KMCT COLLEGE OF ALLIED HEALTH SCIENCES
MUKKOM, KOZHIKODE, KERALA.
DEPARTMENT OF PHYSIOTHERAPY.
FIRST YEAR BPT

BIOMECHANICS & KINESIOLOGY - QUESTION BANK

Essays

1. Describe in detail about Newton's laws of motion.
2. Explain the structure configuration of hip joint in relation to weight bearing in unilateral and bilateral stance along with factors contributing for its stability.
3. Compare architectural characteristics on functions of quadriceps versus hamstring muscles.
4. Discuss in detail the articulating structure, osteokinematics and arthrokinematics of the tibio-femoral joint. Add a note on pathomechanics of knee joint
5. Explain the general properties of connective tissue
6. What is Prehension? Explain power grip and precision handling in detail with examples
7. Explain the structure and function of Plantar arches in detail.
8. What is Scapulohumeral rhythm? Explain the phases of scapulohumeral rhythm in detail with neat diagram.
9. Describe why using a cane on the side opposite to hip joint pain or weakness is more effective than using the cane on the same side.
10. Explain the structure, configuration of hip joint in relation to weight bearing in unilateral and bilateral stance with stability factors
11. Biomechanics of Knee joint.
12. Discuss in detail the prehension activities of the Hand.
13. Discuss in detail the kinematic variables that describe the motion.
14. Explain three orders of Levers with examples. Add a note on mechanical advantage.
15. Write the structure and function of the Hip joint, with the Hip joint pathology.

16. Write the structure and contractile unit of a muscle. Write the types of muscle fibre and the types of muscle contraction.
17. Difference between Phasic and Tonic muscle and add the notes on active and passive insufficiency.
18. Describe the general effects of injury and disease of the joint structure.
19. Discuss the Kinematics and Kinetics of Patella Femoral Joint adding note on applied anatomy also.
20. Discuss in detail the Kinematic variables that describe the motion of Scapulothoracic and Glenohumeral joint.
21. Describe the structure and functions of Hip joint.
22. Describe in detail the structure and function of Humeroulnar and Humeroradial joints.
23. Describe hip complex and explain the role of abductors in bilateral and unilateral stance with an example.
24. Elaborate the structure and function of the shoulder joint
25. Discuss the structure and functions of plantar arches and deviations from normal.
26. Elaborate on the structure and functions of knee joint and effects of aging and disease
27. Describe biomechanics of shoulder joint. Discuss stability and mobility function of shoulder joint complex.
28. Describe in detail the mobility and stability components of hip joint.
29. Explain the analysis of following activities: sitting to standing, lifting
30. Discuss the structure and functions of the arches of foot
31. Discuss the biomechanics of ankle joint
32. What is a lever? Explain the various types of levers with examples and add a note on application of levers in physiotherapy
33. Describe the knee complex and locking mechanism of knee.
34. Explain about the scapulo humeral rhythm during elevation through abduction of shoulder complex.
35. Describe the kinetics and kinematics of motion with relation to the shoulder joint.

36. Enumerate the various types of joints. Explain in detail each type giving examples.
37. Analyze the various types of grips and pinches. Describe the movement occurring at the joints.
38. Discuss the biomechanics of shoulder complex and explain the dynamic stability in detail
39. What is difference between osteokinematics and arthrokinematics? Describe the arthrokinematics and osteokinematics at the shoulder joint
40. Explain various types of power and precision grips with muscle action and joint position
41. Describe biomechanics of abduction of shoulder joint with factors contributing for its stability.
42. What are the ligaments of hip joint? Explain bilateral and unilateral stance with examples.
43. What is the functional position of hand? Add note on power grips.
44. Describe the structure of hip joint. Add a note on kinetics and kinematics.
45. Elaborate on the structure and function of plantar arches and deviations from normal
46. Describe the hip complex. Explain the role of abductors in the unilateral and bilateral stance. Add a note on motion of pelvis on femur.
47. Name the components of shoulder complex. Explain the scapulo-humeral rhythm in detail. Add a note on dynamic stabilizers of the glenohumeral joint.
48. What is stress and strain. Explain load / deformation curve with example.
49. Intrinsic plus and intrinsic minus hand.
50. Explain the screw-home mechanism of knee joint.
51. Mobility and stability functions of muscles
52. Explain levers with examples in human body
53. The effects of disease, injury and immobilization of joints
54. Describe biomechanics of abduction of shoulder joint with factors contributing for its stability.

55. What are the ligaments of hip joint? Explain bilateral and unilateral stance with examples.
56. What is the functional position of hand? Add note on power grips.
57. What is difference between osteokinematics and arthrokinematics? Describe the arthrokinematics and osteokinematics at the shoulder joint
58. What is a lever? Explain the various types of levers with examples and add a note on application of levers in physiotherapy
59. Define posture. Discuss postural reflex and explain the various postural deviations of spine
60. Define posture, its types and describe the effects of posture on pregnancy and occupation
61. Discuss in detail the Define posture and postural control. Discuss the postural analysis
62. Clinical features, kinetics and kinematics of gait with a note on movement analysis lifting
63. Explain the analysis of following activities: sitting to standing, Define static and dynamic posture. Explain the analysis of standing posture. Add a note on effects of age on posture.
64. Discuss the biomechanics of cervical spine
65. Describe in detail the types of posture, postural contro and postural analysis Define posture. Discuss postural reflex and explain the various postural deviations of spine
66. Explain the biomechanics of lumbar spine.
67. What is posture? What is postural reflex? Explain the sagittal plane analysis of the posture
68. Elaborate on the structure and function of regions of vertebral column and effects of aging and disease
69. Explain the features, kinetics and kinematics of gait with a note on movement analysis
70. Discuss the biomechanical analysis of running gait versus walking
71. Describe the normal curves of vertebral column and discuss the factors responsible for its mobility and stability.

