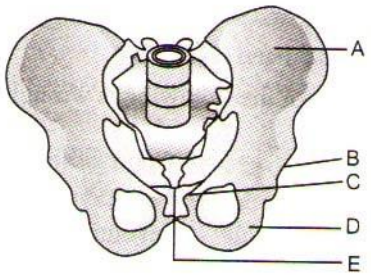
NEET BIOLOGY

LOCOMOTION AND MOVEMENT

1. Volkmann's canal occurs in
   a) Bone b) Cartilage c) liver d) internal ear
2. Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the
   a) second and fifth ribs b) Second and seventh ribs
   c) third and eighth ribs d) fourth and seventh ribs
3. The coxal of the pelvic girdle is formed by the fusion of
   a) ilium,ischium and pubis b) scapula and clavicle
   c) ilium and scapula d) ilium, scapula and ischium
4. The polysaccharide portion of a proteoglycan present in the matrix of cartilage is known as
   a) Ossein
   b) Cartilin
   c) Casein
   d) Chondroitin
5. Statements about the mechanism of muscle contraction are given below.
   I. Acetylcholine is released when the neural signal reaches the motor end plate.
   II. Muscle contraction is initiated by a signal sent by CNS *via* a sensory neuron.
   III. During muscle contraction isotropic band gets elongated.
   IV. Repeated activation of the muscles can lead to lactic acid accumulation.
   Identify the correct statement.
   a) I and IV are correct
   b) I and III are correct
   c) II and III are correct
   d) I, II, and III are correct
6. Human skeletal system consists of
   a) 200 bones b) 300 bones c) 206 bones d) 250 bones
7. Volkmann's canals occur in
   a) Internal ear b) liver c) Cartilage d) Bone
8. Where did an epidemic bone softening disease itai-itai occurred first?
   a) South Korea b) Japan c) China d) Burma
9. The store house of calcium ions in the muscle fibre is
   a) Smooth endoplasmic reticulum b) Golgi body
   c) Sarcoplasmic reticulum d) Lysosomes
10. Ca^{2+} bind …A… in skeletal muscles and leads to the exposure of binding site for …B… on the filament …C…
    Identify A, B and C, so as to complete the given statements
    a) A-troponin, B-actin, C-relaxin b) A-actin, B-myosin, C-troponin
    c) A-troponin, B-myosin, C-actin d) A-tropomyosin, B-myosin, C-actin
11. During skeletal muscle contraction following events occur-
    I. I-band shortens II. A-band shortens
    III. H-zone shortens IV. Sarcomere contract
    V. ATP changes to ADP and Pi
    Choose the option with incorrect events

a) Only I b) Only III c) IV and V d) Only II

12. From outer to inside, the sequence of three bones present, in the middle ear of mammals, is
    a) Malleus, stapes and incus
    b) Stapes, malleus and incus
    c) Malleus, incus and stapes
    d) Incus, malleus and stapes
13. Aerobic muscles called …A… and anaerobic muscles are called …B… . Here A and B refers to
    a) A-red fibres; B-white fibres
    b) A-white fibres; B-red fibres
    c) A-white fibres; B-black fibres
    d) A-red fibres; B-black fibres
14. Hollow bones are characteristic of
    a) Reptiles b) Birds c) Mammals d) Fishes
15. Neuromuscular junction is a junction between
    a) Two neurons and muscles
    b) Sensory neurons and muscles
    c) Motor neurons and sarcolemma of muscles
    d) Sensory neurons and sarcolemma of muscles
16. Zygomatic arch of rabbit is formed of
    a) Maxilla, periotic and jugal
    b) Periotic, jugal and palatine
    c) Maxilla, squamosal and jugal
    d) Maxilla, premaxilla and squamosal
17. Streaming of the cytoplasm/cyclosis is seen in
    a) *Amoeba* b) Earhworm c) *Nereis* d) Leech
18. Pick out the correct match.
    a) Sternum-14 b) Pelvis-3 c) Ribs-20 d) Face-5
19. Chemical ions responsible for muscle contraction are
    a) Ca^{2+} and K^{+} b) Na^{+} and K^{+} c) $Na^{+}$and Ca^{2+} d) Ca^{2+} and Mg^{2+}
20. In the resting state of muscles the troponin
    a) Active site on actin filament
    b) Terminal site on actin filament
    c) Terminal site on actin tropomyosin
    d) Middle site on actin tropomyosin
21. Joints are classified into three major types. They are
    I. Fibrous joint II. Hinge joint
    III. Cartilaginous joint IV. Pivot joint
    V. Synovial joint
    Select the option containing correct articles
    a) I, III and V b) II, III and IV c) I, II and III d) III, IV and V
22. In the pelvic girdle of man A, B, C, D and E respectively represent.



    a) A-Pubis B-acetabulum C-Ilium D- ischium E-Pubic symphysis
    b) 1. Ilium B- acetabulum 2. Pubis D- ischium E-Pubic symphysis
    c) A-Ischium B-acetabulum C-pubis D-ilium E-ischium
    d) A-ilium B- acetabulum C-Pubic symphysis D-ischium E-pubis
23. Action potential in the sarcolemma of muscles is generated by
    a) Neuroinhibitors b) Acetylcholine c) Methylcholine d) Ethylcholine

24. Pelvic girdle consists of two coxal bones and each coxal bone consists
I. ilium II. Incus
III. ischium IV. pubis
Choose the correct option containing all correct bones
a) I, II and III b) II, III, and IV c) I, III and IV d) I, II and IV

25. ……acts as a shock absorber to cushion when tibia
And femur came together
a) Ligament b) Cartilage c) Tendon d) Disc

26. Ligament connects
a) Bone to bone b) Bone to muscle c) Muscle to muscle d) Both (b) and (c)

27. Choose the correct statements regarding muscle proteins
I. Actin is a thin filament and made up of two F-actins
II. The complex protein, tropomyosin is distributed at regular intervals of troponin
III. Myosin is a thick filament which is not a polymerized protein
IV. The globular head of meromyosin consists of Light Meromyosin (LMM)
Option containing correct statement is
a) I, II and III b) I, II and IV c) Only I d) II and IV

28. Folding and unfolding of actin and myosin leads to amoeboid movement. This is hypothesized by
a) Allen b) Goldacre and Lasch c) Berthold d) Jennigs

29. In the centre of each I-band there is an elastic fibre called
a) I-line
b) Z-line
c) A-line
d) H-zone

30. Fibrous joints in humans
a) Allows any movement b) Allows little movement
c) Don't allow any movement d) None of the above

31. Which ribs show 'bucket- handle' type of movement?
a) Rib no. 1-2 b) Rib no.3-5 c) Rib no. 6-10 d) Rib no. 11-12

32. Intercalated disc is found in
a) Muscles of heart b) Vertebrae c) Muscles of legs d) Pubic symphysis

33. Acoelus vertebrae in frog is
a) 5^{th} vertebrae b) Atlas vertebrae c) 8^{th} vertebrae d) None of these

34. Which one of the following is not a part of ear osicles?
a) Malleus b) Incus c) Stapes d) Elium

35. Knee joint is
a) Cartilaginous b) Fibrous c) Gliding joint d) Synovial

36. The set of ions necessary for muscle contraction is
a) Ca^{2+} and Mg^{2+} b) Na^{+} and Mg^{2+} c) Na^{+} and K^{+} d) Na^{+} and Ca^{2+}

37. Gout is a disease that affects the joints and leads to arthritis. It is associated with an abnormality of
a) Pyrimidine metabolism b) Purine metabolism
c) Fat metabolism d) Protein metabolism

38. Sigmoid notch is formed by
a) Cavity formed by humerus b) Cavity formed by radio-ulna
c) Cavity formed by tibio-fibula d) Cavity formed by femur

39. The longest bone of the human body is
a) Humerus b) Tibia c) Vertebra d) Femur

40. Axis vertebra is identified by
a) Sigmoid notch b) Deltoid ridge c) Odontoid process d) Centrum

41. Total number of bones found in right upper limb is

a) 25 b) 26 c) 30 d) 60

42. Common among all mammals is
    a) Ventral nerve cord b) Seven cervical vertebrae
    c) All are carnivores d) All are producers
43. Muscle fatigue is due to
    a) Lactic acid b) Citric acid c) Na d) K
44. How many ear ossicles you have?
    a) 3 b) 4 c) 5 d) 6
45. Joints are the point of contact between
    I. bones II. Cartilages and bones
    III. bones and muscles IV. cartilage and muscles
    Select the containing correct articles
    a) I and II b) II and III c) III and IV d) IV and I
46. Which of the following statements regarding locomotion and movements is wrong?
    a) All the locomotion are movements
    b) All the movements are locomotion
    c) Locomotion and movements in higher organisms are brought by skeletal muscles
    d) None of the above
47. Muscular dystrophy in humans is a
    a) Viral disease b) Bacterial disease c) Genetic disease d) Fungal disease
48. Which of the following statement Is/ are correct / incorrect?
    I. A-bands of the muscle is dark and contain myosin.
    II. I-bands are the light bands and contain actin
    III. During muscle contraction, the A-band contracts.
    IV. The part between the two Z-lines is called as sarcomere.
    V. The central part of thin filament, not overlapped by thick filament is called H-zone.
    a) I,II, and III are correct, while IV and V are incorrect
    b) I,III,V are correct, while II,IV are incorrect
    c) I and II are correct, while III, IV and V are incorrect
    d) I,II,III and V are correct, while IV is incorrect
49. Bones become fragile in
    a) Osteoporosis b) Gout c) Arthritis d) None of these
50. Where the saddle joints are presents in humans?
    a) Between carpals and matacarpals b) Atlas and axis
    c) Radius and ulna d) Carpals and phallanges
51. During muscle contraction, ATP provides energy for
    a) Cross bridge detachment b) Building up action potential
    c) Releasing Ca^{2+} from sarcoplasmic reticulum d) Cross-bridge attachment of myosin to actin
52. Arrange the given steps of muscle contraction in the series of events from first to last
    I. Myosin head binds to the exposed active site on action to form a cross bridge
    II. The Z-line attached to these actin are also pulled in wards there by causing shortening of sarcomere also called contraction
    III. This pulls the attached actin filaments towards the centre of A -band
    The correct option is
    a) I → II → III b) III → II → I c) I → III → II d) III → I → II
53. The contractile protein of skeletal muscle involving ATPase activity as
    a) Tropomyosin b) Myosin c) α − actinin d) Troponin
54. Striped muscles are characterized by
    a) Syncytial b) Spindle shape c) Uninucleate d) None of these

55. …A… band contains actin and is called …B…. band, whereas the ….C… band called ….D… band contains myosin
Choose the correct options for A, B and C to complete the given NCERT statement
a) A-Light, B-I, C-dark, D-A
b) A-Dark, B-I, C-light, D-A
c) A-Dark, B-A, C-light, D-I
d) A-Light, B-A, C-dark, D-I

56. Human cranium has……..bones.
a) 8
b) 14
c) 20
d) None of these

57. Which of the following are the properties of cardiac muscles?
I. They are the muscles of the heart
II. They are non-striated
III. They are involuntary in their functions
IV. They are made up of fascicles
Select the correct option
a) I and III
b) II and IV
c) I and IV
d) II and III

58. Both proteins, actin and myosin are arranged in a rod-like structure in the muscles
a) Radially
b) Parallely
c) Horizontally
d) Obliquely

59. Ligament is mainly made up of
a) Reticulin
b) Elastin
c) Myosin
d) Collagen

60. Skeletal muscles are closely associated with the …A… components of the body. They have …B… appearance under the microscope and hence are called …C… muscles
Choose the correct options to fill A, B and C, so as to complete the given NCERT statement
a) A-muscular, B-stripped, C-striated
b) A-visceral, B-stripped, C-striated
c) A-skeletal, B-stripped, C-striated
d) A-microfibrillar, B-stripped, C-striated

61. Lactic acid in muscles is formed due to
a) Aerobic breakdown of sucrose
b) Anaerobic breakdown of glycogen
c) Anaerobic breakdown of galactose
d) Anaerobic breakdown of fructose

62. Identify the correct statements
I. Acetylcholine is released when the neural signal reaches to the motor end plate
II. Muscle contraction is initiated by signals sent by CNS *via* a sensory neuron
III. During muscle contraction, isotropic bands get elongated
IV. Repeated activation of the muscles can lead to lactic acid accumulation in them
The option with correct choices is
a) I and III
b) I and IV
c) II and III
d) I and II

63. Number of bones in skull is
a) 26
b) 28
c) 107
d) 29

64. Fascicles are held together by the structure
a) Connective tissue
b) Connective fibres
c) Fascia
d) All of these

65. Select the correct statements
I. During muscle contraction, chemical energy changes into mechanical energy
II. Muscle fatitue occurs due to lactic acid formation
III. The reaction time is different to different muscle
IV. Muscle contraction don't need ATP
Choose the option with the correct statements
a) All except I
b) All except II
c) All except III
d) All except IV

66. Choose the correct statements for flagellar movements
a) They are found in coanocytes of sponges
b) They are performs locomotion in euglenoids
c) They helps in the circulation of blood (flagella)
d) All of the above

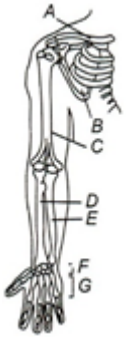
67. Our vertebral column is formed by the

a) 26 serially arranged units called vertebrae
b) 27 serially arranged units called vertebrae
c) 33 serially arranged units called vertebrae
d) 35 serially arranged units called vertebrae

68. The sensation of fatigue in the muscles after prolonged strenuous physical work, is caused by
a) a decrease in the supply of oxygen
b) minor were and tear of muscle fibers
c) the deletion of glucose
d) the accumulation of lactic acid

69. Visceral muscles are also called
a) Smooth muscles
b) Non-striated muscles
c) Involuntary muscles
d) All of these

70. Given diagram shows the right pectoral girdle and upper arm (frontal view) of human female Identify *A* to *G* and choose the correct option



a) A-1st Vertebra, B-Scapula, C-Humerus, D-Radius, E-Ulna, F-Carpals, G-Metacarpals
b) A-Scapula, B-Clavicle, C-Humerus, D-Radius, E-Ulna, F-Carpals, G-Metacarpal
c) A-Ilium, B-Scapula, C-Humerus, D-Radius, E-Ulna, F-Carpals, G-Metacarpals
d) A-Clavicle, B-Scapula, C-Humerus, D-Radius, E-Ulna, F-Carpals, G-Metacarpals

71. Identify *A*, *B* and *C* in the given diagram and choose the correct option

a) A-Cervical vertebrae, B-Coccyx, C-Sacrum
b) A-Cervical vertebrae, B-Coccyx, C-Atlas
c) A-Cervical vertebrae, B-Coccyx, C-Axis
d) A-Cervical vertebrae, B-Sacrum, C-Coccyx

72. Movement of our limbs, jaws, tongue, etc., requires
a) Ciliary movement
b) Amoeboid movement
c) Muscular movement
d) Flagellar movement

