Q1. Which of the following types of muscles are involuntary and show no striations?

A. Skeletal muscles
B. Cardiac muscles
C. Smooth muscles
D. Voluntary muscles

Answer: C. Smooth muscles
Explanation: Smooth muscles are involuntary, non-striated muscles found in internal organs like the intestine and blood vessels.

Q2. Which of the following proteins is not involved in muscle contraction?

A. Actin
B. Myosin
C. Tropomyosin
D. Collagen

Answer: D. Collagen
Explanation: Collagen is a connective tissue protein, not involved in the sliding filament mechanism of muscle contraction.

Q3. The functional unit of a striated muscle fiber is:

A. Sarcoplasm
B. Sarcolemma
C. Sarcomere
D. Myofibril

Answer: C. Sarcomere
Explanation: Sarcomere is the structural and functional unit of muscle contraction between two Z-lines.

Q4. Calcium ions play a major role in muscle contraction by:

A. Binding to actin to form actomyosin
B. Binding to myosin head
C. Binding to troponin to remove tropomyosin inhibition
D. Releasing ATP from mitochondria

Answer: C.
Explanation: Calcium binds troponin, causing tropomyosin to shift and expose actin sites for myosin binding.

Q5. Which of the following events marks the beginning of muscle contraction?

A. Breakdown of ATP
B. Release of calcium from sarcoplasmic reticulum
C. Binding of ATP to myosin head
D. Sliding of actin filaments

Answer: B.
Explanation: Calcium release from sarcoplasmic reticulum initiates contraction by exposing binding sites on actin.

Q6. Myoglobin is an oxygen-binding protein found in:

A. Liver
B. White muscle fibers
C. Red muscle fibers
D. Blood plasma

Answer: C. Red muscle fibers
Explanation: Myoglobin stores oxygen in red muscle fibers, allowing sustained aerobic respiration.

Q7. In humans, the number of bones in the axial skeleton is:

A. 126
B. 206
C. 80
D. 33

Answer: C. 80
Explanation: The axial skeleton consists of 80 bones — skull, vertebral column, and thoracic cage.

Q8. The gliding joint is found in:

A. Elbow
B. Shoulder
C. Between carpals
D. Hip joint

Answer: C. Between carpals
Explanation: Carpals (wrist bones) are flat and articulate with each other via gliding joints allowing limited sliding movement.

Q9. Which of the following diseases is an autoimmune disorder affecting neuromuscular junction?

A. Muscular dystrophy
B. Osteoarthritis
C. Myasthenia gravis
D. Gout

Answer: C. Myasthenia gravis
Explanation: It's an autoimmune disorder where antibodies block acetylcholine receptors, weakening muscles.

Q10. The vertebral column in humans consists of how many vertebrae?

A. 26
B. 33
C. 31
D. 30

Answer: A. 26
Explanation: Though initially 33, during development some fuse, resulting in 26 vertebrae in adults (7C + 12T + 5L + sacrum + coccyx).

Q11. The protein that acts as ATPase during muscle contraction is:

A. Troponin
B. Actin
C. Tropomyosin
D. Myosin

Answer: D. Myosin

Explanation: Myosin head hydrolyzes ATP to provide energy for cross-bridge formation and movement.

Q12. Which among the following bones is part of the appendicular skeleton?

A. Sternum
B. Femur
C. Ribs
D. Skull

Answer: B. Femur
Explanation: Femur is a limb bone and part of the appendicular skeleton.

Q13. Which of the following joints allows movement in one plane only?

A. Ball and socket
B. Pivot
C. Hinge
D. Saddle

Answer: C. Hinge
Explanation: Hinge joints (like elbow and knee) allow movement in a single plane (flexion and extension).

Q14. A muscle remains in a contracted state due to a lack of:

A. Calcium
B. ATP
C. Actin
D. Myosin

Answer: B. ATP
Explanation: ATP is necessary to detach myosin from actin after power stroke; lack of ATP leads to sustained contraction (rigor).

Q15. Which mineral is most essential for proper muscle contraction?

A. Phosphorus
B. Magnesium

C. Iron
D. Calcium

Answer: D. Calcium
Explanation: Calcium is required for exposure of actin binding sites, enabling cross-bridge formation.

Q16. Which enzyme breaks down acetylcholine in the neuromuscular junction to stop muscle contraction?

A. ATPase
B. Acetylase
C. Cholinesterase
D. Kinase

Answer: C. Cholinesterase
Explanation: Cholinesterase hydrolyzes acetylcholine into acetate and choline, stopping the signal transmission and allowing muscle relaxation.