72. Analyze posture and explain the postural deviations
73. Explain about effect of injury and developmental defects of vertebral column.
74. Pathomechanics of gait.
75. Analyse posture and explain the postural deviation.
76. Describe the structure and function of vertebral column.
77. Kinetics, Kinematics and Pathomechanics of lumbar spine.
78. Biomechanics of Gait
79. Describe the relationship between the Zygapophyseal joints and the Interbody joints of vertebral column.
80. Describe the role of muscles that maintain the erect posture.
81. Define Gait. Mention the phases Of gait Cycle, Explain saglttal plane analysis Of gait
82. Discuss in detail kinetics and kinematics of thoracic rib cage. 3, Classify joints in detail with examples and neat diagrams,
83. Define posture. Discuss postural reflex and explain the various postural deviations of spine
84. List the ligaments attached in vertebral column and the importance of stability and mobility of the vertebral column.
85. Role of disk in tempero-mandibular joint.
86. Define static and dynamic posture. Explain the analysis of standing posture. Add a note on effects of age on posture.
87. Describe the structure of a vertebra. Add a note on curves in the vertebral column with its articulations and functions

Short essays:

1. Muscular weakness and atrophy
2. Closed chain motion of the elbow.
3. Functional position of the wrist.
4. Scapulo humeral rhythm
5. Bursae around knee.
6. Talocalaneo navicular joint .
7. Composition of the connective tissue.
8. Axial rotation in the knee joint.
9. Ways to reduce forces acting on the femoral head.
10. Rotator cuff stabilization.
11. . Excitation-contraction coupling.
12. Compare action of anconeus and triceps.
13. Cross-eyed patella.
14. .Structures limiting motion in supination and pronation
15. Cumulative strain in tendons
16. Clavicular contribution to elevation of arm
17. Effects of immobilization in a lengthened versus a shortened position
18. Triceps surae
19. Codman's paradox
20. Passive insufficiency
21. Triangular fibrocartilage complex (TFCC)
22. Pelvic tilts
23. Pronation twist of tarsometatarsal joint
24. Power grip
25. Explain about Pes planus

26. Explain patella as an Anatomic Pulley
27. Advantages and disadvantages of
28. Coracoacromial arch
29. Explain Tennis Elbow
30. Differentiate Coxa valga from Coxa vara
31. What is “Q” angle of knee joint? How is it measured and what implications does it have for patellofemoral problems?
32. Explain the factors affecting muscle function 32. Explain the ligaments of Radioulnar joints
33. Explain about the extensor mechanism of wrist and hand
34. Explain Newton’s law of inertia with example.
35. Osteokinematics of hip joint
36. Winging of scapula
37. Locking and Unlocking of knee
38. Tensile forces
39. Centre of gravity and Line of gravity
40. Functions of hand
41. Talocalcaneo navicular joint
42. Trabecular system of hip joint
43. Shoulder joint stability.
44. Nurse maid’s elbow.
45. Metatarsal break.
46. Inversion and Eversion.
47. Osteokinematics and Arthrokinematics.
48. Lumbricals.
49. Active and Passive insufficiency
50. Torque

51. Explain active and passive tension.
52. Plantar arches – mechanism.
53. Centre of gravity and its application.
54. Reverse scapulohumeral rhythm.
55. Prehension
56. Explain the coupled movements of subtalar pronation and supination
57. Structure of shoulder complex
58. Mention In detail about various deviations occurring at knee joint.
59. Static stability of hip joint
60. Concurrent force systems
61. Enumerate different types of muscle contraction.
62. Palmar arches and its significance
63. Define pulley and enumerate various pulleys present in human body.
64. Active and passive insufficiency
65. Static stability of shoulder joint
66. Analyse various pinches of hand.
67. Supination and pronation twist
68. Compare Lumbo pelvic rhythm with Scapula humeral rhythm.
69. What is biarticular muscle? Explain their property of active in sufficiency with an example.
70. Discuss in brief about length tension and force velocity relationship of a muscle.
71. Time dependent and rate dependent properties of connective tissue
72. Properties of connective tissues
73. Compare and contrast different muscle contractions
74. . Analysis the forces acting on hip joint during unilateral stance phase Explain the phases of swing phase of a gait cycle.
75. Describe the movement of stair climbing.

76. Explain the joint movement that occurs during breathing
77. Explain the movements of facet joint of the vertebral column. Define posture and mention about various types of abnormal posture. Phases of gait cycle
78. Describe ventilatory motions
79. Primary and secondary curves of vertebral column
80. The muscles of vertebral column
81. The structure and function of vertebral column
82. Define gait and explain about phases of gait cycle.
83. Mention in detail about muscles responsible for normal ventilation.
84. Structure and function of Temperomandibular joint
85. Kinematics of gait cycle
86. Explain the pathomechanical changes of thorax in scoliosis
87. Kinematics of chest wall in breathing.
88. Explain the structure and function of intervertebral disc
89. Mechanics of ventilation
90. Define posture and mention in brief about abnormalities of posture.
91. Gait cycle in detail
92. The muscles of vertebral column
93. Movements of rib cage during breathing - Explain the role of inter costal muscles in breathing.
94. Explain the movements of temporomandibular
95. The structure and function of vertebral column joint
96. Balancing of the head and vertebral column.
97. Load-deformation curve. Determinants of gait
98. Optimal posture
99. Determinants of gait
100. Phases of Gait cycle

101. Explain stair gait cycle.
102. Codman's paradox.
103. Factors affecting normal posture.
104. Functions of intervertebral disc.
105. Explain the structure of Tempero mandibular joint.
106. Musculo skeletal changes following COPD
107. Energy expenditure Of gait
108. Kinetics and kinematics of posture
109. List out various gait deviations. Discuss any two in detail
110. Explain the mechanics of rib cage movement during inspiration