73. Tick the wrong option regarding human beings
a) Cranial bones-12
b) Facial bones-14
c) Mendible bones-1
d) Zygomatic bones-2

74. Cross arms of the myosin monomer consists of
a) Outward projection of G-actin filament
b) Outward projection of the head region of meromyosin
c) Outward projection of the tail region of meromyosin
d) Both (b) and (c)

75. Which of the following option shows correct order of some stages of muscle contraction from the beginning to the end of the process?
a) stimuli →Neurotransmitter secretion→ Release of Ca^{2+} →Cross bridges formation→Excitation of T-system→ Sliding of action filaments

b) Stimuli→ Neurotransmitter secretion→Excitation of T-system →Release of Ca^{2+} →Cross bridges formation → Sliding of actin filaments→ 'H' band diminishes

c) Stimuli→ Excitation of T-system→ Neurotransmitter secretion→ Cross bridges formation→ sliding of action filaments→ 'H' band diminishes

d) Stimuli→ Neurotransmitter secretion→ Cross bridges formation→ Excitation of T-system→ Sliding of action filaments

76. Fused vertebrae in human are

I. Sacral
II. Coccygeal
III. Thoracic
IV. Cervical
V. Lumber

a) I and II b) III and IV c) IV and V d) II and V

77. Which of the following statements are false regarding the muscle structure?

I. In the centre of each I-band is an elastic fibre (Z-line) which bisects it
II. Thin filament are firmly attached to the Z-line
III. M-line is a fibrous membrane in the middle of A-band
IV. A sarcomere comprises one full-A band and two half I-bands

a) I and II
b) III and IV
c) II and III
d) None of these

78. Which of the following lubricates ligament or tendons and is an important constituent of synovial fluid of bones?

a) Pectins b) Lipids c) Hyaluronidase d) Hyaluronic acid

79. Troponin is a

a) Digestive enzyme b) Muscle protein
c) High energy reservoir d) Water soluble vitamin

80. Nucleus pulposes is found in

a) Brain b) Nucleus c) Intervertebral disc d) Liver

81. Colle's fracture is associated with

a) Femur b) Ulna c) Humerus d) Redius

82. For how long, contraction of the muscles continues in sliding filament theory?

a) Till ATP binds to myosin head b) Till ADP binds to myosin head
c) Till Ca^{2+} present in sarcoplasm d) Till polymerization of myosin head is going on

83. Osteoporosis is a

a) Age related disorder b) Gene related disorder
c) Viral disease d) Bacterial disease

84. Which statement is correct for muscle contraction?

a) Length of H-zone is decreased b) Length of A-band remains constant
c) Length of I-band gets increased d) Length of two Z-line get increased

85. The membrane sarcolemma is found over

a) Heart b) Muscle fiber c) Both (a) and (b) d) Nerve fiber

86. Human vertebral column is formed by

a) 21 vertebrae b) 30 vertebrae c) 26 vertebrae d) 33 vertebrae

87. The lactic acid generated during muscle contraction is converted to glycogen in

a) Muscles b) Kidney c) Pancreas d) Liver

88. Which of the following is important for muscle contraction and nerve impulse transmission?

a) Ca^{2+} ions b) Mg^{2+} ions c) Mn^{2+} ions d) Fe^{2+} ions

89. Which of the following statements is true with reference to the structure of a muscle fibre?

a) H-zone is present in the middle of A-band
b) A-band is present in the middle of sarcomere
c) M-line is present in the middle of H-zone
d) All of the above

90. Striated appearance of the myofibrils is due to
a) Actin proteins b) Myosin proteins c) Both (a) and (b) d) None of these

91. Latissimus dorsi muscles are
a) Muscles of fore arm b) Muscles of lower jaw
c) Muscles of chest d) Muscles of shoulder

92. A disease associated with joint is humans
a) Glaucoma b) Arthritis c) Hernia d) Horner's syndrome

93. Standing on tip toe is an example of
a) Elevation b) Flexion c) Extension d) Retraction

94. An acromian process is characteristically found in the
a) Pelvic girdle of mammals b) Skull of frog
c) Pectoral girdle of mammals d) Sperm of mammals

95. Which of the below given bones divide olfactory capsules in rebbit into left and right halves?
I. Nasals
II. Premaxillae
III. Maxillae
IV. Mesethmoid
a) I b) IV c) II d) III

96. The muscle band that remains unchanged during contraction and relaxation of the skeletal muscle is
a) I b) H c) A d) A-line

97. Which of the following statements about the joints of humans is false?
a) Joints are essential for all types of movements involving bony parts
b) Joints are the contact between bones or between bones and cartilages
c) Fibrous joints are immovable
d) Cartilaginous joints permits great movement

98. Each actin (thin filament) of is made up of
a) Two 'F' (filamentous) actins b) Two filament tropomyosin
c) Tropin d) All of the above

99. Choose the correct statements
a) Synovial joints are freely movable
b) Ball and socket, and hinge joints are the synovial joints
c) Synovial joints are characterized by synovial cavity with fluid between the articulating surface of the two bones
d) All of the above

100. Select the correct statement with reference to muscle structure
I. Each myosin is a polymerized protein
II. Many meromyosin constitutes one thick filament (myosin)
III. Each meromyosin's tail is called heavy meromyosin (HMM) and head is called light meromyosin (LMM)
IV. The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin
Choose the option with correct statements
a) All except I and II b) All except III and IV c) All except III d) All except I and IV

101. Arrange the following steps of muscle contraction in the sequence of events occurring first
I. Receptor sites on sarcolemma
II. Nerve impulse
III. Release of Ca^{2+}

IV. Acetylcholine release
V. Shortening of sarcomere
VI. Synaptic cleft
VII. Spread of impulse over sarcolemma on T-tubule
The correct option is
a) II → IV → VI → I → VII → III → V
b) II → IV → I → VI → VII → III → V
c) II → IV → I → VI → VII → V → III
d) IV → II → I → VI → VII → V → III

102. The region at the ends of the A-band of two adjoining sarcomeres is called
a) H-zone b) Z-band c) I-band d) M-zone

103. Intervertebral disc consists of a shock absorber connective tissue known as
a) Hyaline cartilage b) Elastic cartilage c) Fibro cartilage d) Reticulo cartilage

104. Transverse ligament is found in
a) Axis b) Atlas c) Sacrum d) Thoracic vertebra

105. The region between two successive Z-lines in a myofibril is
a) Sarcomere b) Sarcosome c) Fascia d) Anisotropic band

106. Choose the correct statements
a) Axial skeleton comprises 80 bones
b) Skull, vertebral column, sternum and ribs constitutes axial skeleton
c) Skull have total 22 bones
d) All of the above

107. The 'wish bone' or 'merry throught bone' of bird is
a) Sternum b) Scapula c) Coracoid d) Clavicle

108. Macrophages and leucocytes in blood exhibits
a) Amoeboid movement b) Ciliary movement c) Muscular movement d) Flagellar movement

109. A cricket player is fast chasing a ball in the field. Which one of the following groups of bones are directly contributing in this movement?
a) Femur, malleus , tibia, metatarsals
b) Pelvis, ulna, patella, tarsals
c) Sternum, femur, tibia, fibula
d) Tarsals, femur, metatarsals, tibia

110. Pelvic girdle of rabbit consists of
a) Ilium, ischium and pubis
b) Ilium, ischium and coracoids
c) Coracoid, scapula and clavicle
d) Ilium, coracoid and scapula

111. Ilium, ischium, pubis are the
a) Cervical vertebrae b) Pectoral bones c) Coaxal bones d) Thoracic bones

112. Low level of Ca^{2+} ions in muscles result in
a) Rapid spasms b) Wild contractions c) Both (a) or (b) d) None of the above

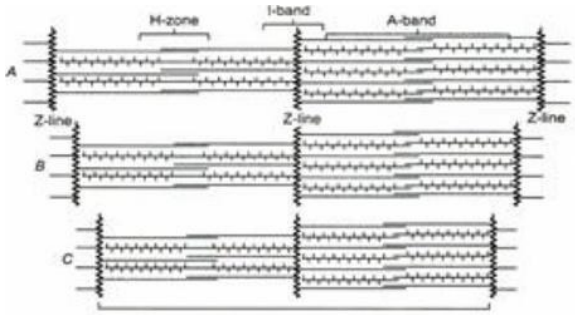
113. In a vertebrate, which germ layer forms the skeleton muscles?
a) Ectoderm b) Endoderm c) Mesoderm d) Both (a) and (c)

114. Muscle is attached to bone by
a) Tendon b) Ligament c) Insertion d) Cartilage

115. Which of the following pairs is correcrly matched?
a) Cartilaginous joint- skull bones
b) Hinge joint- Between vertebrae
c) Fibrous joint- Between phalanges
d) Gliding joint- Between zygapophyses of the successive vertebrae

116. Choose the correct properties of muscle fibres
I. Muscle fibre is lined by the plasma membrane called sarcolemma
II. Cytoplasm of the muscle fibre is called protoplasm
III. Sarcolemma of the muscle fibre encloses the sarcoplasm
IV. Muscle fibre is syncitium
Select the correct option
a) All except II b) All except I c) All except III d) All except IV

117. Identify the state of sarcomere in the diagram and choose the correct option accordingly



a) A-Contracting, B-Relaxed, C-Maximally contracted
b) A-Maximally contracted, B-Contracting, C-Relaxed
c) A-Relaxed, B-Contracting, C-Maximally contracted
d) A-Relaxed, B-Maximally contracted, C-Contracting

118. In *Paraecium*, cilia helps in
a) Movement of cytopharynx
b) Locomotion
c) Both (a) and (b)
d) Reproduction

119. What will happen if ligaments are cut or broken?
a) Bones will move freely at joints
b) No movement at joint
c) Bone will become unfixed
d) Bone will become fixed

120. This joint is made for power
a) Joint between vertebrae
b) Mandibular joint
c) Knee joint
d) Suture in cranium

121. Slow muscle fibres are found in
a) Eye
b) Leg
c) Stomach
d) Heart

122. Decreased level of oestrogen is human body leads to
a) Myasthenia gravis
b) Muscular dystrophy
c) Osteoporosis
d) Gout

123. Sarcomere is a
a) Functional unit of contraction
b) Portion of myofibril present in between two M-lines
c) Complete bundle of muscles
d) Portion of myofibril present in between two A-bands

124. I-bands of myofibrils are bisected by
a) A-bands
b) H-zone
c) Z-lines
d) M-lines

125. In which of the following, growth is possible through increase in volume?
a) Cartilage
b) Striated muscle
c) Never fiber
d) Lens of eye

126. First vertebrae in human is called
a) Axis
b) Atlas
c) Lumber
d) Cervical

127. Consider the following statements.
VI. In man, vertebral column has 33 bones organized as 28 bones.
VII. Pelvic girdle is made up of two fused bones only.
VIII. Osteoporosis is characterized by micro-architectural deterioration of the bone.
a) I is correct
b) II is correct
c) III is correct
d) I is incorrect

128. Bones of the limbs along with their girdles constitutes the
a) Apendicular skeleton
b) Axial skeleton
c) Apex skeleton
d) Axis skeleton

129. *Hydra* can use its tentacles for
a) Capturing its prey
b) Locomotion
c) Digestion
d) Both (a) and (b)

130. Which one of the following is wrongly matched?
a) Myosin-Contractile protein
b) Tendon- Connective tissue
c) Smooth muscle- Involuntary muscle
d) Red muscle- Myoglobin

131. Hinge joint is present between

a) Humerus and ulna
b) Femur and pectoral girdle
c) Humerus and pelvic girdle
d) All of the above

132. In the body, the membrane surrounding the bone is known as
a) Periosteum
b) Endosteum
c) Perichodrium
d) Chondrocytes

133. Which of the following is a part of pectoral girdle?
a) Ilium
b) Ischium
c) Acetabulum
d) Glenoid cavity

134. The joint of femur, with pelvic girdle is
a) Hinge joint
b) Pivot joint
c) Non-movable joint
d) Ball and socket joint

135. Which one is wrongly matched?
a) Tendon – Connective tissue
b) Smooth muscle – Involuntary muscle
c) Red muscle – Myoglobin
d) Troponin – Fibrous protein

136. Which of the following statements are wrong with reference to muscles?
I. Cardiac fibres are branched with one or more nuclei
II. Smooth muscles are unbranched and cylindrical
III. Striated muscles never performs anaerobic respiration
IV. Cardiae muscles are non-striated
Correct option with all wrong statements is-
a) II and III
b) I and IV
c) III and IV
d) I and III

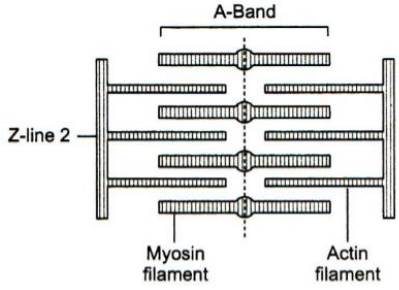
137. Cytoplasmic streaming movement is the characteristic of
a) Prokaryotes
b) Eukaryotes
c) Virus
d) All of these

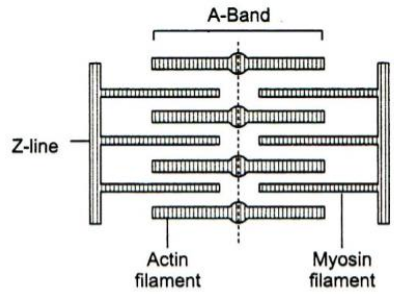
138. Olecranon fossa is present over
a) Scapula
b) Ulna
c) Radius
d) Humerus

139. In which of the following condition, progressive degeneration of skeletal muscles happens?
a) Myasthenia gravis
b) Muscular dystrophy
c) Tetany
d) Arthritis

140. Gout happens due to accumulation of is joints
a) Glucose crystals
b) Uric acid crystals
c) Urea crystals
d) Ammonia crystals

141. Identify the correctly labeled diagram

a)


b)


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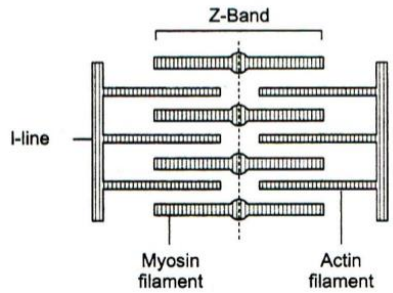
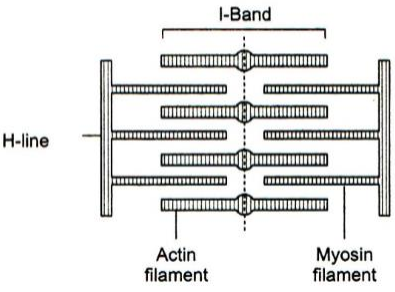


d)