Q17. Which of the following pairs is correctly matched regarding muscle types and location?

A. Cardiac muscle – walls of intestine
B. Smooth muscle – heart
C. Skeletal muscle – iris
D. Smooth muscle – bronchi

Answer: D. Smooth muscle – bronchi
Explanation: Smooth muscles are involuntary and found in hollow organs such as the bronchi, digestive tract, etc.

Q18. Which protein is responsible for preventing the binding of myosin to actin in resting muscle?

A. Actin
B. Myosin
C. Troponin
D. Tropomyosin

Answer: D. Tropomyosin
Explanation: Tropomyosin blocks the myosin binding sites on actin filaments when the muscle is relaxed.

Q19. Red muscle fibers are rich in all of the following except:

A. Myoglobin
B. Mitochondria
C. Glycogen
D. ATPases

Answer: C. Glycogen
Explanation: Red fibers rely more on aerobic respiration; they have less glycogen and more mitochondria and myoglobin.

Q20. Which of the following is a ball-and-socket joint?

A. Knee
B. Elbow
C. Shoulder
D. Ankle

Answer: C. Shoulder
Explanation: Ball-and-socket joints (like shoulder and hip) allow movement in multiple axes and planes.

Q21. The contractile proteins of skeletal muscles include:

A. Actin and Myosin
B. Actin and Keratin
C. Myosin and Collagen
D. Tropomyosin and Elastin

Answer: A. Actin and Myosin
Explanation: Actin (thin) and myosin (thick) are the primary proteins involved in muscle contraction.

Q22. Match the following and choose the correct combination:

Column I
A. Pivot joint
B. Saddle joint
C. Gliding joint

D. Hinge joint

Column II

1. Between atlas and axis

2. Thumb

3. Intercarpal joints

4. Elbow

A. A-1, B-2, C-3, D-4
B. A-2, B-3, C-4, D-1
C. A-3, B-4, C-1, D-2
D. A-1, B-3, C-2, D-4

Answer: A. A-1, B-2, C-3, D-4
Explanation:

Pivot: atlas-axis

Saddle: thumb (carpo-metacarpal)

Gliding: intercarpal

Hinge: elbow

Q23. Which of the following is not a function of the skeletal system?

A. Protection of internal organs
B. Providing attachment for muscles
C. Blood cell formation
D. Coordination of movement

Answer: D. Coordination of movement
Explanation: Coordination is a function of the nervous system, not the skeletal system.

Q24. In a resting muscle fiber, ATP is used to:

A. Activate actin
B. Detach myosin from actin
C. Break calcium-troponin complex
D. Remove tropomyosin

Answer: B. Detach myosin from actin
Explanation: ATP is needed for myosin head to detach from actin after power stroke, resetting the cycle.

Q25. Which joint allows movement in two planes and is found at the base of the thumb?

A. Ball and socket
B. Hinge
C. Saddle
D. Pivot

Answer: C. Saddle
Explanation: The saddle joint (carpo-metacarpal joint of thumb) permits movement in two directions.

Q26. Which of the following muscle types does not fatigue easily?

A. White skeletal muscles
B. Smooth muscles
C. Red skeletal muscles
D. Cardiac muscles

Answer: D. Cardiac muscles
Explanation: Cardiac muscles are rich in mitochondria and myoglobin, so they are fatigue-resistant and work continuously.

Q27. Rigor mortis occurs after death because:

A. Excess calcium floods muscle

B. ATP is unavailable for myosin-actin detachment
C. Lactic acid builds up
D. Muscles receive continuous neural signals

Answer: B.
Explanation: Rigor mortis happens due to ATP unavailability; myosin cannot detach from actin → sustained contraction.

Q28. Which pair is incorrectly matched?

A. Biceps – flexor
B. Triceps – extensor
C. Gluteus maximus – thigh movement
D. Sternum – appendicular skeleton

Answer: D.
Explanation: Sternum is part of axial skeleton, not appendicular.

Q29. Which structure stores calcium in muscle cells?

A. Sarcolemma
B. T-tubules
C. Sarcoplasmic reticulum
D. Z-line

Answer: C. Sarcoplasmic reticulum
Explanation: It releases calcium during contraction and reabsorbs it during relaxation.

Q30. The point of contact between motor neuron and muscle fiber is called:

A. Synaptic cleft
B. Neuromuscular junction
C. Motor end plate
D. Node of Ranvier

Answer: B. Neuromuscular junction
Explanation: It's the synapse between a motor neuron and the sarcolemma of muscle fiber.