Answer briefly:

1. Articularis genu.
2. Tarsal canal.
3. Common hip axis.
4. Kinesthesia and proprioception.
5. Pelvic balance.
6. Gluteus medius limp.
7. .Patellar plicae.
8. Synergist
9. Angular Velocity
10. Concentric Exercise
11. Acromic clavicular joint.
12. Line of gravity
13. Second class lever

14. Law of inertia
15. Lumbricals
16. Point of application of force.
17. Scaption.
18. . Isoinertial exercise.
19. Perturbation.
20. Quadriceps angle.
21. Convex-concave principle.
22. Sustentaculumtali.
23. Volar wrist musculature.
24. Vincula tendinum.
25. Reverse action
26. Bunnell's sign
27. Pes Anserinus
28. Lister's tubercle
29. Dowager's hump
30. Sternoclavicular disk
31. Nutation
32. Divergent muscle pull
33. Voluntary control
34. .Hysteresis.
35. Agonists and Antagonists
36. Volar plate
37. Pars interarticularis
38. Subacromial space
39. Functional position of the hand

40. Close – packed position
41. Carrying angle
42. Angulation of the femur
43. Define Torque
44. What is the instantaneous axis of rotation?
45. What is a motor unit?
46. What is glenoid labrum?
47. What is carrying angle?
48. Name the ligaments of Hip joint
49. What is patella baja?
50. Attachment of medial collateral ligament of knee joint
51. State the ligaments of Talonavicular joint
52. Define moment arm
53. What are the pelvic floor muscles?
54. What is Nutation and counternutation?
55. Moment arm
56. fibrous joint
57. Slow-twitch oxidative fibres
58. Lumbar-pelvic rhythm
59. Cross eyed patella
60. . Volar wrist musculature
61. Juncturatendinae
62. Pars Interarticularis.
63. Angulations of femur.
64. Bunnell's sign.
65. Dowgers hump.

66. Patella Alta and Baja.
67. Seasamoid bone.
68. Coupled motions.
69. Claw toe and hammer toe.
70. . Levers.
71. Carrying angle.
72. Pulleys.
73. Pes Planus.
74. Supinator twist.
75. Vertical steering muscles of Shoulder joint.
76. Fast-twitch fibres.
77. Cubitus Valgus and CubitusVarus.
78. Force and Acceleration.
79. . Load deformation curve.
80. Extensor hood.
81. Trendelenberg sign.
82. Line of gravity.
83. Accessory movements.
84. Rocker bottom foot.
85. Grip.
86. Osteokinematics.
87. Arcuate lines.
88. Tensile forces.
89. Grasp.
90. Angle of femoral torsion – function. Second order lever an example. Resistance.
91. Functional position of hand.

92. Hookes law.
93. Optimal length.
94. Nursemaid's elbow.
95. Extensor expansion.
96. Force couple.
97. Arthrokinematics.
98. What is mechanical advantage? Explain mechanical advantage in relation to pulleys
99. What are the factors affecting muscle function?
100. Add a note on shunt and spurt muscles
101. Define centre of gravity, base of support, line of gravity
102. Define active insufficiency. Explain in detail with appropriate examples
103. Write a note on open and closed kinematic chain exercises with appropriate examples
104. Explain the gleno-humeral rhythm
105. Name the ligaments of shoulder joint.
106. Functions Of Meniscus
107. Clinical significance Of plantararches
108. Agonists
109. What is thumb opposition?
110. Index plus minus foot
111. Angie of inclination
112. patella plica
113. Planter aponeurosis
114. Carrying angle
115. Scoliosis
116. Concurrent force systems
117. Stair climbing

118. Patella Plica
119. Visco elasticity
120. Pes Planus and Pes Cavus
121. Pulleys
122. Open Kinematic chain
123. Palmar arches
124. Ground reaction force
125. Hooke's law
126. Isometric exercises Explain good and bad posture
127. Convex-Concave rule Muscular control of temporomandibular joint (TMJ) and add a note on TMJs relationshipwith cervical spine
128. Isotonic contraction
129. Patellar movements
130. Write a note on open and closed kinematic chain exercises with appropriate examples
131. List out various gait deviations. Discuss any two in detail
132. Explain the mechanics of rib cage movement during inspiration
133. Flat back posture
134. Scoliosis
135. Define step length and stride length.
136. Scoliosis
137. Dynamic posture
138. Mention in detail about muscles responsible for normal ventilation.
139. Explain good and bad posture
140. Any two pathological gait deviation
141. Scoliosis
142. Define postural sway

143. Primary and secondary curves of vertebral column
144. Name the muscles of Inspiration and Expiration
145. Running gait.
146. Ligaments of spine
147. Postural set.
148. Lordosis
149. Pes Anserinus
150. What is Cadence?
151. Attachment of thoracolumbar fascia
152. What is Calcaneal gait?
153. What is the normal postural sway?
154. What are zygapophyseal joints?
155. What is lumbosacral angle?
156. Role of upperlimb in gait
157. Trendelenberg sign.
158. Nucleus pulposus.
159. Posture.
160. Effects of gravity on posture.
161. Temporal and distance variables in gait.
162. Ataxic gait.
163. Frontal plane deviations from optimal vertebral alignment.
164. Equinus gait.
165. Static and dynamic balance
166. Flat back posture
167. Scoliosis
168. Forward head posture.

169. . Function of diaphragm in tidal breathing.