142. Number of tarsals, metatarsals and phalanges in human skeleton is
a) 7,5,14
b) 8,5,14
c) 9,5,14
d) 5,6,7

143. Human skull is
a) Monocondylic
b) Dicondylic
c) Procoelous
d) Heterocoelous

144. In the thin filament of skeletal muscle fibre, a small globular protein that masks the active sites on the F-actin L, is

a) G-actin b) Actin c) Tropomyosin d) Troponin

145. Haversian canal is found in the bone of
a) Mammals b) Reptiles c) Aves d) Pisces

146. Identify the synovial joints among the given articles
I. Ball and socket
II. Hinge joint
III. Pivot joints
IV. Sutures of skull
V. Vertebral joints
Select the option containing correct articles
a) I, II, III and IV b) I, III, IV and V c) II, III, IV and V d) I, II and III

147. Atlas and axis are joined by
a) Hinge joint b) Pivot joint c) Saddle joint d) None of these

148. The number of cervical vertebrae present in giraffe is
a) 14 b) 5 c) 4 d) 12

149. Each myofibrils of muscles contains
a) Regular dark bands b) Regular light bands
c) Both (a) and (b) d) Alternate dark and light bands

150. Functional unit of skeletal muscle is called
a) Sarcomere b) Twitch c) Z-band d) None of these

151. Globular head with a short arm and a tail are the two imperfect part of
a) F-actin b) G-actin c) Tropomyosin d) Meromyosin

152. In rabbit, end of a long bone is connected to another by
a) Tendon b) ligaments c) Muscle d) Cartilage

153. Synsacrum of fowl consists of about
a) 29 vertebrae b) 3 vertebrae c) 16 vertebrae d) Single vertebrae

154. Actin and myosin filaments of muscles are also called
a) Thick and thin filaments respectively
b) Thin and thick filaments respectively
c) Black and white filaments respectively
d) White and black filaments respectively

155. A sarcomere in the myofibrils of muscle is found in between
a) 2 M-lines
b) 2 Z-lines
c) 2 H-lines
d) 2 A-bands

156. Identify the muscle which represents the following characteristics and choose the correct option accordingly
I. Transportation of food through the digestive tract
II. Transportation of gametes through the genital tract
a) Skeletal muscles b) Visceral muscles c) Cardiac muscles d) Striated muscles

157. Middle ear contains three tiny bones
I. Maxillae II. Malleus
III. Incus IV. Stapes
V. Vomer
a) I, II and III b) II, III and IV c) III, IV and V d) I, II and V

158. I. Myoglobin in very less quantity
II. Appear pale or whitish
III. Mitochondria are very few
IV. Sarcoplasmic reticulum in large quantity

Given characteristics of muscles fibres be long to

a) White fibres b) Green fibres c) Red fibres d) Pink fibres

159. Which ion binds with troponin during muscle contraction?

a) HCO_3^- b) Ca^{2+} c) Cl^- d) Na^+

160. Muscle contraction is initiated by the signal sent by

a) CNS b) PNS

c) ANS d) Neutral transmitters

161. Haversian canals are found in

a) Internal ear of mammal b) External ear of mammal

c) Long bone of rabbit d) Spinal cord

162. What is the purpose of locomotion performed by animals?

I. Search of food

II. Search of shelter

III. Search of mate

IV. Search of suitable breeding grounds

V. Search of favourable climate conditions

VI. Escaping from enemies/predators

Choose the correct option

a) All except V b) All except IV c) All except II d) All of these

163. Flat bone on the ventral midline of thorax is called

a) Coccyx b) Sternum c) Sacrum d) Ribs

164. Which muscle component is the smallest among the given options?

a) Muscle fibre b) Myofibril c) Actin d) Sarcomere

165. Choose the wrongly matched option

a) Frontal bone-1 b) Parietal bones-2 c) Temporal bone-1 d) Sphenoid bone-1

166. Cartilage has slightly pliable matrix due to

a) Chondroitin salts b) Osteoblast c) Chondroclast d) Osteoclast

167. In humans, true ribs connects to …A… and …B… dorsally and ventealiy respectively

	Dorsally to	Ventrally to
a)	Sternum	Vertebral column
b)	Sternum	Stapes
c)	Vertebral column	Sternum
d)	Vertebral column	Incus

168. Myofilaments or myofibrils are

a) Obliquely arranged filaments of muscle fibre b) Parallely arranged filaments of muscle fibre

c) Horizontally arranged filaments of muscle fibre d) Radially arranged filaments of muscle fibre

169. Select the correct statements with reference to muscles

I. Cardiac muscles are non-striated

II. All non-striated muscles are involuntary

III. All movements leads to locomotion

IV. Micro filaments all involved in amoeboid movements

Correct option with all wrong statements is-

a) I and III b) I and II c) III and IV d) II and IV

170. Ciliary movement occurs in most of our internal tubular organs which are lined by …A epithelium. The coordinated movement of cilia in the …B… help us in removing dust particles. Passage of ova through female reproductive tract is facilitated by the …C… movement

Identify A, B and C to complete the given NCERT statement

a) A-squamous, B-trachea, C-ciliary b) A-cuboidal, B-trachea, C-ciliary

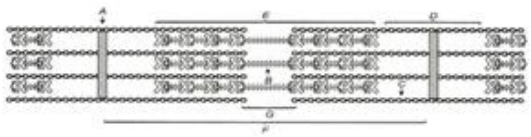
c) A-ciliated B-trachea, C-amoeboid d) A-stratified, B-trachea, C-amoeboid

171. The clavicle articulates with…….of scapula.

a) Acromion process b) Glenoid cavity

c) Acetabulum cavity d) Ball and socket joint

172. Elbow joint is an example of
a) Pivot joint b) Hinge joint c) Gliding joint d) Ball and socket joint
173. The thin filaments of a muscle fiber are made up of
a) Actin, troponin, tropomyosin b) Actin, troponin
c) Myosin,troponin d) Actin, tropomyosin
174. Motor unit is a
a) Neuron b) Muscle fibre
c) Motor neuron with muscle fibre d) All of the above
175. Based on their location in humans body or animals types of muscles are
I. skeletal II. visceral
III. cardiac IV. non-visceral
The correct option is
a) I and II b) II and IV c) I, II and III d) I, III and IV
176. In which of the following muscle component actin binding sites all present?
a) Troponin b) Tropomyosin
c) Meromyosin d) Troponin and tropomyosin
177. Which one of the following is a skull bone?
a) Coracoid b) Arytenoid c) Atlas d) Pterygoid
178. Centrum of 8^{th} vertebra of frog is
a) Procoelous b) Acoelous c) Amphicoelous d) Amphiplatyan
179. Which of the following statements is correct?
a) Movable skull bone is mandible
b) We move our hands, while walking for balancing
c) Cartilaginous joints have little mobility due to fibrocartilage disc between its articular ands, *e*. *g*., intervertebral disc between the centre of vertebrae
d) All of the above
180. Identify A-G in the given diagram and choose the correct option with reference to the hints I-VII



I. A-band II. I-band
III. Sarcomere IV. H-zone
V. Myosin
VI. Actin, troponin and tropomyosin
VIII. Z-line
The correct option is
a) I-E, II-D, III-F, IV-G, V-B, VI-C, VII-A b) I-E, II-D, III-C, IV-G, V-B, VI-A, VII-F
c) I-E, II-D, III-F, IV-G, V-C, VI-C, VII-B d) I-E, II-D, III-F, IV-A, V-B, VI-C, VII-G
181. Sensation of fatigue in muscles after prolonged strenuous physical work is caused due to
a) Decrease in the supply of oxygen b) Minor wear and tear of muscle fibres
c) The depletion of glucose d) The accumulation of lactic acid
182. In a …A… state, the edge of thin filaments on either side of thick filaments …B… overlap the free ends of ...C… filaments leaving the central part of thick filaments. This central part of thick filament, not overlapped by thin filaments is called …D… zone.
Choose the correct options to fill the gaps A, B, C and D, so as to complete the given NCERT statement
a) A-resting, B-partially, C-thick, D-H b) A-resting, B-partially, C-thick, D-A
c) A-resting, B-partially, C-thick, D-I d) A-resting, B-partially, C-thick, D-M
183. Muscle pump is
a) Beating of heart

b) Squeezing effect of muscles upon veins running through them
c) Peristaltic wave that travel along the alimentary canal
d) None of the above

184. There are seven cervical vertebrae in almost
a) All vertebrate b) All amphibian c) All reptile d) All mammals

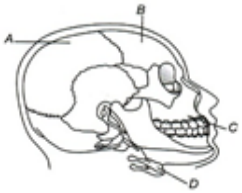
185. Which of the following statements are true for ciliary movements?
a) They takes part in the propulsion of excretory products
b) They present in trachea, vasa efferentia and oviducts
c) They are seen in *Paramecium* and other ciliates
d) All of the above

186. Synovial joints is humans are characterized by
a) Joining of two bones b) Presence of fluid filled synovial cavity
c) Rare movement d) No movement at all

187. What is the approximate number of muscle present in human body?
a) 21 b) 96 c) 1042 d) 640

188. How many pairs of ribs are present in human skeleton?
a) 10 pair b) 12 pair c) 9 pair d) 7 pair

189. Identify A, B, C and D in the given diagram of humans skull. Choose the correct option



a) A-Hyoid bone, B-Maxilla, C-Frontal bone, D-Parietal bone
b) A-Hyoid bone, B-Maxilla, C-Parietal bone, D-Frontal bone
c) A-Maxilla, B-Hyoid bone, C-Parietal bone, D-Frontal bone
d) A-Parietal bone, B-Frontal bone, C-Maxilla, D-Hyoid bone

190. Monomer of the myosin (thick) filament is
a) Troponin b) Tropomyosin c) Meromyosin d) F-actin

191. Head of myosin monomer consists of
I. actin binding sites
II. ATP binding sites
III. ADP binding sites
IV. AMP binding sites
Select the correct options
a) I and II b) III and IV c) I and IV d) II and IV

192. The joint of radio-ulna with the upper arm is
a) hinge joint b) pivot joint c) socket joint d) None of these

193. Suturus of human skull is
a) Fibrous joint b) Hinge joint c) Synovial joint d) Pivots joint

194. Skeletal system consist of a
a) Bones and cartilage b) Brain c) Only bones d) Only cartilage

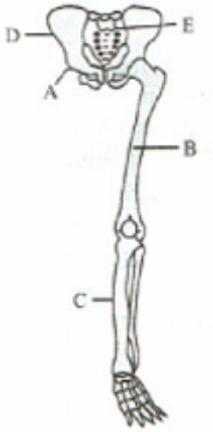
195. The parashenoid bone in frog forms
a) Base of cranium b) Floor of cranium
c) Dorsal side of cranium d) Dorsolateral side of cranium

196. Study the following statement
I. Accumulation of acidic acid in muscles causes fatigue
II. Accumulation of lactic acid in muscles causes fatigue
III. Anaerobic respiration takes place in muscles
IV. Cori cycle occurs in muscles

Choose the correct set of statements

a) I, II and III b) II, III and IV c) I, III and IV d) II, III and IV

197. Parts labelled as 'A', 'B', 'C', 'D' and 'E' respectively indicate in the given figure are



	A	B	C	D	E
a)	ilium	femur	tibia	pubis	sacrum
b)	Pubis	tibia	femur	ilium	sacrum
c)	ilium	femur	ilium	pubis	sacrum
d)	Pubis	femur	tibia	ilium	sacrum

198. Contractile fibrils of the muscles are called

a) Neurofibrils b) Collagen fibres c) Myofibrils d) Yellow fibres

199. I. Ca^{2+} ions pumps back to sarcoplasmic reticulum

II. Z-lines back to their original position

III. Masking of actin filament

IV. Relaxation of muscles

Arrange the above given steps in the sequence of event from first to last

a) I → II → III → IV b) I → III → II → IV c) IV → III → II → I d) IV → III → I → II

200. Where the troponin is found during muscle contraction?

a) Myosin filament b) Meromyosin c) Tropomyosin d) T-tubule

201. Read the statements regarding muscle proteins.

IX. Actin is a thin filament and is made up of two F-actins.

X. The complex protein, tropomyosin is distributed at regular inervals of troponin.

XI. Myosin is a thick filament which is also a polymerized protein.

XII. The globular head of meromyosin consists of light meromyosin (LMM).

Which of the above statements are correct?

a) I,II and III b) I, II and IV c) I and III d) II and IV

202. Which one is odd pair?

a) Femur-Humerus b) Tibia-Radius c) Axis-Atlas d) Tarsal- Carpals

203. Actin binding sites are located on

a) Troponin b) Tropomyosin c) Meromyosin d) Both (b) and (c)

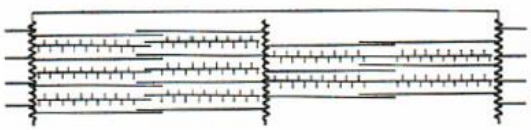
204. Neural canal is present in

a) Humerus b) Tibio-fibula c) Vertebral column d) Cranial bones

205. Vestigial tail in humans is

a) Thoracic vertebrae b) Lumber vertebrae c) Sacral vertebrae d) Caudal vertebrae

206. Identify the state of two sarcomeres in the diagram given below



a) Relaxed state
b) Contracting state
c) Fully contracted state
d) Maximally relaxed state

207. Sigmoid notch is present in
a) Femur b) Redius-ulna c) Tibia-fibula d) Humerus

208. Haversian canals are present in
a) Bone marrow b) Hyaline cartilage c) Bone matrix d) Calcified cartilage

209. Each human limb is made of
a) 60 bones b) 50 bones c) 40 bones d) 30 bones

210. Which is common to kidney and skeleton in mammals?
a) Cortex b) Medulla c) Pelvis d) Radius

211. Immediate energy source for muscle contraction is
a) ATP b) ADP c) Glucose d) Lactic acid

212. Which of the following statements about the molecular arrangement of actin and myosin are correct?
I. Each actin (thin filament) is made up of 2F (filamentous) actins
II. F-actin is the polymer of G (globular) actin
III. 2F = actins are twisted into a helix
IV. Two strands of tropomyosin (protein) lies in the grooves of F-actin
The correct option is
a) I and II b) III and IV c) I and IV d) All except IV

213. Arthritis is
a) Inflammation of liver b) Inflammation of joints
c) Degradation of joints d) Inflammation of heart

214. Humerus fits into glenoid cavity is example of
a) Ball and socket joint b) Pivot joint c) Peg and socket joint d) Condyloid joint

215. Ribs attached to sternum are
a) First seven pairs b) All ten ribs c) First ten rib pairs d) First five rib pairs

216. Locomotion requires a perfect coordinated activity of
a) Muscular system b) Skeletal system c) Neural system d) All of these

217. Largest muscle in the human body is
a) Sartorius b) Gluteus c) Stapedius d) Masseter

218. Red fibres are the fibres containing high content of
a) Myoglobin b) Globular protein c) Glycogen d) Anthocyanin

219. An individual sarcomere of myofibril consists of
a) Overlapping actin and myosin b) A stack of actin fibres
c) A stack of myosin units d) Overlapping actin and relaxin

220. During the muscle contraction, which zone decreases?
a) I-zone b) Z-zone c) H-zone d) M-zone

221. Main types of movement exhibited by the cells of human body are
I. Amoeboid II. Ciliary
III. Muscular IV. Flagellar
Option containing the correct answer is
a) I and II b) II and III c) III and IV d) I, II, III and IV