Q31. Which of the following proteins binds calcium ions during muscle contraction?

A. Tropomyosin
B. Actin
C. Troponin
D. Myosin

Answer: C. Troponin
Explanation: Calcium binds to troponin, causing conformational changes that shift tropomyosin and expose myosin-binding sites on actin.

Q32. Which muscle fiber type is better adapted for anaerobic activities like sprinting?

A. Red fibers
B. Cardiac muscle
C. Smooth muscle
D. White fibers

Answer: D. White fibers
Explanation: White fibers have fewer mitochondria and myoglobin but high glycogen, making them ideal for short-term anaerobic activities.

Q33. Which ion is essential for cross-bridge formation in muscle contraction?

A. Na^+
B. K^+
C. Ca^{2+}
D. Cl^-

Answer: C. Ca^{2+}
Explanation: Calcium initiates contraction by enabling actin-myosin interaction through troponin binding.

Q34. What happens to the sarcomere during muscle contraction?

A. A-band shortens
B. H-zone disappears
C. Z-lines move apart

D. I-band lengthens

Answer: B. H-zone disappears
Explanation: During contraction, thin filaments slide inwards, narrowing or eliminating the H-zone.

Q35. Identify the correct order of the skeletal muscle structure from largest to smallest:

A. Fascicle → Muscle fiber → Myofibril → Sarcomere
B. Muscle fiber → Fascicle → Myofibril → Sarcomere
C. Sarcomere → Myofibril → Muscle fiber → Fascicle
D. Myofibril → Sarcomere → Fascicle → Muscle fiber

Answer: A. Fascicle → Muscle fiber → Myofibril → Sarcomere
Explanation: Muscle → fascicles (bundles) → fibers → myofibrils → sarcomeres.

Q36. Myasthenia gravis is a disease affecting:

A. Myelin sheath
B. Neuromuscular junction
C. Sarcoplasmic reticulum
D. Muscle tendons

Answer: B. Neuromuscular junction
Explanation: It's an autoimmune disease where antibodies block acetylcholine receptors, weakening voluntary muscles.

Q37. Which of these is not a part of the axial skeleton?

A. Skull
B. Sternum
C. Ribs
D. Humerus

Answer: D. Humerus
Explanation: Humerus is part of the appendicular skeleton (upper limb bones).

Q38. Which of the following joints allows the least movement?

A. Gliding joint
B. Ball-and-socket joint
C. Hinge joint
D. Fibrous joint

Answer: D. Fibrous joint
Explanation: Fibrous joints (e.g., skull sutures) allow little to no movement.

Q39. The dark band in a sarcomere contains:

A. Only actin
B. Only myosin
C. Actin and myosin overlap
D. Only tropomyosin

Answer: C. Actin and myosin overlap
Explanation: A-band (dark band) contains overlapping actin and myosin filaments.

Q40. Which vitamin is essential for calcium absorption, thus aiding bone formation?

A. Vitamin A
B. Vitamin B12
C. Vitamin C
D. Vitamin D

Answer: D. Vitamin D
Explanation: Vitamin D enhances intestinal absorption of calcium and phosphorus, supporting bone health.

Q41. Which muscle shows autorhythmicity?

A. Skeletal
B. Smooth (visceral)
C. Cardiac
D. Diaphragm

Answer: C. Cardiac
Explanation: Cardiac muscle is involuntary and self-excitable (autorhythmic), regulated by pacemaker cells.

Q42. Which of these structures is present at the center of the I-band?

A. H-zone
B. Z-line
C. M-line
D. A-band

Answer: B. Z-line
Explanation: Z-line is the anchor point for actin filaments and lies at the center of the I-band.

Q43. During contraction, which band remains unchanged in length?

A. A-band
B. I-band
C. H-zone
D. Sarcomere

Answer: A. A-band
Explanation: A-band (myosin) doesn't change in length; it's the zone of thick filament.

Q44. Which connective tissue attaches muscle to bone?

A. Ligament
B. Cartilage
C. Tendon
D. Fascia

Answer: C. Tendon
Explanation: Tendons are tough cords of connective tissue that link muscle to bone.

Q45. Which skeletal disorder is due to inflammation of joints?

A. Osteoporosis
B. Arthritis
C. Rickets
D. Gout

Answer: B. Arthritis
Explanation: Arthritis is characterized by joint inflammation, pain, and stiffness.