170. Atypical vertebrae of cervical spine.

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BIOMECHANICS & KINESIOLOGY - ANSWER KEYS

Essay:-

1. **Newton's Laws of Motion:**
   - **First Law:** Objects stay at rest or in motion unless acted upon by an external force.
   - **Second Law:** Force equals mass times acceleration (F = ma).
   - **Third Law:** Every action has an equal and opposite reaction.
2. **Hip Joint Structure and Stability:**
   - **Unilateral Stance:** Standing on one leg; muscles like gluteus medius stabilize side-to-side movement.
   - **Bilateral Stance:** Standing on both legs; joint shares load for equilibrium.
   - **Factors for Stability:** Labrum deepens socket, ligaments hold joint, muscles provide dynamic stability, and capsule offers support.
3. **Scapulohumeral Rhythm:** It's the coordinated movement between the shoulder blade (scapula) and upper arm (humerus) during arm raising. Phases include Initial Elevation (0-30°), Scapular Upward Rotation (30-90°), and Full Elevation (90-180°).
4. **Cane Use for Hip Pain:** Using a cane on the opposite side improves stability and reduces load on the affected hip, aiding balance and gait. It shifts the body's center of gravity towards the stronger side.
5. **Hip Joint Structure:** Ball-and-socket joint connecting femur and acetabulum. Unilateral stance: Load borne by one hip; Bilateral stance: Load shared between both hips. Stability from bony anatomy, ligaments, and surrounding muscles.

6. **Biomechanics of Knee:** Complex hinge joint. Flexion and extension motions. Menisci provide cushioning and stability. Ligaments (ACL, PCL) limit movement. Quadriceps and hamstrings are major muscle groups influencing knee mechanics.

7. **Prehension Activities of Hand:** Grasping and manipulating objects. Precision grip (e.g., pinching) and power grip (e.g., holding a hammer). Involves thumb opposition, finger flexion, and wrist control.

8. **Kinematic Variables:** Describe motion. Includes displacement, velocity, acceleration, and time. Essential for understanding movement characteristics.

9. **Levers and Mechanical Advantage:** 1st class (e.g., seesaw), 2nd class (e.g., wheelbarrow), 3rd class (e.g., bicep curl). Mechanical advantage relates to how levers amplify force or distance.

10. **Hip Joint Structure:** Ball-and-socket joint. Provides wide range of motion. Pathologies include osteoarthritis, hip fractures, and labral tears.

11. **Muscle Structure and Types:** Made of muscle fibers. Contractile unit is sarcomere. Types: skeletal (voluntary), smooth (involuntary), cardiac (heart). Contraction types: concentric (shortening), eccentric (lengthening), isometric (no change).

12. **Phasic vs. Tonic Muscles:** Phasic contract quickly (e.g., biceps), tonic sustain contraction (e.g., postural muscles). Active insufficiency: muscle can't shorten further. Passive insufficiency: muscle can't stretch enough between the shoulder blade (scapula) and upper arm (humerus) during arm raising. Phases include Initial Elevation (0-30°), Scapular Upward Rotation (30-90°), and Full Elevation (90-180°).

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22. **Effects of Joint Injury and Disease:** Joint injury and disease can lead to pain, swelling, limited range of motion, instability, and reduced functionality of the affected joint.

23. **Kinematics and Kinetics of Patellofemoral Joint:** The patellofemoral joint is responsible for knee movement. It involves sliding, rolling, and rotation of the patella on the femur during knee flexion and extension.

24. **Kinematic Variables of Scapulothoracic and Glenohumeral Joints:** Scapulothoracic joint involves protraction, retraction, elevation, depression, upward rotation, and downward rotation of the scapula. Glenohumeral joint permits flexion, extension, abduction, adduction, internal rotation, and external rotation of the humerus.

25. **Structure and Functions of Hip Joint:** The hip joint is a ball-and-socket joint allowing a wide range of motion, including flexion, extension, abduction, adduction, internal rotation, and external rotation.

26. **Humeroulnar and Humeroradial Joints:** Humeroulnar joint permits elbow flexion and extension, while humeroradial joint allows for rotation during forearm pronation and supination.

27. **Hip Complex and Abductor Role:** The hip complex involves the pelvis, femur, and hip joint. Abductors, like the gluteus medius, stabilize the pelvis during bilateral and unilateral stance. For instance, during unilateral stance (e.g., standing on one leg), the abductors prevent the opposite side of the pelvis from dropping, maintaining balance.

28. **Structure and Function of Shoulder Joint:** The shoulder joint is a ball-and-socket joint with high mobility. It allows flexion, extension, abduction, adduction, internal rotation, and external rotation of the arm.

29. **Plantar Arches and Deviations:** The plantar arches (medial and lateral) maintain the foot's structure and assist in shock absorption during walking. Deviations from normal arches can lead to issues like flat feet or high arches.

30. **Structure and Functions of Knee Joint:** The knee joint is a hinge joint permitting flexion and extension. It also allows slight rotation during flexion. Aging and disease can cause cartilage degeneration, reduced range of motion, and pain.

31. **Biomechanics of Shoulder Joint:** The shoulder joint relies on a balance between mobility and stability. Muscles and ligaments provide stability while allowing a wide range of motion.

32. **Mobility and Stability of Hip Joint:** The hip joint offers a balance between mobility and stability. The deep socket provides stability, while strong muscles permit movements like walking, running, and squatting.

34. **Analysis of Activities (Sitting to Standing, Lifting):**

    - **Sitting to Standing:** Involves hip and knee extension, ankle plantarflexion; quadriceps and glutes muscles work.
    - **Lifting:** Requires hip and knee flexion/extension, spinal stabilization; proper technique reduces strain.

35. **Arches of Foot:**

    - **Structure:** Longitudinal (medial and lateral) and transverse arches.
    - **Functions:** Distribute weight, absorb shock, provide flexibility and stability.

36. **Biomechanics of Ankle Joint:**

- Involves dorsiflexion and plantarflexion; tibia and fibula articulate with talus; supported by ligaments and muscles.