222. Synovial fluid is present in
a) Fibrous joints b) Cartilaginous joints c) Freely movable joints d) Intervertebral joints

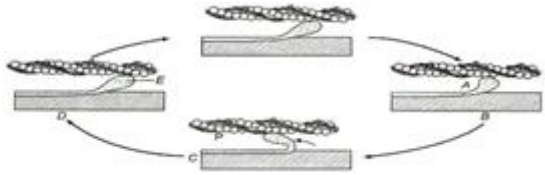
223. The gliding joints are important for gliding movements. One example of such a joint is between the
a) Zygapophysis of adjacent vertebrae b) Humerus and glenoid cavity
c) Occipital condyle and odontoid process d) Femur and tibio fibula

224. Which of the following features differentiate bone from cartilage?

a) Haversian canal b) Blood vessel c) Lymph vessel d) All of these

225. End of long bones are covered with
a) Muscle b) Cartilage c) Adipose tissue d) Bone marrow

226. Identify *A* to *E* in the given diagram



a) A-Cross bridge, B-Cross bridge formation, C-Breakage of cross bridge, D-Sliding, E-ATP
b) A-Cross bridge, B-Cross bridge formation, C-Sliding/rotation, D-Breakage of cross bridge, E-ATP
c) A-Cross bridge, B-Breakage of cross bridge, C-Sliding/rotation, D-Cross bridge formation, E-AMP
d) A-Cross bridge, B-Cross bridge formation, C-Sliding/rotation, D-ADP, E-Breakage of cross bridge

227. Bones of pectoral and pelvic girdle helps in the articulation of
a) Upper limbs b) Lower limbs c) Both (a) and (b) d) None of these

228. The number of occipital condyles in man is/are
a) One b) Two c) Three d) Four

229. Action potential in sarcolemma of muscles causes the release of
a) Na^+ b) Cl^- c) Ca^{2+} d) HCO_3^-

230. Choose the incorrect statement about the skeletal muscles
a) Their activities are under the voluntary control of the nervous system
b) They are known as voluntary muscles
c) They are primarily involved in locomotory actions and changes of body postures
d) None of the above

231. Find out the correct order of number of bones in the parts of skull such as cranial bone, facial bone, hyoid bone and middle ear bone and middle ear bone respectively.
a) 14, 8, 1 and 3 b) 3, 8, 14 and 1 c) 14, 8, 3 and 1 d) 8, 14, 1 and 3

232. Muscle contains a red coloured oxygen containing pigment called
a) Haemoglobin b) Myoglobin c) Haemocyanin d) Both (a) and (b)

233. Breast bone is also called
a) Sternum b) True rib c) False rib d) Axis vertebrae

234. Which one of the following item gives its correct total number?
a) Floating ribs in humans-4 b) Amino acids found in proteins-16
c) Types of diabetes-3 d) Cervical vertebrae in humans-8

235. Acetabulum is
a) Ilium and incus b) Ilium and ischium
c) Incus and ischium d) Incus, ischium and llium

236. In frog, the vertebra with an anterior convex surface (*i.e.,* double convexties) is
a) Atlas b) Urostyle c) 8^{th}vertebra d) 9^{th}vertebra

237. Contraction of the muscles takes place by the sliding of
a) Thick filament over thin filament
b) Thin filament over thick filament
c) Thin filament over thin filament
d) Thick filament over thick filament

238. Select the correct function of vertebral column in humans
a) Protects the spinal cord b) Supports the head
c) Surface as an attachment for ribs and musculature of back d) All of the above

239. Which muscle band remains unchanged during the contraction and relaxation of the skeletal muscle?
a) I b) H c) A d) E

240. Neural canal is
a) Solid portion of vertebrae through which the neural canal passes
b) Hollow portion of vertebrae through which the neural canal passes
c) Both (a) and (b)
d) None of the above

241. Pseudopodia in Protozoa is formed by the streaming of
a) Cytoplasm b) Protoplasm c) Cell membrane d) Cell wall

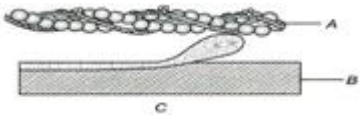
242. Cartilaginous joints in humans
a) Permit any movement b) Permit little movement
c) Permit no movement d) All of these

243. What is the Location of troponin in the process of muscle contraction?
a) Attached to myosin filament b) Attached to tropomyosin
c) Attached to myosin cross bridge d) Attached to T-tubule

244. Fascicles in human/animal are the
a) Blood capillaries b) Muscle bundles c) Intercalated discs d) Muscle cytoplasm

245. Which is not the function of endoskeleton?
a) Sight b) Hearing c) Locomotion d) Production of RBCs

246. Identify A, B and C in the given diagram. Choose the correct option



a) A-Actin filament, B-Myosin filament, C-Breaking of cross bridge
b) A-Myosin filament, B-Myosin filament, C-Breaking of cross bridge
c) A-Myosin filament, B-Actin filament, C-Breaking of cross bridge
d) A-Actin filament, B-G-actin filament, C-Breaking of cross bridge

247. The joint found in head of upper arm and pectoral girdle is
a) Hinge joint b) Ball and socket joint c) Gliding joint d) Saddle joint

248. Study the following sentense .
XIII. The accumulation of pyruvic acid in the muscle causes fatigue
XIV. ATP is resynthesized in the muscle by the phosphorylation of ADP by a phosphogen.
XV. Cori and cori's cycle occurs in the muscles.
XVI. The phosphogen in the vertebrate muscle is arginine phosphate.
The correct set of answers for muscle contraction is
a) I and II b) II and IV c) III and IV d) II and III

249. In procoelous vertebrae,
a) Anterior Centrum is convex b) Anterior Centrum is convex
c) Anterior Centrum is saddle-shaped d) Posterior Centrum is concave

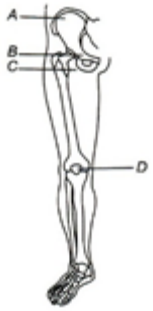
250. Select the wrong set of statements with respect to muscles
I. Z-line is present in the centre of the light band
II. Thin filaments are firmly attached to the M-line
III. The central part of the thick filaments, not overlapped by thin filaments is called Z-band
IV. Light band contains only thin filaments
Correct option with all wrong statements is
a) I and IV b) II and III c) I and III d) II and IV

251. Pick the true statements with reference to human beings
I. Vertebral column consists of 26 vertebrae
II. Vertebeal is dorsally placed
III. Neural canal invertebra is the passage for spinal cord
IV. Netural canal is ventrally placed
The option with all correct statements is

a) II, III and IV b) I, III and IV c) I, II and IV d) I, II and III

252. I. Sarcoplasmic reticulum are abundant
II. Myoglobin content is high
III. Sarcoplasmic reticulum are moderate
IV. Aerobic muscles
V. Depends on anaerobic respiration for energy
VI. Less myoglobin content
Select the option with correct statements for red muscle
a) I, II and IV b) I, II and III c) II, III and IV d) II and IV

253. Identify A, B, C and D in the given diagram. Choose the correct option



a) A-Ilium, B-Ischium, C-Pubis, D-Patella b) A-Ilium, B-Pubis, C-Ischium, D-Patella
c) A-Ilium, B-Patella, C-Ischium, D-Pubis d) A-Ilium, B-Patella, C-Pubis, D-Ischium

254. Rib cage is formed by
a) Thoracic vertebrae b) Ribs c) Sternum d) All of these

255. The term 'innominate' is related with
a) Nerve b) Artery c) Skeleton d) None of these

256. Inflammation of joints due to accumulation of uric acid crystals is called as
a) Gout b) Myasthenia gravis c) Osteoporosis d) Osteomalacia

257. F-actin is a polymer of
a) G (molecular) actin b) G (globular) actin
c) G (meromyosin) action d) All of these

258. For muscle contraction, in myofibrils the formation of a protein is essential, such protein was discovered by
a) Jean Hanson b) Cori and Cori c) Albert Szent Gyorgyi d) Hugh Huxley

259. Select the incorrect option about the human skull
a) It has 6 ear osscicles b) It includes 14 facial bones
c) It is dicondylic d) Hyoid is included in the skull bone

260. Identify A, B and C along the given diagram

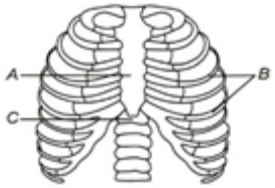
a) A-Troponin, B-Tropomyosin, C-Factin
b) A-Thick filament, B-Troponin, C-Tropomyosin
c) A-Myosin filament, B-Troponin, C-Tropomyosin
d) A-Meromyosin, B-Troponin, C-Tropomyosin

261. The glenoid cavity is associated with
a) Scapula b) Humerus c) Both (a) and (b) d) None of these

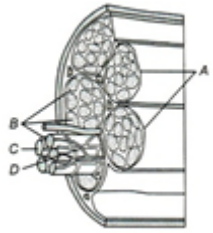
262. Hardness of the bones is due to
a) Hard matrix made up of calcium salts b) Soft matrix made up of sodium salts
c) Hard matrix made up of sodium salts d) Soft matrix made up of chondroitin salts

263. Ribs that are attached to the thoracic vertebrate and ventrally connected to the sternum with the help of hyaline cartilage are called
a) True ribs b) False rib c) Floating ribs d) Rib cage

264. The number of floating ribs in the human body is
a) 6 pairs b) 5 pairs c) 3 pairs d) 2 pairs
265. Scapula is a triangular bone situated
a) Dorsal part of thorax between 2nd an 7th ribs
b) Ventral part of thorax between 2nd an 7th ribs
c) Medial part of thorax between 2nd an 7th ribs
d) None of the above
266. Matrix of bone is composed of
a) Chondrin b) Ossein c) Osteon d) Auxin
267. Relaxation of the muscle takes place due to
I. pumping of Ca^{2+} ions in sarcoplasmic reticulum
II. presence of ATP
III. confirmational changes in troponin and masking the actin filament
Option containing correct statement is
a) I and III b) I and II c) II and III d) I, II and III
268. Which one of the following is a sesamoid bone?
a) Pelvis b) Patella c) Pterygoid d) Pectoral girdle
269. Identify A, B and C is the given diagram choose the correct option



a) A-Sternum, B-Vertebral column, C-Ribs b) A-Ribs, B-Vertebral column, C-Sternum
c) A-Ribs, B-Sternum, C-Coccyx d) A-Sternum, B-Ribs, C-Vertebral column
270. Mechanism of muscle contraction is best explained by
a) Physical filament theory b) Chemical filament theory
c) Sliding filament theory d) Jumping filament theory
271. Identify A, B, C and D in the given diagram and choose the correct option



a) A-Fascicle, B-Muscle fibre, C-Sarcolemma, D-Blood capillary
b) A-Muscle fibre, B-Fascicle, C-Sarcolemma, D-Blood capillary
c) A-Muscle fibre, B-Fascicle, C-Sarcoplasm, D-Blood capillary
d) A-Muscle fibre, B-Endoplamic reticulum, C-Sarcolemma, D-Blood capillary
272. Identify A, B, C and D, in the given diagram and choose the correct option

a) A-Actin binding site, B-ATP binding site, C-Head, D-Cross arm
b) A-Actin binding site, B-ATP binding site, C-Head, D-Side arm
c) A-Actin binding site, B-ATP binding site, C-Head, D-Long arm
d) A-Actin binding site, B-ATP binding site, C-Head, D-Short arm
273. Choose the correct statement about muscles
a) Muscles are the specialized tissues of mesodermal origin
b) About 40-50% of the body weight is contributed by muscles

c) Muscles have special properties like excitability, contractibility and extensibility
d) All of the above

274. During muscles contraction
a) Thick filaments slide over thin filaments
b) I-band gets reduced
c) Both (a) and (b)
d) None of the above

275. When body part moves towards the median axis the muscle is called
a) Abductor
b) Adductor
c) Supinator
d) Pronator

276. According to the functions the skeletal muscles is/are
a) Antagonists
b) Synergists
c) Prime movers
d) All of these

277. Formula of vertebral column of man is
a) $C_4\ T_4\ L_4\ S_8\ C_8$
b) $C_7\ T_{12}\ L_5\ S_1\ C_1$
c) $C_7\ T_{12}\ L_1\ S_5\ C_1$
d) $C_7\ T_8\ L_5\ S_6\ C_7$

278. Sliding filament theory was given by
a) AF Huxley and T Huxley
b) Leeuwenhoek and Hooke
c) AF Huxley and HF Huxley
d) HF Huxley and Robert Hooke

NEET BIOLOGY

LOCOMOTION AND MOVEMENT

: ANSWER KEY :

1)	a	2)	b	3)	a	4)	d	141)	a	142)	a	143)	b	144)	d
5)	a	6)	c	7)	d	8)	b	145)	a	146)	d	147)	b	148)	c
9)	c	10)	c	11)	d	12)	c	149)	d	150)	a	151)	d	152)	b
13)	a	14)	b	15)	c	16)	c	153)	c	154)	b	155)	b	156)	b
17)	a	18)	b	19)	d	20)	a	157)	b	158)	a	159)	b	160)	a
21)	a	22)	d	23)	b	24)	c	161)	c	162)	d	163)	b	164)	c
25)	b	26)	a	27)	c	28)	b	165)	c	166)	a	167)	c	168)	b
29)	b	30)	c	31)	c	32)	a	169)	d	170)	c	171)	b	172)	b
33)	b	34)	d	35)	d	36)	a	173)	a	174)	c	175)	c	176)	b
37)	b	38)	b	39)	d	40)	c	177)	d	178)	c	179)	d	180)	a
41)	c	42)	b	43)	a	44)	d	181)	d	182)	a	183)	b	184)	d
45)	a	46)	b	47)	c	48)	c	185)	d	186)	b	187)	d	188)	b
49)	a	50)	a	51)	a	52)	c	189)	d	190)	c	191)	a	192)	a
53)	b	54)	a	55)	a	56)	a	193)	a	194)	a	195)	b	196)	d
57)	a	58)	b	59)	d	60)	c	197)	d	198)	c	199)	b	200)	c
61)	b	62)	b	63)	d	64)	c	201)	c	202)	c	203)	b	204)	c
65)	d	66)	d	67)	a	68)	d	205)	d	206)	d	207)	b	208)	a
69)	d	70)	d	71)	d	72)	c	209)	d	210)	c	211)	a	212)	d
73)	a	74)	b	75)	b	76)	a	213)	b	214)	a	215)	a	216)	d
77)	d	78)	d	79)	b	80)	c	217)	b	218)	a	219)	a	220)	c
81)	d	82)	c	83)	a	84)	b	221)	d	222)	c	223)	a	224)	d
85)	b	86)	d	87)	d	88)	a	225)	b	226)	b	227)	c	228)	b
89)	d	90)	c	91)	d	92)	b	229)	c	230)	d	231)	d	232)	b
93)	a	94)	c	95)	d	96)	c	233)	a	234)	a	235)	d	236)	d
97)	d	98)	a	99)	d	100)	c	237)	b	238)	d	239)	c	240)	b
101)	a	102)	c	103)	c	104)	b	241)	b	242)	b	243)	b	244)	b
105)	a	106)	d	107)	d	108)	a	245)	a	246)	a	247)	b	248)	d
109)	d	110)	a	111)	c	112)	c	249)	b	250)	b	251)	d	252)	a
113)	c	114)	a	115)	d	116)	a	253)	b	254)	d	255)	c	256)	a
117)	c	118)	c	119)	c	120)	b	257)	b	258)	c	259)	d	260)	a
121)	b	122)	c	123)	a	124)	c	261)	c	262)	d	263)	a	264)	d
125)	a	126)	b	127)	c	128)	a	265)	a	266)	b	267)	d	268)	b
129)	d	130)	c	131)	a	132)	a	269)	d	270)	c	271)	a	272)	a
133)	d	134)	d	135)	d	136)	a	273)	d	274)	b	275)	b	276)	d
137)	b	138)	d	139)	b	140)	b	277)	b	278)	c				

NEET BIOLOGY

LOCOMOTION AND MOVEMENT

: HINTS AND SOLUTIONS :

1 **(a)**
Haversian canals are found in long bones of mammals. These canals are interconnected by transverse canals called Volkmann's canals.

