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Muscular System

Answers and Explanations

I. Introduction to the Muscular System

A. Multiple Choice Questions

1. (b) – Skeletal muscles receive motor impulses rather than generating them.
2. (a) – Irritability refers to the capacity of muscle fibers to respond to motor nerve impulses; the actual contraction of the muscle follows the arrival of the stimulus.
3. (d) – Muscle fibers are most effective at contracting once they have been elongated.

B. True–False Questions

1. True – Tonus is the continuous contraction of isolated fibers within relaxed muscle.
2. False – The arterial blood pressure is maintained by ventricular contraction of the heart and contraction of the tunica muscularis of the arterial walls. The impetus for venous blood flow is though tonus and general tetanus of skeletal muscles.
3. True – Smooth muscles and cardiac muscles account for approximately 3% and skeletal muscle accounts for approximately 37%.

II. Structure of Skeletal Muscles

A. Multiple Choice Questions

1. (a) – The galea aponeurotica of the scalp is an example of an aponeurosis.
2. (b) – The endomysium is in contact with individual skeletal muscle fibers; the perimysium is in contact with muscle bundles, binding them together; and the epimysium surrounds the entire muscle.
3. (d) – The superficial fascia is in contact with the hypodermis of the skin, and both have abundant adipose tissue.
4. (a) – Most of the deltoid muscle has a convergent fiber arrangement.
5. (c) – The short, densely packed fibers in pennate-fibered muscles accumulate lactic acid quickly; thus, these muscles have low endurance.

B. True–False Questions

1. False – The more stationary point of muscle attachment is its origin.
2. False – A retinaculum physically holds tendons in position but does not lubricate them.
3. False – Contracting synergistic muscles are responsible for most body movements.
4. True – The endomysium surrounds the individual muscle fibers, the perimysium surrounds the fasciculi, and the epimysium surrounds the entire muscle.
5. True – The functions of the endomysium include surrounding and binding a muscle and merging the connective tissues of the muscle with a tendon.
6. False – Synergistic muscles perform similar functions and are on the same side of a limb.
7. False – Parallel-fibered muscles have long excursions and good endurance, but are not especially strong.

C. Short Answer Questions

1. parallel—straplike; long excursion; good endurance
2. convergent—fan-shaped, thick muscle; moderate endurance
3. sphincter—surrounds orifice and constricts openings
4. unipennate—muscle fibers on one side of tendon; strong muscle
5. bipennate—muscle fibers on all sides of tendon; strong muscle
6. multipennate—short, tightly packed fibers; strong muscle; excellent dexterity but fatigues quickly

III. Skeletal Muscle Fibers and Types of Muscle Contraction

A. Multiple Choice Questions

1. (d) – A fasciculus is a bundle of muscle fibers, and a muscle fiber consists of myofibrils, myofilaments, and the actin and myosin proteins.
2. (c) – The central regions of the A bands are called H bands. The H bands contain only myosin that is not overlapped with thin filaments.
3. (a) – Z lines are thin dark lines in the middle of the I bands. The distance from one Z line to another is called a sarcomere.
4. (c) – The sarcomeres shorten, or come closer together, during muscle contraction.
5. (a) – The I bands and H bands are located within a sarcomere.

B. True–False Questions

1. False – The cytoplasm within a muscle cell is called sarcoplasm.
2. True – Contraction of a muscle causing movement against a resistance is an isotonic contraction.
3. False – Acetylcholine is stored in synaptic vesicles at the axon terminals rather than in motor end plates.
4. False – The principle of “all-or-none contraction” applies to motor units; therefore, the strength of contraction of a motor unit is always the same.

IV. Naming of Muscles

A. Multiple Choice Questions

1. (b) – Strength of contraction is not a criterion used in naming muscles.
2. (b) – The sternum and clavicle are the sites of origin of the sternocleidomastoid muscle, and the mastoid process of the temporal bone is its insertion.
3. (a) – As its name implies, the tibialis anterior muscle is positioned on the anterior aspect of the tibia.

V. Muscles of the Axial Skeleton

A. Multiple Choice Questions

1. (d) – Contraction of the zygomaticus muscles draws the corners of the mouth superiorly and laterally, as in smiling.
2. (a) – The platysma inserts on the fascia covering the mandible.
3. (a) – The actions of the lateral pterygoid are responsible for grinding movements and protraction of the mandible.
4. (b) – Five of the six ocular muscles extend directly from the bony orbit to the sclera of the eye. The superior oblique muscle passes through the trochlea before attaching to the sclera.
5. (a) – The inferior oblique ocular muscle attaches inferiorly and obliquely onto the sclera of the eyeball, where it causes a superior and lateral rotation of the eye when it contracts.
6. (d) – The digastric muscle is antagonistic to the temporalis and masseter muscles in lowering the mandible when it contracts.
7. (a) – A contraction of the external intercostal muscles produces an increase in the lateral dimension of the thorax, causing air to move into the lungs.
8. (c) – Contraction of the rectus abdominis muscles flexes the joints of the vertebral column in a movement described as bowing.
9. (c) – The coccygeus muscle is named for its position on the coccygeal vertebrae on the posterior aspect of the pelvis.
10. (d) – The semispinalis muscles originate from the posterior thoracic area, not from the os coxae and sacral areas as do the erector spinae muscles.