37. **Lever and Types:**

- A lever is a rigid structure that pivots around a fulcrum.
- **Types:** First-class (see-saw), second-class (wheelbarrow), third-class (tweezers).
- **Application in Physiotherapy:** Exercises use lever principles for targeted muscle work.

38. **Knee Complex and Locking Mechanism:**

- Involves femur, tibia, and patella; locking mechanism in extension stabilizes the joint.

39. **Scapulo-Humeral Rhythm:**

- Coordination between scapula and humerus during shoulder elevation; proper ratio maintains joint integrity.

40. **Kinetics and Kinematics of Shoulder Joint:**

- **Kinetics:** Study of forces causing motion; muscles and tendons act on the joint.
- **Kinematics:** Study of motion patterns; abduction, flexion, rotation in shoulder complex.

41. **Types of Joints:**

- **Fibrous (e.g., sutures), Cartilaginous (e.g., intervertebral), Synovial (e.g., knee, shoulder).**

42. **Grips and Pinches:**

- **Grips:** Power grip (firm hold) and precision grip (fine manipulation).
- **Joints:** Fingers flex and extend, thumb opposition.

43. **Biomechanics of Shoulder Complex and Dynamic Stability:**

- Multi-articular joint involving humerus, scapula, and clavicle; rotator cuff stabilizes

44. **Osteokinematics vs. Arthrokinematics:**

- **Osteokinematics:** Motion of bones in space.
- **Arthrokinematics:** Motion between joint surfaces.

45. **Shoulder Joint Osteokinematics and Arthrokinematics:**
    - **Osteokinematics:** Flexion/extension, abduction/adduction, internal/external rotation.
    - **Arthrokinematics:** Convex humeral head on concave glenoid; rolling and sliding.
46. **Power and Precision Grips:**
    - **Power Grip:** Firm hold for maximum force; involves wrist and finger flexors.
    - **Precision Grip:** Delicate grasp with fingertips; uses finger flexors and extensors.
47. **Biomechanics of Shoulder Abduction:**
    - **Stability Factors:** Rotator cuff muscles, glenoid labrum, ligaments.
48. **Hip Joint Ligaments, Stance Types:**
    - **Ligaments:** Iliofemoral, pubofemoral, ischiofemoral.
    - **Bilateral Stance:** Both feet on ground; stable.
    - **Unilateral Stance:** One foot on ground; requires more balance.
49. **Functional Hand Position and Power Grips:**
    - **Functional Position:** Wrist slightly extended, fingers slightly flexed.
    - **Power Grips:** Fist, hook, cylindrical; strong grip for heavy objects.
50. **Hip Joint Structure, Kinetics, and Kinematics:**
    - **Structure:** Ball-and-socket joint; femur in acetabulum.
    - **Kinetics:** Forces during hip movements.
    - **Kinematics:** Hip joint movement patterns.
51. **Plantar Arches and Deviations:**
    - **Structure:** Medial longitudinal, lateral longitudinal, transverse arches.
    - **Deviations:** Flat feet (pes planus) or high arches (pes cavus).
52. **Hip Complex and Abductors:**

- **Abductors in Stance:** Unilateral: Stabilize pelvis; Bilateral: Balance.
- **Pelvic Motion on Femur:** Tilts, rotates during leg movement.

53. **Components of Shoulder Complex and Scapulo-Humeral Rhythm:**
    - **Components:** Humerus, scapula, clavicle.
    - **Scapulo-Humeral Rhythm:** Ratio of scapular and humeral movement during shoulder elevation.
54. **Stress, Strain, Load/Deformation Curve:**
    - **Stress:** Force applied to an area; **Strain:** Deformation due to stress.
    - **Load/Deformation Curve:** Describes material behavior under load.
55. **Intrinsic Plus and Intrinsic Minus Hand:** The intrinsic plus hand refers to the natural hand posture with the fingers slightly flexed. The intrinsic minus hand is a hand deformity where intrinsic muscles are weak, causing hyperextension of the metacarpophalangeal joints and flexion of the interphalangeal joints.
56. **Screw-Home Mechanism of Knee Joint:** During knee extension, the tibia externally rotates slightly to lock the joint. This is due to the shape of the femoral condyles and the tightening of the cruciate ligaments.
57. **Muscle Mobility and Stability Functions:** Muscles provide mobility by generating force for movement and stability by maintaining joint integrity and preventing excessive movement.
58. **Levers in the Human Body:** Levers are rigid structures (bones) that rotate around a fixed point (joint). Examples in the body include the biceps brachii acting as a lever during forearm flexion.
59. **Effects of Disease, Injury, and Immobilization of Joints:** Disease and injury can lead to pain, limited range of motion, and joint dysfunction. Immobilization can cause muscle atrophy, joint stiffness, and reduced function.
60. **Biomechanics of Abduction of Shoulder Joint:** Shoulder abduction involves the deltoid muscle lifting the arm away from the body. Stability is aided by the rotator cuff muscles, which keep the humeral head centered within the glenoid socket.

61. **Ligaments of Hip Joint:** Ligaments include the iliofemoral, pubofemoral, and ischiofemoral ligaments. In bilateral stance, both legs support the body. In unilateral stance, one leg supports while the other leg's hip abductors stabilize the pelvis.

62. **Functional Position of Hand and Power Grips:** Functional position is a neutral hand posture. Power grips involve gripping objects with maximum force, such as a fist grip or a cylindrical grip.

63. **Osteokinematics vs. Arthrokinematics:** Osteokinematics is gross movement of bones, like flexion/extension. Arthrokinematics is joint surface movement, like rolling and gliding. At the shoulder, osteokinematics involve flexion/extension, while arthrokinematics involve humeral head rolling and gliding in the glenoid.

64. **Lever Types and Application in Physiotherapy:** Levers are mechanical systems. In the body, the effort (muscle force) moves the resistance (load) around a joint. Types include first-class (see-saw), second-class (wheelbarrow), and third-class (tweezers). Physiotherapy uses lever principles to optimize exercise efficiency.