2 **(b)**
Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs. The dorsal, flat, triangular body of scapula has a slightly elevated ridge called the, spine which projects as a flat, expended process called acromion.

3 **(a)**
Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones- ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates.

4 **(d)**
Chondroitin sulphate is a jelly like substance that provides support and adhesiveness in cartilage, bone, skin and blood vessels

5 **(a)**
The junction between a motor neuron and the sarcolemma of the muscle fiber is called the neuromuscular junction or motor-end plate. A neural signal reaching this junction (motor-end plate) releases a neurotransmitter (acetylcholine) which generates an action potential in the sarcolemma.

6 **(c)**
Originally human skeleton consists of 270 bones, which gets fused to become 206 bones and out of which 6 bones are ear ossicles. The remaining 200 bones are distributed into axial and appendicular skeleton

7 **(d)**
Volkmann's canals are found in long bones of mammals. These are transverse canals and connecting to Haversian canals.

8 **(b)**
The epidemic bone softening 'Itai-Itai' was first seen in Japan.

9 **(c)**
Sarcoplasmic reticulum.
Each muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm. Muscle fibre is a syncitium as the sarcoplasm contains many nuclei. The endoplasmic reticulum, *i.e.,* sarcoplasmic reticulum of the muscle fibres is the store house of calcium ions. A characteristic feature of muscle fibre is the presence of large number of parallely arranged filaments in the sarcoplasm called myofilaments or myofibrils

10 **(c)**
A-Troponin, B-Myosin, C-Actin

11 **(d)**
During muscle contraction the hydrolysis of ATP to ADP + Pi takes place in breaking and forming of cross bridges between the actin and myosin filaments

12 **(c)**
The middle ear cavity in mammals characteristically contains a chain of three little bones called or **ear ossicles** extending between the tympanic membrane and the fenestra ovalis. These are called from outside as the **malleus** (hammer), **incus** (anvil) and **stapes** (stirrup), so named because of their characteristic shapes.

13 **(a)**
Muscle contains a red coloured oxygen storing pigment called myoglobin. Myoglobin content is high in some of the muscles which gives them a reddish appearance. Such muscles are called the red fibres. These muscles, also contains plenty of mitochondria, which can utilise the large amount of oxygen stored in them for ATP production. These muscles therefore, can also be called aerobic muscles

14 **(b)**

Most of the bones in birds are pneumatic and filled with air sac instead of bone marrow.

15 **(c)**
The junction between a motor neuron and the sarcolemma of the muscle fibre is called the neuromuscular junction or motor end plate. A neural signal reaching this junction releases a neurotransmitter, acetylecholine which generates an action potential in the sarcolemma

16 **(c)**
Jugal is a narrow wavy bone. It connects zygomatic processes of squamosal and maxilla forming 'zygomatic arch'.

17 **(a)**
Animals and plants exhibit a wide range of movements. Streaming of protoplasm in the unicellular organisms like *Amoeba* is a simple form of movement

18 **(b)**
Sternum -1
Pelvis -3
Ribs -24
Face -14

19 **(d)**
Chemical ions responsible for muscle contraction are Ca^{2+} and Mg^{2+}.

20 **(a)**
In resting state, troponin binds to tropomyosin and masks the binding sites, Ca^{2+} binds to the troponin and frees the binding sites of troponin so that contraction can proceed

21 **(a)**
Joints have been classified into three major structural forms
(i) **Fibrous joints** don't allow any movement. This type of joint is shown by flat skull bones, which fuse end to end by fibrous connective tissue to form sutures of the cranium
(ii) **Cartilaginous joints** allows only limited movements. Bones are joint together with the help of cartilages. The joint between the adjacent vertebrae in the vertebral column is a cartilaginous joints
(iii) **Synovial joints** are characterized by the presence of fluid filled synovial cavity between the articulating surfaces of the two bones. Such an arrangement allows considerable movement

22 **(d)**
A-ilium B- acetabulum
C-Pubic D-ischium
E- Pubic symphysis

23 **(b)**
Acetylcholine.
The junction between a motor neuron and the sarcolemma of the muscle fibre is called the neuromuscular junction or motor end plate. A neural signal reaching this junction releases a neurotransmitter, acetylecholine which generates an action potential in the sarcolemma

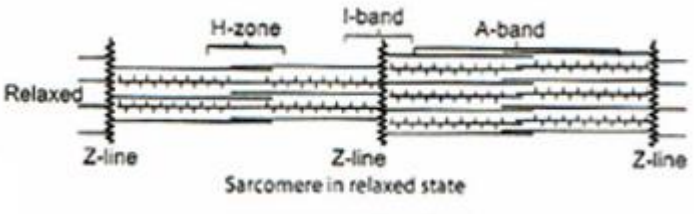
25 **(b)**
Cartilage is a vertebrate skeletal connective tissue. It is an amorphous matrix and contains glycoproteins, basophilic chondroitin and fine collagen fibres. Cartilage helps in bone to bone lighation.

26 **(a)**
Ligament has a high proportion of elastic fibres and white collagen fibres. This connects bone to bone.

27 **(c)**
Actin is thin filament and made up of f-actin. Each myosin (thick filament) is a polymerized protein. Many monomeric proteins called meromyosin constitutes one thick filament. Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called heavy meromyosin and the later is called light meromyosin.
The HMM component, *i.e.,* the head and short arm projects outwards at regular distance and angle from each other from the surface of polymerized myosin filament and is called cross arm. The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin
Each actin (thin) filament is made up of two 'F' (filamentous) actins which are helically wound to each other. Each F-actin is a polymer of monomeric G (globular) actins. Two filaments of another protein, tropomyosin also run close to the 'F' actins throughout its length.
A, complex protein troponin is distributed at regular intervals on the tropomyosin. In the resting state, a sub-unit of troponin masks the active binding sites for myosin on the actin filaments

28 **(b)**
Folding and unfolding of actin and myosin leads to amoeboid movement. This is hypothezised by **goldacre** and **larch**.

29 **(b)**



The thick filaments lies parallel to one another and thin filaments are present in orderly array between the thick filaments. In the centre of the I-band, there is a band of amorphous material called Z-line. In the middle of the A-band a comparatively less dark zone called H-zone of band is present. The area between the two Z-lines is called sarcomere. M-line is present, in the middle of H-zone

30 **(c)**

Fibrous Joints These are the immovable or fixed joints. These joints don't allow any movement due to the presence of strong white and tough cartilaginous fibres, *e*. *g*., joints in tooth socket and between skull bone

31 **(c)**

Rib number 6-10 show bucket handle type of movement.

32 **(a)**

Intercalated disc is found in cardiac muscle. It is an irregular transverse thickening of sarcolemma that contains desmo somes and hold cardiac muscle fibres together and gap junction that aid in conduction of muscle action potentials.

33 **(b)**

The first vertebrae of vertebrates is generally called **atlas**. It is **acoelous** in frog, *i*. *e*., the centrum of atlas is convex at both ends. It is the smallest vertebra and looks more ring-like.

34 **(d)**

Elium

35 **(d)**

Knee joint, elbow, ankle and interphalangeal joint are example of hinge joint (a type of **synovial joint**). A hinge joint allows movement primarily in one plane.

36 **(a)**

Ca^{2+} and Mg^{2+} are necessar for muscle contractio

$$\text{Myosin} + \text{Actin} \xrightarrow[Ca^{2+}]{ATP} \text{Actomyosin}$$

$$ATP + H_2O \xrightarrow[Ca^{2+}\ /\ Mg^{2+}]{\text{Myosin ATP are}} ADP + P_i + \text{energy}$$

37 **(b)**

Gout is associated with purine metabolism resulting in over production of uric acid crystals in the ragion of joints.

38 **(b)**

In rabbit, at the elbow joints, ulna projects beyond the radius as an olecranon process, which has a deep sub-terminal sigmoid notch for articulation with the distal end of humerus.

39 **(d)**

In humans, femur or the thing bone is the longest bone of the body. It articulates with the acetabulum to from hip joint.

40 **(c)**

Axis is the second cervical vertebra, which is identified by a prominent odontoid process. The odontoid process of axis vertebra fits in the odontoid fossa of first cervical vertebera (*i*. *e*., atlas) forming the actual pivot joint at which the skull rotates around together with the atlas.

41 **(c)**

Each arm consists of 30 bones of, which one humerus, one radius, one ulna, eight carpal bones, five metacarpal bones and fourteen are phalanges bones, *i*. *e*. ,

1+1+1+8+5+14=33

42 **(b)**

Presence of seven cervical vertebrae in the neck is common feature in all mammals. These vertebrae are acoelous, covered by cartilaginous pads, *i*. *e*., epiphysis.

43 **(a)**

Due to continuous contraction, a muscle exhausts it's stored ATP and glycogen molecules and accumulates lactic acid, which gradually retards and finally stops the contraction activity of muscle cell. The situation is known as fatigue of a muscle.

44 **(d)**

6 ear ossicles are present in human three in each ear.
Each middle ear contains three tiny bones (i) Malleus (ii) Incus (iii) Stapes which are collectively called ear ossicles

45 **(a)**
Joints are the points of contact between the bones or between the bones and cartilages. Force generated by the muscles is used to carry out the movements through joints

46 **(b)**
Locomotion and movements may be linked by stating that all the locomotions are movements but all movements are not locomotions

47 **(c)**
Muscular dystrophy Progressive degradation of skeletal muscle mostly due to genetic disorder

48 **(c)**
I, II, and IV statements are correct, while III and V are incorrect.

49 **(a)**
Bones become fragile in **osteoporosis**, *i*. *e*., reduction in bone tissue mass causing weakness of skeletal strength. It is characterized by pain in the bone, specifically in the back and vertebral crush, usually in weight bearing vertebrae.

50 **(a)**
Between carpals and matacarpals

51 **(a)**
Cross-bridge ditachment.
When ATP binds to myosin filament there is a detachment of myosin and actin filament. Due to detachment, the sliding (contraction) takes place and the hydrolysis of ATP to ADP takes place. In that step again, the cross bridge formation between actin and myosin takes place

52 **(c)**
By utilizing the energy from ATP hydrolysis, the myosin head binds to the exposed active sites on actin to form a cross bridge. This pulls the attached actin filaments towards the centre of A-band. The Z-line attached to these actin are also pulled inwards thereby causing the shortening of sarcomere, *i.e.,* contraction

53 **(b)**
The kinesin, myosin and dynein proteins of skeletal muscle involve ATPase activity.

54 **(a)**
Striped muscles are also known as skeleton muscle or voluntary muscle. These muscles are made up of large number of fibres. Skeleton muscle fibres are multinucleated, **syncytial**, asepted.

55 **(a)**
A-Light, B-1, C-dark, D-A

56 **(a)**
Cranium (brain case) is a strong and firm bony box with a helmet like covering over the brain called vault of skull. Its cavity is called cranial cavity. **Eight** bones are articulated with each other to form the cranium.

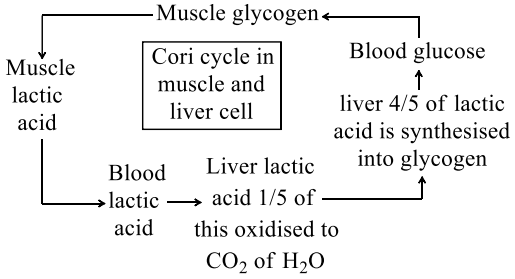
57 **(a)**
Cardiac muscle as the name suggests, the muscles of heart. Many cardiac muscle cells assemble in a branching pattern to from a cardiac muscle. Based on appearance, they are striated. They are involuntary in nature as the nervous system does not control their activities directly

58 **(b)**
Both proteins, *i.e.,* actin and myosin are arranged as rod-like structure, parallel to each other and also to the longitudinal axis of the myofibrils. Actin filaments are thinner as compared to myosin filaments, hence they are commonly called thin and thick filaments respectively

59 **(d)**
Ligament is tough cord or fibrous band of dense regular connective tissue that contains numerous parallel arrangements of **Collagen fibres**. It connects bone or cartilages and serves to serves to strengthen joints.

60 **(c)**
A-Skeletal, B-Stripped, C-Striated

61 **(b)**
Lactic acid is formed due to anaerobic break down of glycogen (muscle)



62 **(b)**
The junction between a motor neuron and sarcolemma of muscle is called neuromuscular junction

(i) A neural signal reaching this junction (motor end plate) release a neurotransmitter
(ii) Repeated activation of muscles can lead to the accumulation of lactic acid due to anaerobic break down of glucose in them

63 **(d)**
Skull provides a bony protection of the brain the blais. The skull consists of 29 bones. The bones of skull is divided into following parts:
Cranial bones -8
Facial bones -14
Hyoid bone -1
Bones of middle ear -6

64 **(c)**
Fascia.
Each organized skeletal muscle in our body is made of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle contains a number of muscle fibres

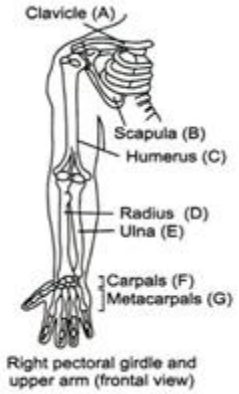
65 **(d)**
When ATP binds to myosin filament there is a detachment of myosin and actin filament. Due to detachment, the sliding (contraction) takes place and the hydrolysis of ATP to ADP takes place. In that step again, the cross bridge formation between actin and myosin takes place

66 **(d)**
Flagellar movements
(i) Flagella of choanocytes maintains a regular current of water in the body (sponges)
(ii) Performs locomotion in euglenoids and other flagellar protists (*Chlamydomonas*), sperm, etc.
(iii) Helps in the circulation of food
(iv) Flagellate choanocytes brings about the circulation of water in canal system of sponges

67 **(a)**
Human vertebral column is formed by 20 serially arranged units called vertebrae. In the embryonic state, they were 33 but later they fuse and forms 26 vertebrae.
It extends from the base of the skull and constitutes the main framework of the trunk. Each vertebra has a central hollow portion (neural canal) through, which the spinal canal passes

68 **(d)**
The reduction in force of contraction of a muscle after prolonged stimulation is called muscle fatigue. The accumulation of lactic acid leads to muscle fatigue. Lactic acid is produced by glycolysis in absence of O_2.