B. True–False Questions

1. False – The orbicularis oris muscle surrounds the opening of the mouth.
2. True – When contracted, the depressor anguli oris muscles depress the corners of the mouth, as in a frown.
3. False – In area covered and in overall mass, the temporalis muscle is larger than the masseter muscle.
4. True – Intrinsic means confined to a particular organ or body region.
5. True – When contracted, the mylohyoid is elevated and can be palpated with the fingers held flat against the space between the two sides of the mandible.

6. False – The serratus anterior muscle extends from the ribs to the scapula.
7. False – The fibers of the external abdominal oblique muscle extend inferiorly and medially.
8. True – The linea alba is vertically positioned between the two rectus abdominis muscles.
9. True – The ischiocavernosus muscle is located at the base of the penis in the male and at the base of the clitoris in a female.
10. True – The rectus abdominis muscle is a flexor of the spine, and the erector spinae and spinalis thoracis muscles are extensors of the spine.

VI. Muscles of the Appendicular Skeleton

A. Multiple Choice Questions

1. (b) – The latissimus dorsi muscle originates on the vertebral column and portions of the rib cage and inserts on the intertubercular groove of the humerus.
2. (a) – The greater tubercle of the humerus is a major attachment point for muscles that act on the shoulder joint.
3. (c) – The coracobrachialis muscle flexes and adducts the shoulder joint.
4. (a) – The biceps brachii muscle originates on the scapula and inserts on the radius.
5. (d) – The lateral epicondyle of the humerus is a major attachment point for muscles that extend the joints of the wrist and digits.
6. (b) – The iliotibial tract is a tendinous band extending down the lateral thigh.
7. (d) – The gluteus maximus muscle is a powerful extensor muscle of the hip and is important for bipedal stance and locomotion.
8. (d) – The sartorius muscle crosses from the lateral side of the hip to the medial side of the knee.
9. (c) – Spanning two joints, the rectus femoris muscle, when contracted, flexes the hip joint and extends the knee joint.
10. (d) – The tendo calcaneus is the tendinous attachment onto the calcaneus bone for both the gastrocnemius and the soleus muscles.

B. True–False Questions

1. False – The trapezius muscle exerts its action on the scapula and the head.
2. True – The long head of the triceps brachii muscle originates on the scapula, and the medial and lateral heads originate on the medial and lateral sides of the humerus, respectively.
3. False – The palmaris longus muscle is not a rotator of the hand, but rather a flexor of the joints within the hand.
4. True – The thenar eminence is the fleshy base of the thumb formed by the abductor pollicis brevis, the flexor pollicis brevis, and the opponens pollicis muscles.
5. False – The gluteus maximus muscle inserts on the gluteal tuberosity and iliotibial tract.
6. True – The proximal portion of the gracilis muscle lies within the groin area.
7. False – The sartorius muscle acts on both the hip and knee joints.
8. True – Positioned on the anterior thigh, the quadriceps extend the knee joint; positioned on the posterior thigh, the hamstrings flex the knee joint.
9. True – Three of the four hamstring muscles work on both the hip and the knee joints, whereas the short head of the biceps femoris muscle works only on the knee joint.
10. True – Although the gastrocnemius muscle and soleus muscle are positioned one on top of the other, each has a distinct function.

VII. Developmental Exposition of the Muscular System

A. Completion Questions

1. myoblasts
2. myotomes
3. quickening

VIII. Clinical Considerations

A. Multiple Choice Questions

1. True – Poliomyelitis is a viral disease of the anterior horn of the spinal cord.
2. False – Muscular dystrophy is a muscular disease, not a neurological disease.
3. True – Cancer of muscle tissue occurs most frequently in young children and elderly people.

B. Completion Questions

1. hernia
2. myopathy
3. torticollis (wryneck)

IX. Chapter Review

A. Completion Questions

1. tendon
2. aponeuroses
3. fasciculi
4. pennate
5. motor (efferent)
6. sarcolemma/sarcoplasm
7. sarcomeres
8. rigor mortis
9. isometric
10. neuromuscular
11. motor unit
12. epinephrine (adrenaline)
13. thenar
14. brachioradialis
15. flexor retinaculum
16. linea alba
17. ischiocavernosus
18. quadriceps femoris/hamstring

B. Matching Questions

1. (h)
2. (e)
3. (g)
4. (d)
5. (c)
6. (b)
7. (k)
8. (l)
9. (f)
10. (a)
11. (j)
12. (i)