

Class: 11
Subject: Biology
Topic: Locomotion and Movement
No. of Questions: 25

Q1. Where would you find gliding joints?

Sol. The bones in the palm or in the sole of the foot, we find gliding joints.

Q2. How does a muscle receive a stimulus to contract?

Sol. The contraction of a muscle is brought about by the nervous system in response to a stimulus. The muscle tissues are supplied with motor nerves. Each motor nerve fibre divides into a number of branches. Each branch terminates into a flattened muscle fibre, which is the motor end plate. When the motor neuron impulse arrives at the motor end plate, it causes contraction of the muscle fibre.

Q3. What are the ligaments?

Sol. Ligaments are the flexible connective tissue which binds the articulating bones together.

Q4. Define joints and classify various types of joints on the basis of mobility.

Sol. The place of articulation between two or more bones is called a joint. At the joint, the surface of the two bones is opposite to each other. These joints facilitate the movement of bones in different ways.

On the basis of mobility, the joints are classified into,

- (a) Fixed or fibrous joints - in these joints, the articulating bones are firmly fixed together by dense bands of tough, inextensible white fibrous tissues. These joints allow no movements between them. e.g. Sutures of the skull bones.
- (b) Slightly movable or cartilaginous joints and – These joints show limited movements due to the presence of white fibro cartilage tissues at the opposing end of articulating bones. e.g. between the vertebrae and at the symphysis pubis.
- (c) Freely movable or synovial joint. – These types of joints are freely movable. The presence of synovial fluid in the synovial cavity makes these joints move freely. This fluid lubricates the joint for free and easy movement. The articulating bones provide considerable movement between them without any danger of friction. The articulating surfaces are kept in close contact by a fibrous capsule. e.g. shoulder joint, knee and ankle joints, etc.

Q5. Write the difference between skeletal and smooth muscles.

Sol. Difference between skeletal and smooth muscle are tabulated below:

Skeletal Muscle	Smooth Muscle
(i) It is attached to bones and tendons.	(i) It is found in the wall of hollow organs like alimentary canal and blood vessels.
(ii) It is under the control of our will. So it is called voluntary muscle.	(ii) it is involuntary in action. It helps in movement of materials by tubular organs.
(iii) It has transvers stripes. Hence, it is called striated muscle.	(iii) It is a non-striated muscle.

Q6. What are the antagonistic muscles?

Sol. The antagonistic muscles are the muscles which contract to produce opposite movement at the same joint, e.g. biceps and triceps muscles.

Q7. What is the function of pectoral girdle and pelvic girdle?

Sol. Pectoral girdle:- It provides a surface to the soft organs of the body in the pectoral region. It also provides a surface for the articulation of forelimbs. In the glenoid cavity of the pectoral girdle fits the head of the humerus bone.

Pelvic girdle: - It protects the organs of the pelvic region and provides a surface for the articulation of the hind limbs.

Q8. Name the antagonistic muscle of biceps.

Sol. The antagonistic muscles of biceps are the muscles of triceps.

Q9. List any two functions of ribs in our body.

Sol. The two functions of ribs in our body are as follow:

- (a) Thoracic rib cage protects the heart and lungs.
- (b) The ribs allow the chest cavity to expand and contract during breathing movements.

Q10. Name the type of cartilage present between vertebrae to allow limited movement.

Sol. In vertebral disc is the fibrocartilage present between vertebrae to allow limited movement.

Q11. What is contractibility of muscle fibres?

Sol. The contractibility is the property of shortening of muscles fibres and their return to relaxed state based on relative position of different intracellular filaments.

Q12. Discuss the three types of synovial joints.

Sol. The three types of synovial joints are,

- (a) Ball and socket joint : - In this type of joint, one bone forms a cup – like socket in which the ball-like structure fits. The head or ball can move freely in the joint in any direction .e.g. shoulder joint and hip joint.
- (b) Hinge joint: - Movement is performed only in one direction. e.g. Elbow joint, knee joint, etc.
- (c) Gliding joint: - These are the joints in which one surface glides over another such joints are present in the vertebral column.

Q13. Explain any two disorders of bones.

Sol. Arthritis and osteoporosis are the two disorders of bones in humans.

- (a) Arthritis disorder: - The inflammation of joints is the main cause of arthritis. It is of many types – they are rheumatoid arthritis, osteoarthritis and gouty arthritis. The rheumatoid arthritis is diagnosed by the presence of rheumatoid factor. This factor is a type of immunoglobulin. There is inflammation of synovial membrane. This membrane secretes abnormal granules called pannus. Erosion is caused on the surface of the cartilage due to pannus. As a result of this, the joints become immovable. It is cured by heat treatment and physiotherapy. Osteoarthritis is a degenerative joint disorder. It is characterized by the degeneration of the articular cartilage and proliferation of new bones. Gouty arthritis is also called gout. This is caused due to excessive formation of uric acid, which is deposited at the joint.
- (b) Osteoporosis disorder:- It is an age dependent systemic disorder. It is characterized by low bone mass and is the micro architectural deterioration of bones. It makes bones brittle and prone to fracture. It can also occur in pregnant women. Thyrocalcitonin, parathyroid and sex hormone's imbalance is the main cause of this disease. The major causative factors are the deficiency of vitamin D and calcium deficiency in body.