69 **(d)**
Visceral muscles are located in the inner wall of hollow visceral organs of the body like the alimentary canal, reproductive tract, etc. They don't exhibit any striation and are smooth in appearance hence they are called smooth muscles (non-striated muscles). Their activities are not under the voluntary control of the nervous system and are therefore, called involuntary muscles. They assist, for example, in the transportation of food through the digestive tract and gametes through the genital tract

70 **(d)**


Right pectoral girdle and upper arm (frontal view)
Right pectoral girdle and upper arm (frontal view)

71 **(d)**
(i) Non-striated muscles are involuntary. They don't obey according to our like heart muscles
(ii) Microfilament are involved in the movement of *Amoeba* and ciliatory protist

72 **(c)**
The contractile property of the muscles is effectively used for locomotion and other movements by human beings and majority of multicellular organisms. Locomotion requires a prefect coordinated activity of muscular, skeletal and neural systems

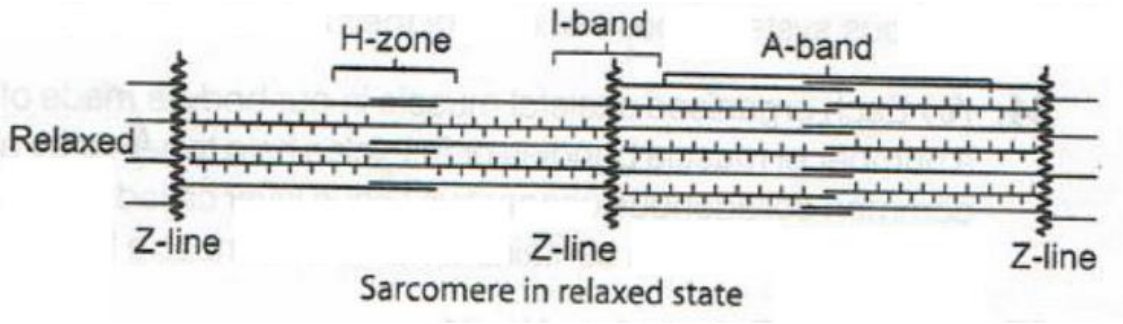
74 **(b)**
Outward projection of head region of meromyosin.
Each myosin (thick filament) is a polymerized protein. Many monomeric proteins called meromyosin constitutes one thick filament. Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called heavy meromyosin and the later is called light meromyosin.

The HMM component, *i.e.,* the head and short arm projects outwards at regular distance and angle from each other from the surface of polymerized myosin filament and is called cross arm. The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin

75 **(b)**
The contraction of skeletal muscle includes ultrastructural and biochemical events. Ultrastructural events leads with stimuli excitation of T-system followed by crossbridge formation (myosin and actin filaments involved) and the cross bridge breakage. The biochemical events explain that stimuti leads to neurotransmitter secretion, excitation of T-system and release of Ca^{2+}.

76 **(a)**
Sacral and coccygeal (caudal) vertebrae are fused vertebrae in human beings
Sacral vertebrae First five sacral vertebrae gets fused to form sacrum. It is a strong and short supporting pelvic girdle as it (sacrum) articulates with the ilium of pelvic girdle
Caudal or coccygeal vertebrae Mainly 3 to 4 caudal vertebrae gets fused to form a small triangular bone called coccyx. It is the vestigial tail in humans

77 **(d)**
None of these.



Sarcomere in relaxed state

The thick filaments lies parallel to one another and thin filaments are present in orderly array between the thick filaments. In the centre of the I-band, there is a band of amorphous material called Z-line. In the middle of the A-band a comparatively less dark zone called H-zone of band is present. The area between the two Z-lines is called sarcomere. M-line is present, in the middle of H-zone.
In the centre of each I-band is an elastic fibre called Z-line which bisects it. The thin filaments are firmly attached to the Z-line. The thick filaments in the A-band are also held together in the middle of this band by thin fibrous membrane called M-line. The A and I-band are arranged alternately throughout the length of myofibrils. The portion of the myofibrils between two successive Z-lines is considered as the functional unit of contraction called sarcomere

78 **(d)**
Hyaluronic acid lubricates ligaments and tendons and is an important constituent of synovial fluid of bone joints, vitreous humour of eyes, etc.

79 **(b)**
Troponin is a muscle protein, associated with actin in thin filaments.

80 **(c)**
Nucleus pulposes is the central soft part of intervertebral disc representing remains of notochord (shock absorber).

81 **(d)**
A fracture of the distal end of radius, in which the distal fragment displaced posteriorly is called **Colles' fracture**.

82 **(c)**
Sliding of actin and myosin filaments constitutes till the Ca^{2+} ions are pumped back to the sarcoplasmic cisternae, resulting in masking the actin filaments. This causes the return of Z lines back to their original position, *i.e.,* relaxation

83 **(a)**
Osteoporosis Age-related disorder characterized by decreased bone mass and increased chanes of pracheres. Decreased level of oestrogen is a common cause of this disease

84 **(b)**
During muscle contraction, actin and myosin interact to form actomyosin. According to sliding filament theory, cross bridge are formed by myosin filament to slide actin filament. During

muscle contraction, length of A- band remains constant.

85 **(b)**

Sarcolemma is the tough elastic membrane formed by the modified plasma membrane over the **muscle fibres**.

86 **(d)**

Human vertebral column is formed by 33 vertebrae which are as follow:

Cervical vertebrae - 7
Thoracic vertebrae - 12
Lumbar vertebrae - 5
Sacrum, sacral vertebrae - 5
Coccyx, coccygeal vertebrae - 4

87 **(d)**

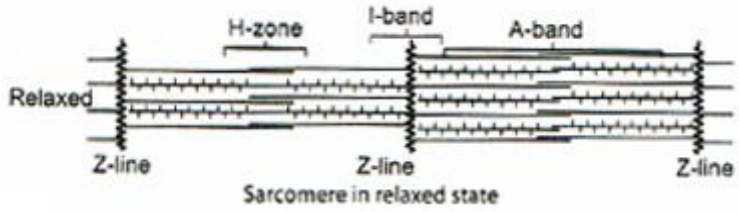
During anaerobic situation, lactic acid formation becomes start by the body cells. Later on, this lactic acid is delivered by the blood to the liver, where lactic acid dehydrogenase enzyme converts lactic acid to pyruvic acid.

88 **(a)**

Ca^{2+} ions is essential of muscle contraction, neuro- muscular functions and nerve impulse transmission.

89 **(d)**

All of the above.



Sarcomere in relaxed state

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90 **(c)**

Each myofibril has an alternate dark and light bands on it. A detailed study of the myofibril has established that the striated appearance is due to the distribution pattern of two important proteins, *i.e.,* actin and myosin

91 **(d)**

Latissimus dorsi is one of the pair of large triangular muscles on thoracic and lumbar areas of the back. The latissimus dorsi extends, adducts and rotates the arm medially, draws the shoulder back and down.

92 **(b)**

Arthritis.

Arthritis Inflammation of joints

Rheumatoid arthritis Hard tissue deposites over articular cartilage along with the higher secretion of synovial fluid, causing pain and stiffness which leads to rheumatoid arthritis

Osteoarthritis Tearing of articular cartilage and development of bony lumps at places causing pain, stiffness and permanent bending which lead to osteoarthritis

93 **(a)**

Elevation involves the raising of a part, *e*. *g*., standing on tiptoe, massetor raises the lower jaw, etc. Flexion involves the bending of a part over another, *e*. *g*., forearm towards upper arm by biceps, while extension involves straightening of a bent part, *e*. *g*., bent forearm is straightened or extended by triceps.

94 **(c)**

An acromian process is found in pectoral girdle of mammals.

95 **(d)**

The olfactory capsule in the case of mammals (*e*. *g*., rabbit) is taken into the facial region. These capsules are dorsally bounded by an elongated, flat, membranous, nasal bone, ventrally by Y-shaped vomers and laterally by premaxilla and maxilla bone. Medially the two chambers are separated by a cartilaginous internasal septum of mesethmoid bone.

96 **(c)**

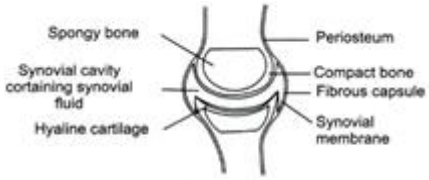
During contraction and relaxation of muscles, both I-band and H-zone **progressively shorten and disappears.**

Dark A-band (anisotropic) **undergo no** change during contraction and relaxation of muscle fibres.

97 **(d)**
Cartilaginous joints allows only some movements at the joints through the compression of the discs of cartilages, *e*. *g*., vertebrae of vertebral column

98 **(a)**
Two f-actins

99 **(d)**
Structure of synovial joint is as follows



Structure of synovial/freely movable joint

(i) **Synovial Cavity**
(a) Contains mucin, a lubricant for joint surfaces
(b) Reduces friction between the joint surface
(c)Allows the movements of nutrients and respiratory gases
(ii) **Hyaline Cartilage**
(a) Contains no blood vessels or nerves
(b) Reduces the friction between bones during movement
(c)Because of its elastic property, it also acts as shock absorber
(iii) **Fibrous Capsule**
(a) Formed by the number of ligaments
(b) Arrangement in such a way, as to cope effectively with the particular stresses suffered by the joints
(iv) **Synovial membrane**
(a) Secretes synovial fluid (a clear sticky fluid) into the synovial cavity
(b) Acts as water proof seal, preventing escape of synovial fluid
(c) Allows movement of nutrients and respiratory gases

100 **(c)**
All except III

101 **(a)**
Nerve impulse causes
↓
Acetylcholine release reaches to
↓
Synaptic cleft
↓
Sarcolemma have receptor which senses the acetylcholine
↓
Spread of the impulse through out the T-tubules
↓
Release of calcium from sarcoplasmic reticulum
↓
Breakdown of troponin
↓
Thin and thick filaments slides on each other and contraction starts

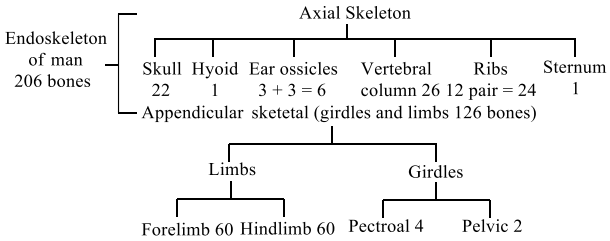
102 **(c)**
In the centre of each I-band is an elastic fibre called Z-line which bisects it. The thin filaments are firmly attached to the Z-line. The thick filaments in the A-band are also held together in the middle of this band by thin fibrous membrane called M-line. The A and I-band are arranged alternately throughout the length of myofibrils. The portion of the myofibrils between two successive Z-lines is considered as the functional unit of contraction called sarcomere

103 **(c)**
Fibrocartilage possess thick dense bundles of collagen fibres in matrix. White fibrocartilage is the **strongest cartilage**. It occurs in joints **between vertebrae** functioning as shock absorber and also in pubic **symphysis**.

104 **(b)**
A transverse ligament is found in atlas. It divides the neural foramen of atlas into a smaller anterior (front) odontoid fossa and a posterior, larger vertebral foramen.

105 **(a)**
Sarcomere is the smallest contractile unit of muscle, which extends from one Z-disc to the next.

106 **(d)**
All of the above



107 **(d)**
Clavicle is the wish bone of birds.

108 **(a)**
Specialized cells in human body like macrophages and leucocytes in blood exhibits amoeboid

movement. It is affected by pseudopodia formed by the streaming of protoplasm (as in *Amoeba*). Cytoskeletal elements like microfilaments are also involved in amoeboid movement

109 **(d)**
Tarsals, femur, metatarsals and tibia are parts of hind limb bones that mainly take part during chasing a ball in the field by a cricket player.

110 **(a)**
The pelvic girdle of rabbit consists of two halves or innominate bones, each innominate bone consisting of 3 parts; ilium, ischium and pubis.

111 **(c)**
Innominate (mean no name) are called hip bones (coaxae). *Coaxal bone are*
(i) Ischium (ii) Pubis (iii) Ilium

112 **(c)**
Rapid spasm is also called wild contraction of the muscles. It takes place due to the low level of Ca^{2+} ions in the sarcoplasmic reticulum or during the muscular contraction the level of Ca^{2+} lowers ions than the normal concentration

113 **(c)**

Germ Layer	Structure Formed
Ectoderm	Nervous system
Mesoderm	Connective tissue like bones, skeleton muscle
Endoderm	Respiratory system

114 **(a)**
Tendons are the white fibrous connective tissue, which joins muscles to bones.

115 **(d)**
Gliding joint is present between zygapophyses of the successive vertebrae. In this joint, articular ends of two bones are either flat or slightly curved to allow sliding on gliding movement.

116 **(a)**
Each muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm. Muscle fibre is a syncitium as the sarcoplasm contains many nuclei. The endoplasmic reticulum, *i.e.,* sarcoplasmic reticulum of the muscle fibres is the store house of calcium ions. A characteristic feature of muscle fibre is the presence of large number of parallely arranged filaments in the sarcoplasm called myofilaments or myofibrils

117 **(c)**
A-Relaxed, B-Contracting, C-Maximally contracted

118 **(c)**
Locomotory structures need not to be different from those affecting the other types of movements. For example, in *Paramecium*, cilia helps in the movement of food through cytopharynx and in locomotion as well. *Hydra* can use its tentacles for capturing its prey and also use them for locomotion. We use limbs for changes in body postures and locomotion as well

119 **(c)**
Ligaments are specialized connective tissues, which connect bones together.Hence if they are cut or broken, the bone will become unfixed.

120 **(b)**
Movement of organ occur due to pulling of the bones caused by the force generated by contracting muscles. Movement takes place along the joints. These all function as lever, which are divided into three categories. These levers are aimed at powar and speed. The mandibular joint is for power. It is a joint between the head of mandible and the mandibular fossa and articular fubercle of the temporal bone. It is also called temporomandibular joint.

121 **(b)**
Gastrocnemius muscle of leg have slow muscle fibres. Slow fibres are specialized to enable them to continue contraction for extending periods, long after a fast muscle would have become fatigued.

122 **(c)**
Osteoporosis.
Osteoporosis Age-related disorder characterized by decreased bone mass and increased chanes of pracheres. Decreased level of oestrogen is a common cause of this disease

123 **(a)**
Functional unit of contraction is called sarcomere. It is present between the two Z-lines

124 **(c)**
I-band or anisotropic band contains the actin filaments that's why they are thinner then myosin filament. They are bisected by Z-line into two

125 **(a)**
Growth occurs in body parts or cells through four different phages, as growth in cartilage occurs by secretion of extracellular matrix. Striated muscles grow through increase in volume. Nerve fibres grow by extension and growth of axons and dendrites, while lens of eye grow by multiplication of cells.