65. **Posture and Postural Reflex:** Posture is the body's alignment and positioning. Postural reflexes maintain balance. Various deviations like scoliosis affect spinal alignment.

66. **Types of Posture and Effects on Pregnancy/Occupation:** Types include erect, kyphotic, and lordotic. Poor posture during pregnancy can lead to discomfort. Occupation-related postural issues include prolonged sitting causing back pain.

67. **Posture and Postural Control:** Posture is body alignment. Postural control is maintaining balance. Postural analysis assesses alignment deviations.

68. **Gait Clinical Features, Kinetics, Kinematics:** Gait analysis assesses walking. Kinetics involve forces, while kinematics involve motion. Movement analysis studies lifting and its effects.

69. **Analysis of Activities and Posture:** Sitting to standing involves coordinated muscle action. Static posture is stationary, dynamic posture changes during movement. Age affects posture due to musculoskeletal changes.

70. **Biomechanics of Cervical Spine:** Cervical spine supports the head, allows flexion/extension, rotation, and lateral flexion.

71. **Types of Posture and Postural Control:** Types include kyphotic, lordotic, and neutral. Postural control involves maintaining balance.

72. **Posture and Postural Deviations:** Posture is alignment. Deviations include scoliosis, kyphosis, and lordosis.

73. **Biomechanics of Lumbar Spine:** Lumbar spine supports weight, permits flexion/extension, resists rotation.

74. **Posture and Postural Reflex in Sagittal Plane:** Posture is body alignment. Postural reflex maintains balance.

75. **Vertebral Column Structure and Aging/Disease Effects:** Vertebral regions vary. Aging and disease affect alignment, mobility.

76. **Gait Features, Kinetics, Kinematics:** Gait involves walking phases. Kinetics relate to forces, kinematics to motion.

77. **Biomechanics of Running vs. Walking:** Running has periods of no support, walking always has one foot on the ground.

78. **Curves of Vertebral Column and Mobility/Stability:** Curves aid weight distribution. Muscles and ligaments provide stability.

79. **Posture Analysis and Deviations:** Posture assessment identifies deviations.

80. **Effect of Injury and Developmental Defects on Vertebral Column:** Injury/defects affect alignment, mobility.

81. **Pathomechanics of Gait:** Pathological conditions affect gait.

82. **Posture Analysis and Deviation:** Analyzing posture identifies misalignments.

83. **Structure and Function of Vertebral Column:** Vertebral column supports body, protects spinal cord.

84. **Kinetics, Kinematics, and Pathomechanics of Lumbar Spine:** Kinetics involve forces, kinematics involve motion. Pathomechanics assess spinal abnormalities.

85. **Biomechanics of Gait:** Gait biomechanics analyze walking.

86. **Zygapophyseal and Interbody Joints Relationship:** Zygapophyseal (facet) joints guide motion. Interbody joints facilitate flexibility.

87. **Role of Muscles in Erect Posture:** Muscles maintain spine alignment.

88. **Gait Definition and Phases:** Gait is walking. Phases include stance and swing.

89. **Kinetics and Kinematics of Thoracic Rib Cage:** Thoracic cage motion involves breathing. Joints vary by type.

90. **Posture and Postural Deviations:** Posture is alignment. Deviations involve misalignment.

91. **Ligaments in Vertebral Column and Stability/Mobility:** Ligaments stabilize and allow movement.

92. **Disk Role in Temporomandibular Joint:** Disk allows smooth jaw movement.

93. **Static and Dynamic Posture:** Static is stationary, dynamic changes with movement. Standing posture analysis assesses alignment.

Short Essays:-

1. **Muscular Weakness and Atrophy:** Loss of muscle strength and size due to various factors like disuse, injury, or medical conditions.

2. **Closed Chain Motion of the Elbow:** Elbow movement while the hand is fixed, such as during push-ups or weight-bearing activities.

3. **Functional Position of the Wrist:** Slight wrist extension and radial deviation, the optimal alignment for daily tasks.

4. **Scapulohumeral Rhythm:** Coordinated movement between the shoulder blade (scapula) and upper arm (humerus) during arm motion.

5. **Bursae around Knee:** Fluid-filled sacs near the knee joint that reduce friction between moving structures.

6. **Talocalcaneonavicular Joint:** Articulation between the talus, calcaneus, and navicular bones in the foot.

7. **Composition of Connective Tissue:** Comprised of cells, fibers (like collagen), and a gel-like substance called ground substance.

8. **Axial Rotation in Knee Joint:** Limited due to the knee's ligaments and menisci.

9. **Reducing Forces on Femoral Head:** Maintaining proper posture, weight management, and avoiding high-impact activities.
10. **Rotator Cuff Stabilization:** Group of muscles (supraspinatus, infraspinatus, teres minor, subscapularis) stabilizing the shoulder joint.
11. **Excitation-Contraction Coupling:** Process linking nerve signal (excitation) with muscle contraction.
12. **Anconeus vs. Triceps:** Anconeus assists elbow extension and forearm pronation, while triceps mainly extends the elbow.
13. **Cross-Eyed Patella:** Patella tilted towards the midline, altering tracking.
14. **Structures Limiting Motion in Supination/Pronation:** Annular ligament restricts forearm rotation.
15. **Cumulative Strain in Tendons:** Gradual damage from repetitive stress on tendons.
16. **Clavicular Contribution to Arm Elevation:** Clavicle aids in raising the arm during shoulder movements.
17. **Effects of Immobilization in Lengthened vs. Shortened Position:** Lengthened – muscle weakening; Shortened – muscle stiffness.
18. **Triceps Surae:** Calf muscles comprising gastrocnemius and soleus.
19. **Codman's Paradox:** Passive shoulder elevation during external rotation.
20. **Passive Insufficiency:** Muscle can't elongate sufficiently for desired joint movement.
21. **Triangular Fibrocartilage Complex (TFCC):** Wrist structure providing stability and load distribution.
22. **Pelvic Tilts:** Anterior/posterior rotation of the pelvis, affecting lumbar curvature.
23. **Pronation Twist of Tarsometatarsal Joint:** Twisting of midfoot bones during pronation.
24. **Power Grip:** Strong hand grasp involving multiple fingers and thumb.
25. **Pes Planus:** Flat feet condition, reduced arches.
26. **Patella as Anatomic Pulley:** Alters quadriceps tendon force direction.
27. **Advantages/Disadvantages:** Context-dependent benefits and drawbacks.