Q14. What are the terms used for the plasma membrane and cytoplasm of muscle cells?

Sol. The terms used for the plasma membrane and cytoplasm of muscle cells are sarcolemma and sarcoplasm respectively.

Q15. What are cross bridges, actin and myosin? Also state their importance.

Sol. Myosin and actin are special kinds of proteins. Myosin and actin are special kinds of proteins. Myosin forms the thick filaments while the actin forms the thin filaments of the muscles. The

actin and myosin help in the contraction of shortening of muscles by the formation of cross bridges. A cross bridge is the portion of the myosin filament which is overlapped by actin filament.

Q16. Why does a red muscle fibre work for a prolonged period while a white muscle fibre suffers from fatigue after a shorter period of work?

Sol. Red muscle fibres are rich in myoglobin and contain larger number of mitochondria. The function of myoglobin is to bind and store oxygen and oxyhaemoglobin. During muscle contraction, oxygen is released from the oxyhaemoglobin. Red muscle fibres produce energy only under aerobic conditions. So very little amount of lactic acid gets accumulated in the muscle. Hence these muscles can work for a prolonged period. On the other hand, in white muscle fibres, myoglobin is absent and there are very less number of mitochondria. So they depend on aerobic glycolysis for their energy production. As a result, lactic acid gets accumulated in the muscle and they soon get fatigued.

Q17. What are skeletal and cardiac muscles?

Sol. Skeletal muscles:- These muscles are found attached with the skeleton of the organism. They are under the control of the will of an individual.

Cardiac muscles: - They form the wall of the heart only.

Q18. What is the threshold stimulus?

Sol. Threshold stimulus is the minimum stimulus that is required to bring about the contraction of muscles.

Q19. Which kind of muscle fibres are richly found in the extensor muscles present on the back of human body? What characteristics enable these fibres to serve their purpose?

Sol. Red muscle fibres are found in the extensor muscles. They are rich in mitochondria, myoglobin, slow acting, no lactic acid, aerobic respiration takes place. These characteristics enable these fibres to serve their purpose.

Q20. What is muscle twitch?

Sol. The single isolated contraction of a muscle fibre is known as muscle twitch.

Q21. What happened to the leg muscle of an athlete who runs a marathon race.

Sol. Athletes usually develop cramps due to vigorous exercise or after running a marathon race. Cramp is a condition when a muscle contracts and it does not relax again. This is because of the fact that sufficient supply of energy by the oxidation of food is not available. Due to this

lactic acid gets accumulated which is not be converted into glycogen or oxidized due to the sufficient supply of oxygen.

Q22. White muscles fibres become fatigued quickly. Give reasons.

Sol. White muscle fibres are thicker, lighter in colour and poor in mitochondria. They are free of myoglobin. Their concentration rate is faster. Energy is produced in them by anaerobic glycolysis. Lactic acid is accumulated in them in sufficient amount during strenuous work. So white muscle fibres become fatigued quickly. When the muscle stop contracting.

Q23. What is the role of Ca^{++} and ATP in muscle contraction?

Sol. The chemical changes occurring during muscle contraction were worked out by Albert Szent Gyorgyi and his co-workers. The sequences of chemical events in muscle contraction may occur under the following steps:

- Motor nerve endings release acetylcholine from the end plate or neuromuscular synaptic junction. Acetylcholine caused release of calcium ions from the sarcoplasmic reticulum inside the muscle fibre.
- Ca^{++} binds the troponin which result in interaction of myosin and actin to form actomyosin in the presence of ATP and Ca^{++} ions.
- Breakdown of ATP into ADP and energy takes places in the presence of Mg^{++} , Ca^{++} and myosin ATPase.
- ATPase is activated in the presence of Ca^{++} ions.
- The above energy is used in the contraction of muscle.
- Creatine phosphate reacts with ADP to give rise to ATP and creatine. In this way regular supply of ATP is maintained from the creatine stored in muscles.

Q24. What is the utility of ribs in the body?

Sol. Ribs form the side of the chest cavity. There are 12 pairs of ribs in man. The first seven pairs of ribs are attached to the thoracic vertebra at the back and to the sternum in front. The next three pairs are connected to the rib above each. These are vertebrochondral ribs. Rib cage is formed by ribs, sternum and thoracic vertebrae. The last two pairs are free and hence called floating ribs. The rib cage formed by the ribs encloses and protects the heart and lungs. The ribs also allow the chest cavity to expand and contract during breathing movements.

Q25. What do you understand by denervation atrophy?

Sol. If any damage occurs to the nerve cell or its axon in a particular muscle, a condition called paralysis of the muscle occurs. The denervated muscle decreases in size. This decrease in size of the muscle is termed as denervation atrophy.