126 **(b)**
The first vertebra is the atlas and it articulates with the occipital condyles. It is articulated to the skull

127 **(c)**
Osteoporosis is a disease, in which bones loses minerals and fibres from its matrix. Imbalances of hormones like calcitonin, parathyroid and sex hormones, deficiencies of calcium and vitamin-D are the main causes of osteoporosis.

128 **(a)**
Appendicular skeleton lies laterally and is attached to axial skeleton. It is made up of girdles (pectoral and pelvic) and limb bones (forelimb and hindlimb). Pectoral girdle and pelvic girdle supports forelimb and hindlimb respectively. The appendicular skeleton consists of 126 bones

129 **(d)**
Both (a) and (b).
Locomotory structures need not to be different from those affecting the other types of movements. For example, in *Paramecium*, cilia helps in the movement of food through cytopharynx and in locomotion as well. *Hydra* can use its tentacles for capturing its prey and also use them for locomotion. We use limbs for changes in body postures and locomotion as well

130 **(c)**
Troponin is a component of thin filaments (along with actin and tropomyosin) and is the protein (globular) to which calcium binds to accomplish the regulation of muscle (cardiac and skeletal) contraction.

131 **(a)**
Hinge joint is a perfect joint or synovial joint. Movement takes place only in one direction or one plane, $e.g.$, joint between humerus and ulna ($e.g.$, elbow joint), knee joint.

132 **(a)**
The bone in the body is surrounded by **periosteum**. The periosteum comprises two distinct layer, a thin outer layer of fibrous connective tissue and a layer of osteoblasts.

133 **(d)**
Pectoral girdle or shoulder girdle is composed of two separate halves. Each half consists of the scapula of shoulder bone, coracoid process and clavicle or collar bone. At the junction of scapula and clavicle, is a concave depression, called glenoid cavity, which articulates with the head of the humerus to form a ball and socket joint.

135 **(d)**
Troponin is globular protein not fibrous protein is tropomyocin

136 **(a)**
Hyaluronic acid lubricate the ligaments and tendons and is an important constituent of synovial fluid of the bone joints, vitreous humur of eyes. etc.

137 **(b)**
Cytoplasmic streaming movement is also called cyclosis. Cyclosis helps in the circulation of material in the cells (inside eukaryotic cells)

138 **(d)**
Humerus is the bone of upper arm. It articulates with ulna of lower arm. Two depressions just above trochlea-the olecranon fossa upon posterior and coracoids fossa upon anterior surfaces respectively receive olecranon process of ulna, when our arm extends and coronoid process of ulna when our arm relaxes.

139 **(b)**
Muscular dystrophy.
Muscular dystrophy Progressive degradation of skeletal muscle mostly due to genetic disorder

140 **(b)**
Gout is generally a old age disorder in which inflammation of joints accurs due to the line accumulation of uric acid crystals

142 **(a)**
Hindlimb Leg bones Each lower limb has 30 bones
Femur (2) – Thigh
Patella (2) – Knee
Tibia (2) – Shank
Fibula (2) – Shank
Tarsal ($14 = 2 \times 7$) – Ankle
Metatarsal ($10 = 2 \times 5$) – Sole
Phalangies – ($28 = 2 \times 14$) – Toes

143 **(b)**
The human skull articulates with the superior region of the vertebral column with the help of two occipital condyles, that's why human skull is called dicondylic skull

144 **(d)**
The thin filament of skeletal muscle fibre is composed of three distinct proteins, $i.e.$, actin, tropomyosin and troponin. Troponin-I inhibits the F-actin –mysosin intraction and also binds to other components of troponin. Tropomyosin is

fibrous molecule that attaches to F-actin in the groove between its filaments.

145 **(a)**
Presence of Haversian canal is the characteristic feature of mammalian bones.

146 **(d)**
Synovial joints are of following types
(i) **Ball and Socket Joint** Between humerous and pectoral girdle
(ii) **Hinge Joints** Knee joint
(iii) **Pivot Joint** Between atlas and axis
(iv) **Gliding joints** Between carpals
(v) **Saddle joints** Between carpals and metacarpals of thumb

147 **(b)**
Atlas and axis are joined by pivot joint. It is also known as rotatoria (rotatory joint). Pivot joint fixes one of the two bones in its place and bear a peg like process over, which the other bone rotates.

148 **(c)**
Almost all mammals (including giraffe) have seven cervical vertebrae, of which first is atlas and second is axis.

149 **(d)**
Each myofibrils contains alternate dark and light bands. Light bands contains actin and is called I-band or isotropic band, whereas the dark bands are called A or anisotropic bands containing myosin

150 **(a)**
The skeleton muscles bring about voluntary movement under conscious control of brain and hence, called voluntary muscles. The segment of a fibril between two adjacent Z-bands is called a **sarcomere**.

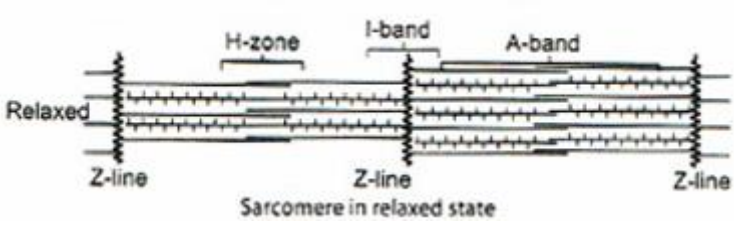
151 **(d)**
Globular head with short arm and the tail are the part of HMM (Heavy Meromyosin) and LMM (Light Meromysoin) respectively. These are the parts of meromyosin filament. Many meromyosin filaments polymerized to form thick filaments (myosin)

152 **(b)**
Ligaments consist of mainly collagen fibres and some elastic fibres. It connects end of a long bone to another.

153 **(c)**
Synsacrum is the thoracic region of vertebral column in fowl. It consists of about 16 fused vertebrae and provides support to ilia bones of immense pelvic girdle.

154 **(b)**
Thin and thick filament respectively.
Both proteins, *i.e.,* actin and myosin are arranged as rod-like structure, parallel to each other and also to the longitudinal axis of the myofibrils. Actin filaments are thinner as compared to myosin filaments, hence they are commonly called thin and thick filaments respectively

155 **(b)**
2 Z-lines.



Sarcomere in relaxed state

The thick filaments lies parallel to one another and thin filaments are present in orderly array between the thick filaments. In the centre of the I-band, there is a band of amorphous material called Z-line. In the middle of the A-band a comparatively less dark zone called H-zone of band is present. The area between the two Z-lines is called sarcomere. M-line is present, in the middle of H-zone

156 **(b)**
Visceral muscles.
Visceral muscles are located in the inner wall of hollow visceral organs of the body like the alimentary canal, reproductive tract, etc. They don't exhibit any striation and are smooth in appearance hence they are called smooth muscles (non-striated muscles). Their activities are not under the voluntary control of the nervous system and are therefore, called involuntary muscles. They assist, for example, in the transportation of

food through the digestive tract and gametes through the genital tract

157 **(b)**
Each middle ear contains three tiny bones (i) Malleus (ii) Incus (iii) Stapes which are collectively called ear ossicles

158 **(a)**
White Skeletal Muscle (Fast twitch fibre) Their fibres are much thicker and of light colour due to the absense of myoglobin. The number of mitochondria is low in white fibres. They have little or no store of oxygen. They are meant for fast and strenous physical activity over a short duration as they get tired soon. They carryout anaerobic contraction with accumulating lactic acid, *e*. *g*., muscles of eye ball, flight muscle of fast flying birds such as sparrows

159 **(b)**
Ca^{2+}

160 **(a)**
Muscle contraction is initiated by a signal sent by Central Nervous System (CNS), *via* motor neurons. A motor neuron along with the muscle fibres connected to it constitutes a motor unit

161 **(c)**
Haversian canals are characteristic feature of long bone of mammals. The Haversian canals are interconnected by Volkmann's canals to form **Haversian system**. Its main function is transportation of nutrients and O_2 through blood.

162 **(d)**
Methods of locomotion performed by animals vary with their habitats and the demand of the situations. However, locomotion is generally performed for the search of food, shelter, mate, suitable breeding grounds, favourable climate condition or to escape from enemies/predators

164 **(c)**
Actin and myosin polymerise to form myofibrils. Several myofibrils forms muscle fibre and several muscle fibres form muscle fasciculus

165 **(c)**
Temporal bone are two in number

166 **(a)**
Chondroitin salt.
Bone and cartilage are specialized connective tissues. The former has a very hard matrix due to calcium salts in it and the later has slightly pliable matrix due to chondroitin salts

167 **(c)**
True ribs are the ribs, which connects dorsally to vertebrae column and ventrally to the sternum. First seven pairs of ribs are the true ribs

168 **(b)**
Parallely arranged filament of muscle fibre.
Each muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm. Muscle fibre is a syncitium as the sarcoplasm contains many nuclei. The endoplasmic reticulum, *i.e.,* sarcoplasmic reticulum of the muscle fibres is the store house of calcium ions. A characteristic feature of muscle fibre is the presence of large number of parallely arranged filaments in the sarcoplasm called myofilaments or myofibrils

170 **(c)**
A-Ciliated B-Trachea, C-Amoeboid

171 **(b)**
Each half pectoral girdle consists of suprascapula, scapula, coracoids, precoracoid, epicoracoid and paraglenoid cartilage, Clavicle is a slender rod, separated from the coracoids by a wide gap called coracoids foramen. Posteriorly scapula forms the upper half of a deep cup-like depression the glenoid cavity for articulation with the humerus bone of forelims.

172 **(b)**
In hinge joint, the convex surface of one bone fits into the concave surface of another bone, *e*. *g*., knee, elbow and interphalangeal joints.

173 **(a)**
The thin filaments of a muscle fibre are made up of actin, troponin and tropomyosin.

174 **(c)**
Motor neuron with muscle fibre.
Muscle contraction is initiated by a signal sent by Central Nervous System (CNS), *via* motor neurons. A motor neuron along with the muscle fibres connected to it constitutes a motor unit

175 **(c)**
Muscle have been classified using different criteria, *i.e.,* location, appearance and nature of regulation of their activities. Based on their location three types of muscles are identified (i) Skeletal (ii) Visceral (iii) Cardiac

176 **(b)**
A complex protein, troponin is distributed at regular intervals on the tropomyosin. In the resting state, a subunit of troponin marks the

active binding site for myosin on the actin filament

177 **(d)**
Pterygoid is a small skull bone articulated with the palatine.

178 **(c)**
The centrum of 8thvertebra of frog is amphicoelous, *i*. *e*., concave at both ends. Its transverse processes are somewhat narrower, pointed and directed straight outwards. The neural spine is somewhat flattened and directed upwards.

179 **(d)**
All of the above

181 **(d)**
The reduction in force of contraction of a muscle after prolonged stimulation is called muscle fatigue. The accumulation of lactic acid leads to muscle fatigue. Lactic acid is produced by glycolysis in the absence of O_2

182 **(a)**
A-Resting, B-Partially, C-Thick, D-H

183 **(b)**
When muscles contract, they have squeezing effect on veins running through them, this is called muscle pump.

184 **(d)**
Most mammal have 7 cervical vertebrae. *There are four exceptions as follows*
2-toed sloth = 6 Cervical vertebrae
Manatee = 6 Cervical vertebrae
Anthear = 8 Cervical vertebrae
3-toed sloth = 9 Cervical vertebrae

185 **(d)**
Ciliary movements
(i) Swimming (*e*. *g*., *Paramecium* and other ciliates)
(ii) Takes part in the propulsion of excretory products in urinary tubules and flame cells (flatworms)
(iii) Cilia present in trachea, vasa efferentia and oviducts helps in pushing out dust particles, sperms and eggs respectively

186 **(b)**
Synovial Joints Those joints are the perfect joints which allows free movements in one or more directions. Synovial joints are of different types depending upon the nature of articulation and degree of movement. Bones end bear synovial membranes and enclose a cushion of synovial fluid.
Synovial fluid lubricates the joints to allow nearly frictionless movement of bones on each other and nourishes the structures participating in the joints. It also serves to keep the bones held together like a film of water between the two glass plates does

187 **(d)**
Human body has some 639 separate muscles, which make up about 50-60% of the body weight

188 **(b)**
12 pairs.
Most mammal have 7 cervical vertebrae. *There are four exceptions as follows*
2-toed sloth = 6 Cervical vertebrae
Manatee = 6 Cervical vertebrae
Anthear = 8 Cervical vertebrae
3-toed sloth = 9 Cervical vertebrae

190 **(c)**
Meromyosin

191 **(a)**
Each myosin (thick filament) is a polymerized protein. Many monomeric proteins called meromyosin constitutes one thick filament. Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called heavy meromyosin and the later is called light meromyosin.
The HMM component, *i.e.,* the head and short arm projects outwards at regular distance and angle from each other from the surface of polymerized myosin filament and is called cross arm. The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin

192 **(a)**
Hing joint produces an angular opening and closing motion like that of a hinged door, e.g., knee, elbow and interphalangeal joints.

193 **(a)**
Sutures are the dense fibrous connective tissues through which the skull bones fuses with each other to form cranium

194 **(a)**
Skeletal system constitutes hard internal or external living or non-living parts that forms the supporting frame work of the body. It consists of bones and cartilage

195 **(b)**

Parasphenoid bone is a flattened and inverted T-shaped bone, which forms floor of cranium.

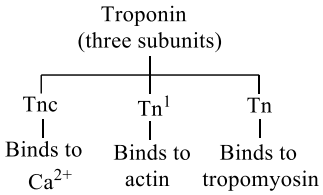
196 **(d)**
Accumulation of lactic acid from glucose by the process by anaerobic respiration in white muscle causes muscle fatigue. The conversion of lactic acid to blood glucose takes place in liver by Cori cycle

197 **(d)**
Chondroitin sulphate is a jelly like substance that provides support and adhesiveness in cartilage, bone, skin and blood vessels.

198 **(c)**
Myofibrils are parallely arranged contractile muscle fibres in the sarcoplasm of fascicle

199 **(b)**
I → III → II → IV

200 **(c)**
The proteins troponin and tropomyosin are closely associated



201 **(c)**
Tropomyosin is fibrous molecule that attaches to F-actin in the groove between its filaments. Troponin T binds to tropomyosin as well as to troponin I and troponin C.