28. **Coracoacromial Arch:** Bony structure guarding the shoulder joint.
29. **Tennis Elbow:** Lateral epicondylitis, overuse of forearm extensors
30. **Coxa Valga vs. Coxa Vara:** Coxa valga refers to an increased angle between the femoral neck and shaft, while coxa vara is a decreased angle. These terms describe the relationship between the neck and shaft of the femur bone.
31. **Q Angle of Knee Joint:** The Q angle is the angle formed between the line connecting the anterior superior iliac spine (ASIS) and the center of the patella, and the line connecting the tibial tuberosity to the center of the patella. It measures patellar tracking and can affect patellofemoral problems.
32. **Factors Affecting Muscle Function:** Muscle function is influenced by factors like muscle length-tension relationship, force-velocity relationship, motor unit recruitment, muscle fiber type, and biomechanical leverage.
33. **Extensor Mechanism of Wrist and Hand:** The extensor mechanism includes tendons, muscles, and ligaments that extend the wrist and fingers. It involves coordination of these structures to produce wrist and finger extension.
34. **Newton's Law of Inertia:** An object at rest stays at rest, and an object in motion stays in motion with the same speed and direction unless acted upon by an external force. Example: A soccer ball remains still until kicked.
35. **Osteokinematics of Hip Joint:** Osteokinematics refers to the gross movement of bones. In the hip joint, movements include flexion, extension, abduction, adduction, internal rotation, and external rotation.
36. **Winging of Scapula:** Winging occurs when the scapula juts out from the back due to weak or paralyzed muscles. It can result from damage to the long thoracic nerve.
37. **Locking and Unlocking of Knee:** Locking is when the knee joint becomes fully extended during the stance phase of gait. Unlocking is the opposite movement during knee flexion, allowing limb swing.
38. **Tensile Forces:** Tensile forces pull or stretch tissues. They are common in muscles, tendons, and ligaments during movements.

39. **Center of Gravity and Line of Gravity:** The center of gravity is the point where the body's weight is evenly distributed. The line of gravity is a vertical line passing through the center of gravity, determining balance.

40. **Functions of Hand:** The hand functions in manipulation, grasp, precision, sensation, and communication.

41. **Talocalcaneonavicular Joint:** It's a joint involving the talus, calcaneus, and navicular bones in the foot, allowing complex foot movements.

42. **Trabecular System of Hip Joint:** Trabeculae are supportive structures in bones. The hip joint's trabecular system supports weight-bearing and shock absorption.

43. **Shoulder Joint Stability:** The shoulder joint relies on ligaments, muscles, and the labrum for stability due to its inherent mobility.

44. **Nursemaid's Elbow:** A common injury in young children, where a sudden pull on the forearm causes the radius bone to partially dislocate from the annular ligament.

45. **Metatarsal Break:** Refers to a fracture in one of the metatarsal bones of the foot.

46. **Inversion and Eversion:** Inversion is inward rolling of the foot, while eversion is outward rolling.

47. **Osteokinematics and Arthrokinematics:** Osteokinematics is gross bone movement, while arthrokinematics refers to joint surface movements.

48. **Lumbricals:** These are hand muscles that flex the metacarpophalangeal joints and extend the interphalangeal joints.

49. **Active and Passive Insufficiency:** Active insufficiency is when a muscle can't contract maximally because it's already shortened. Passive insufficiency is when a muscle can't stretch further due to antagonist tension.

50. **Torque:** Torque is the turning force around an axis. It's calculated by multiplying force and the distance from the axis.

51. **Active and Passive Tension:** Active tension is the force produced by a contracting muscle. Passive tension is the tension in a muscle when it's stretched.

52. **Plantar Arches – Mechanism:** The plantar arches are arches formed by bones and ligaments in the foot, providing shock absorption and weight distribution.

53. **Center of Gravity and Its Application:** The center of gravity affects balance and stability during movement and can be adjusted for different activities.

54. **Reverse Scapulohumeral Rhythm:** During shoulder abduction, for every 2 degrees of glenohumeral joint movement, the scapula rotates 1 degree.

55. **Prehension:** The action of grasping or holding objects using the hand.

56. **Coupled Movements of Subtalar Pronation and Supination:** During gait, subtalar joint pronation and supination facilitate proper foot adaptation to the ground.

57. **Structure of Shoulder Complex:** The shoulder complex comprises the clavicle, scapula, and humerus, along with associated muscles and ligaments.

58. **Deviations Occurring at Knee Joint:** These can include varus/valgus alignment, genu recurvatum, and abnormal patellar tracking.

59. **Static Stability of Hip Joint:** The hip joint's deep socket, labrum, and ligaments provide inherent stability.

60. **Concurrent Force Systems:** Concurrent forces act through a common point but have different directions and magnitudes.

61. **Types of Muscle Contraction:** Isometric (muscle length stays the same), concentric (muscle shortens), eccentric (muscle lengthens).

62. **Palmar Arches and Significance:** Palmar arches maintain hand shape and allow grip force distribution.

