly trap.

39. Enlist some of the functions of skeleton. (LB-2015)

(i) Support and shape : Bones support soft tissues and serve as attachment sites for most muscles and provide shape to the body.

(ii) Protection: Bones protect critical internal organs, such as brain, spinal cord, heart and lungs.

(iii) Movement: Skeletal muscles attached to the bones help in moving the body.

(iv) Mineral homeostasis: Bones serve as store for calcium, phosphorus, sodium and potassium. Through negative feedback mechanisms, bones can release or take up minerals to maintain homeostasis.

(v) Blood cell production: Red and white blood cells are produced in bone marrow, a connective tissue found within certain bones.

40. How callus is formed? (LB-2012)

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. Callus also unites the branches during budding and grafting.

41. Name the different types of cells associated with bones. (LB-2014)

- Bone-forming cell (osteoblast)
- Mature bone cell (osteocyte)
- Bone dissolving cells (osteoclast)

42. Define sleep movement in plants with example. (LHR 2018)

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. These sleeping movements are due to daily changes in turgor pressure in the pulvinus. The place of attachment of leaf with the shoot, pulvinus, is swollen portion of the petiole composed of parenchymatous cells with relatively large inter cellular spaces and central strand of vascular tissues.

When turgor pressure on the lower side of pulvinus increases the leaves rise and become horizontal. When turgor pressure decreases on the lower side of pulvinus, the leaves lower and go to “sleeping” Position.