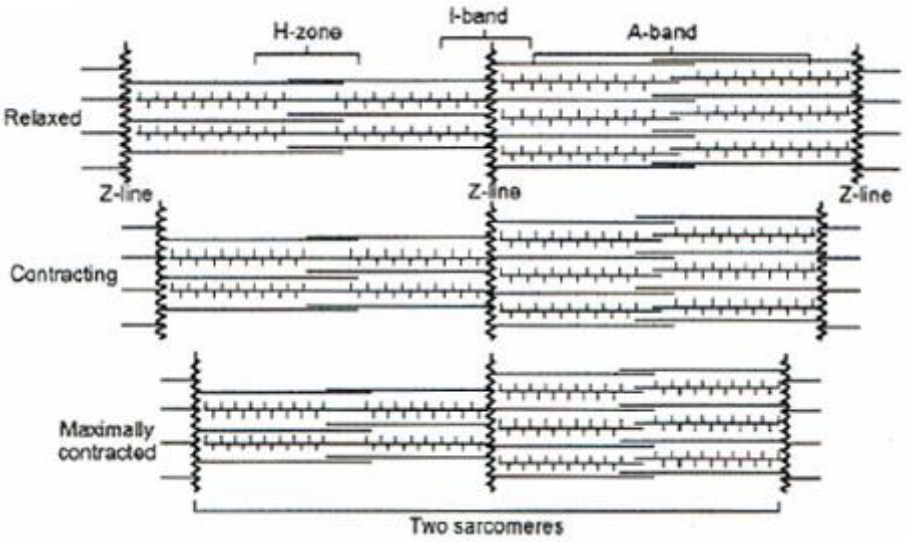
202 **(c)**
Atlas is first cervical vertebra and axis is second cervical vertabra, whereas all other options shows the pair of forelimb and hindlimb bones.

203 **(b)**
Each actin filament is made of two 'F' (filamentous) actins helically wound to each other. Each 'F' actin is a polymer of monomeric 'G' (Globular) actins. Two filaments of other proteins, tropomyosin also run close to the 'F' actins throughout its length. A complex protein troponin is distributed at regular intervals on the tropomyosin. In the resting state a subunit of troponin marks the active binding sites for myosin on the actin filaments.

204 **(c)**
Neural canal is present in vertebral column.

205 **(d)**
Caudal.
Sacral and coccygeal (caudal) vertebrae are fused vertebrae in human beings
Sacral vertebrae First five sacral vertebrae gets fused to form sacrum. It is a strong and short supporting pelvic girdle as it (sacrum) articulates with the ilium of pelvic girdle
Caudal or coccygeal vertebrae Mainly 3 to 4 caudal vertebrae gets fused to form a small triangular bone called coccyx. It is the vestigial tail in humans

206 **(d)**
Sliding-filament theory of muscle contraction (movement of the thin filaments and the relative size of the I-band and H-zones)



207 **(b)**
Lower part of forelimb has two bones, an inner radius and an outer ulna. The ulna is longer and

thicker. At the elbow joint, which projects beyond the radius as an olecranon process that has a deep subterminal sigmoid notch for articulation with trochlea of humerus by a hinge joint.

208 **(a)**
Running along the length and present in the wall of bone, there are a number of longitudinal canal called the Haversian canal, which are interconnected by a number of small transverse and oblique canal called Volkmann's canal.

209 **(d)**
Limbs consists of 30 bones
Total bones $= 30 \times 4 = 120$ bones (forelimb and hindlimb)

210 **(c)**
The term 'pelvis' is common to both kidney and skeleton in mammals. In relation to kidney, it can be described as a chamber in the kidney into which the urine drains from renal tubules before passing to the ureter. For skeleton, it is related with pelvic girdle or hip girdle.

211 **(a)**
ATP is the source of energy for muscle contraction.

213 **(b)**
Arthritis Inflammation of joints
Rheumatoid arthritis Hard tissue deposites over articular cartilage along with the higher secretion of synovial fluid, causing pain and stiffness which leads to rheumatoid arthritis
Osteoarthritis Tearing of articular cartilage and development of bony lumps at places causing pain, stiffness and permanent bending which lead to osteoarthritis

214 **(a)**
Ball and socket joint is a synovial joint (*i. e.*,movable joint) which is found in humerus in glenoid cavity and femur in acetabulum.

215 **(a)**
First seven pairs of ribs are known as true ribs because these are attached to sternum by mears of hyaline cartilage.

216 **(d)**
All of the these

217 **(b)**
Gluteus maximus (buttock muscle) is the largest muscle in the human body.

218 **(a)**
Myoglobin.
Muscle contains red coloured oxygen containing pigment called the myoglobin. It is generally found in the red muscle in more quantity than other (white fibre)

219 **(a)**
In the resting state, the edges of thin filaments on either sides of the thick filaments partially overlaps the free ends of thick filaments, leaving the central part of the thick filaments. This central part of the thick filaments which is not overlapped by thin filaments is called H-zone

220 **(c)**
According to sliding filament theory, when a fibril contracts its 'A' bands remain intact, while the 'I' bands progressively shorten and eventually disappear. At this stage, 'H' zones also disappear because the active filaments of both the sides in each sarcomere may even overlap each other that the 'M' line and 'Z' lines and touch the ends of myosin filaments.

221 **(d)**
Cells of human body exhibits three main types of movements, *i.e.,* amoeboid, ciliary and muscular

222 **(c)**
Synovial fluid is present in perfect movable joints. The synovial membrane secretes synovial fluid, which lubricates and provides nourishment to articular cartilage.

223 **(a)**
An example of gliding joint is zygapophyses of adjacent vertebrae.

224 **(d)**
Haversian canals are longitudinal canals present in long bones of mammals. Lymph vessels and blood vessels are present in bones. so, Haversian canals, blood vessels and jymph vessels are present in bones but absent in cartilage.

225 **(b)**
Bone is highly mineralized connective tissue and is made up of osteocyte. In the matrix of bone, are present spaces called lacunae, which contain osteocytes. The external lining of bone is known as periosteum and internal lining is known as endo- osteum. End of long bones are lined by hyaline cartilage or articular cartilage.

228 **(b)**
The skull region articulates with the superior regien of the vertebral column with the help of two occipital condyles (dicondylic skull).

229 **(c)**

The action potential in the sarcolemma causes the release of Ca^{2+} ions in the sarcoplasm. Increase in the Ca^{2+} level leads to the binding of Ca^{2+} with a sub unit of troponin on the actin filaments and thereby removes the masking of actin sites for myosin

230 **(d)**

Skeletal muscle are closely associated with the skeletal components of the body. They have a stripped appearance under the microscope and hence are called striated muscles. As their activities are under the voluntary control they are also called voluntary muscles too. They are primarily involved in locomotory actions and changes of body postures

231 **(d)**

Skull has 29 bones in total, their distribution is as follows:

3. Cranial bones -08
4. Facial bones -14
5. Hyoid bone -01
6. Ossicles (ear bones)-3 in each ear (*i.e.*,6)

232 **(b)**

Muscle contains red coloured oxygen containing pigment called the myoglobin. It is generally found in the red muscle in more quantity than other (white fibre)

233 **(a)**

Sternum (breast bone) It is narrow, elongated and fattened structure, present just under the skin in the middle of the front chest. It is longer in male than in female

234 **(a)**

There are 12 pairs of ribs in human, which from the bony lateral walls of the thoracic cage. The last two pair of ribs (total four) are called floating ribs because their anterior ends are not attached to either the sternum or the cartilage of another rib. The floating ribs protect the kidneys.

235 **(d)**

Acetabulum is the fusion of incus, ischium and ilium. The two halves of pelvic meets ventrally to form the pubic symphysis containing fibrous cartilage

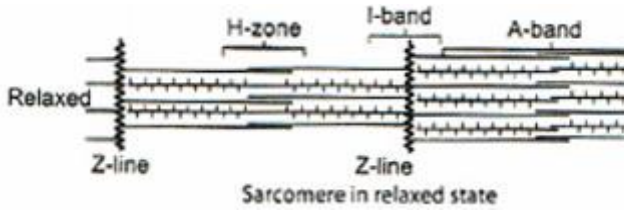
236 **(d)**

The 9^{th} or sacral vertebra of frog is acoelous and highly specialised. The anterior face is convex for this give greater strength to them, it would be given if its anterior end are hollowed out, the transverse process are stout and downwardly directed. The ileum of the pelvic girdle articulates with the transverse process of 9^{th} vertebrae.

237 **(b)**

Thin filament over thick filament.

Mechanism of muscle contraction is best explained by sliding and filament theory, which states that the contraction of a muscle fibre takes place by the sliding of the thin filaments over thick filaments



Sarcomere in relaxed state

238 **(d)**

The vertebral column protects the spinal cord, supports the head and serve as a point of attachment for ribs and musculature of back. Sternum is a flat bone on the vertebral midline of thorax

239 **(c)**

A-band or anisotropic band, which is made up of thick filaments (myosin) remains unchanged during the muscle contraction. Thin fibres slides on thick fibres and causes contraction

240 **(b)**

Hollow portion of vertebrae through which the neural canal passes

241 **(b)**

Protoplasm

242 **(b)**

Cartilaginous Joints They are slightly moveable joints. Dics of white fibrocartilage is strong but more elastic and compressable than the white fibrous tissue. These joints holds the bones together at joints between the bodies of vertebrae, at pubis and between the sternum and ribs. The bones make some movements at such joints, through compression of the discs of cartilage

243 **(b)**

The proteins troponin and tropomyosin are closely associated with actin. Troponin is a complex of three polypeptide chains- T_n C, T_n I and Y_nT. T_nC binds to Ca^{2+} T_nI binds to actin T_nT binds to tropomyosin.

244 **(b)**
Each organized skeletal muscle in our body is made of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle contains a number of muscle fibres

245 **(a)**
Sight is not the function of endoskeleton.

247 **(b)**
In ball and socket joint, ball of the bone articulates in socket of another bone and allowing free movement in all planes, *e*. *g*.head of humerus and glenoid cavity of pectoral girdle, femur and acetabulum of pelvic girdle, joint between incus and stapes.

248 **(d)**
The ATP is actively and continuously replenished by energy rich muscle phosphogen, In muscles, the pyruvic acid produced by glycolysis is transformed into lactic acid in absence of oxygen. Accumulation of lactic acid in the muscle causes fatigue. In the liver, 80% of lactic acid resynthesized by a process called Cori's cycle.

249 **(b)**
In procoelus vertebrae, the anterior face of Centrum is concave and posterior face of Centrum is convex. The examples of procoelous vertebrae are typical vertebrae of frog and vertebrae of most reptiles.

250 **(b)**
(i) Thin filaments are firmly attached to the Z band which bisects the I-band
(ii) In the central part of thick filament which is not over lapped by thin filament is called H-band

251 **(d)**
Vertebral column is dorsally placed

252 **(a)**
Red muscle certain high myoglobin arobically respire and have high number of sarcoplasmic reticulum

254 **(d)**
Rib cage is formed by the combination of
(i) thoracic vertebrae (ii) ribs
(iii) sternum

255 **(c)**
Innominate (means no name) bone is one of the two bones that from each half of the pelvic girdle in adult vertebrates. This bone is formed by the fusion of ilium, ischium and pubis.

256 **(a)**
Gout is an inherited disorder of purine metabolism, occurring especially in men. Body forms excess amounts of uric acid and the crystals of sodium urate are deposited in the synovial joints, giving rise to severe arthritis.

257 **(b)**
Each actin (thin) filament is made up of two 'F' (filamentous) actins which are helically wound to each other. Each F-actin is a polymer of monomeric G (globular) actins. Two filaments of another protein, tropomyosin also run close to the 'F' actins throughout its length.
A, complex protein troponin is distributed at regular intervals on the tropomyosin. In the resting state, a sub-unit of troponin masks the active binding sites for myosin on the actin filaments

258 **(c)**
Albert Szent Gyorgyi (1942) have studied the biochemical and electrical events during muscle contraction.

259 **(d)**
Hyoid is a horseshoe-shaped bone present in the neck between the lower jaw and sound box or larynx. It is also called the tongue bone. It is not articulated to any bone but simply suspended from the temporal bones by means of ligments. It supports tongue and provides insertion to save the tongue muscles

260 **(a)**
A-Troponin, B-Tropomyosin, C-Factin

261 **(c)**
Glenoid cavity is associated with both scapula and humerus. It is deep cup like concavity, located at the end of scapula close to coeacoid process.

262 **(d)**
Bone and cartilage are specialized connective tissues. The former has a very hard matrix due to calcium salts in it and the later has slightly pliable matrix due to chondroitin salts

263 **(a)**
True ribs.
Most mammal have 7 cervical vertebrae. *There are four exceptions as follows*
2-toed sloth = 6 Cervical vertebrae
Manatee = 6 Cervical vertebrae
Anthear = 8 Cervical vertebrae

3-toed sloth = 9 Cervical vertebrae

264 **(d)**

Two pairs of floating ribs are found in human body

265 **(a)**

Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs. The dorsal, flat, triangular body of the scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion

The clavicle articulates with this. Below the acromion depression called the glenoid cavity, which articualates with the head of the humerus to form the shoulder joint. Each clavicle is a long slender bone with two curvatures. This bone is commonly called the collar bone

266 **(b)**

The intercellular substance of bone is hard and dense. About 35% to 38% part of matrix of bone is organic mainly containing bone protein ossein. About 60% to 65% part of matrix is inorganic referred as hydroxyapatite; mainly containing calcium and phosphorus.

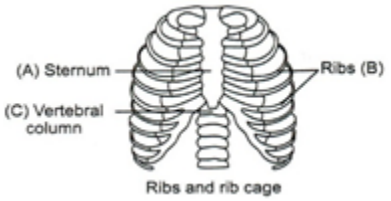
267 **(d)**

Ca^{2+} ions binds to the troponin and unmark the tropomyosin sites for attaching ATP so that, the contraction takes place during the muscle contraction. A band never shortens. It is the light band, which slides over the I-band and causes the shortning I, H-band. In relexed state Ca^{2+} are pumped back into sarcoplasmic reticulum and this causes the troponin confirmation changes that load troponin to occupy the active site of actin filament

268 **(b)**

The bones, which are formed by the ossification of tendon (fibrous connective tissue, which attaches muscles to bone) are called sesamoid bone, *e*. *g*., patella. The patella or knee cap, is a small triangular bone that sits in front of the joint formed by the femur, tibia and fibula.

269 **(d)**



Ribs and rib cage

Bone articulates in the socket of other, *e*. *g*., head of humerous and glenoid cavity of pectoral girdle. Femur and acetabulum of pelvic girdle.

Joints between incus and stapes

270 **(c)**

Mechanism of muscle contraction is best explained by sliding and filament theory, which states that the contraction of a muscle fibre takes place by the sliding of the thin filaments over thick filaments

273 **(d)**

Muscle is a specialized tissue of the mesodermal origin. About 40-50% of the body weight of human adult is contributed by muscles. They have special properties like excitability, contractibility, extensibility and elasticity

274 **(b)**

During shortening of the muscles, *i.e.,* contraction, the I-bands get reduced, whereas the A-bands retains the length

275 **(b)**

Adductor is a muscle that draws a part towards a median axis.

277 **(b)**

The formula for vertebral column is

C_7 T_{12} L_5 S_1 C_1

C_7 – 7 bones in cervical vertebrae

T_{12} – 12 bones in thoracic vertebrae

L_5 – 5 bones in lumbar vertebrae

S_1 – 1 bone in saccral vertebrae

C_1 – 1 bone in coccyx vertebrae

278 **(c)**

Sliding filament was proposed by AF Huxley and HE Huxley in 1954. It is also called Rachek power stroke mechanism which explains the physical events involved in muscle contraction