63. **Pulley:** A structure that changes the direction of a force, like tendons redirecting muscle force. Examples include patella and trochlea.

64. **Active and Passive Insufficiency:** Repeated question. See answer 49.

65. **Static Stability of Shoulder Joint:** Ligaments, joint shape, and muscle tension contribute to shoulder joint stability.

66. **Pinches of Hand:** Key pinch, tip pinch, lateral pinch involve various finger combinations for gripping.

67. **Supination and Pronation Twist:** Supination is turning the forearm palm-up, while pronation is turning it palm-down.

68. **Lumbo-Pelvic Rhythm vs. Scapulo-Humeral Rhythm:** Both describe coordinated movements between adjacent joint systems during functional activities.

69. **Biarticular Muscle:** A muscle that crosses two joints. Their active insufficiency occurs when they can't effectively shorten across both joints. Example: Rectus femoris during hip flexion and knee extension.

70. **Length-Tension and Force-Velocity Relationship:** Length-tension: Muscle generates most force at its optimal length. Force-velocity: Muscle generates less force at higher contraction speeds.

71. **Time-Dependent and Rate-Dependent Properties of Connective Tissue:** Time-dependent: Connective tissues change length over time under constant load. Rate-dependent: Their response to loading rate changes.

72. **Properties of Connective Tissues:** Viscoelastic, load-bearing, resilient, adaptable.

73. **Different Muscle Contractions:** Concentric (shortening), eccentric (lengthening), isometric (constant length).

74. **Forces on Hip Joint during Stance Phase:** Body weight, ground reaction force, and muscle forces act on the hip joint. Swing Phase of Gait: Non-weight-bearing leg movement during walking.

75. **Stair Climbing Movement:** Involves flexion at the hip and knee joints.

76. **Joint Movement during Breathing:** Ribs elevate during inhalation due to intercostal muscle contraction.

77. **Facet Joint Movements of Vertebral Column:** Allow flexion, extension, lateral bending, and rotation of the spine. Posture: Body alignment in various positions. Abnormal Postures: Kyphosis, lordosis, scoliosis.

78. **Ventilatory Motions:** Breathing movements of ribcage and diaphragm during respiration.

79. **Primary and Secondary Curves of Vertebral Column:** Primary curves (thoracic and sacral) are present at birth. Secondary curves (cervical and lumbar) develop later.

80. **Muscles of Vertebral Column:** Include erector spinae, multifidus, and transversospinalis muscles.

81. **Structure and Function of Vertebral Column:** Supports body weight, protects spinal cord, and allows movement.

82. **Gait Definition and Phases:** Gait is the pattern of walking. Phases: Stance (60%) and swing (40%).

83. **Muscles Responsible for Normal Ventilation:** Diaphragm and external intercostal muscles.

84. **Temporomandibular Joint (TMJ):** Connects the mandible to the skull. It's a hinge joint with sliding and rotational motions.

85. **Kinematics of Gait Cycle:** Involves heel strike, midstance, toe-off, and swing phases.

86. **Pathomechanical Changes of Thorax in Scoliosis:** Scoliosis can cause asymmetrical ribcage and spine deformities.

87. **Kinematics of Chest Wall in Breathing:** Chest wall moves in a bucket-handle and pump-handle manner during respiration.

88. **Structure and Function of Intervertebral Disc:** Discs between vertebrae provide cushioning and flexibility.

89. **Mechanics of Ventilation:** Involves changes in pressure that drive air in and out of the lungs.

90. **Posture Definition and Abnormalities:** Posture is body alignment. Abnormalities include kyphosis, lordosis, and scoliosis.

91. **Gait Cycle in Detail:** Gait cycle includes stance and swing phases, subdivided into different periods.

92. **Muscles of Vertebral Column:** Repeated question. See answer 80.

93. **Rib Cage Movements during Breathing:** Ribs elevate during inhalation due to external intercostal muscle contraction.

94. **Movements of Temporomandibular Joint:** Include hinge (opening-closing) and gliding (side-to-side) motions.

95. **Structure and Function of Vertebral Column Joint:** Repeated question. See answer 81.

96. **Balancing of the Head and Vertebral Column:** Muscles and ligaments support the head atop the vertebral column.
97. **Load-Deformation Curve:** Shows the relationship between load applied to a tissue and its deformation. Determinants of Gait: Balance, muscle strength, joint flexibility.
98. **Optimal Posture:** Balanced alignment that minimizes stress on joints and muscles.
99. **Determinants of Gait:** Include age, gender, body size, fitness, and health conditions.
100. **Phases of Gait Cycle:** Stance phase (60%) and swing phase (40%).
101. **Stair Gait Cycle:** Involves heel strike, weight transfer, and stair ascent or descent.
102. **Codman's Paradox:** Refers to the paradoxical movement of the humerus in patients with frozen shoulder.
103. **Factors Affecting Normal Posture:** Muscle imbalances, skeletal alignment, habits.
104. **Functions of Intervertebral Disc:** Absorb shock, allow flexibility, maintain spacing.
105. **Structure of Temporomandibular Joint:** Repeated question. See answer 84.
106. **Musculoskeletal Changes Following COPD:** Chronic obstructive pulmonary disease can lead to muscle wasting and decreased bone density.
107. **Energy Expenditure of Gait:** The energy required for walking.
108. **Kinetics and Kinematics of Posture:** Kinetics involves forces, while kinematics involves motion.
109. **Gait Deviations:** Various deviations like antalgic gait, Trendelenburg gait. Explaining any two in detail would require more space.
110. **Rib Cage Movement during Inspiration:** Ribs elevate, expanding the thoracic cavity

Brief Answers:-

1. Articularis genu: Muscle that pulls the suprapatellar bursa during knee extension.
2. Tarsal canal: Passage between medial malleolus and calcaneus for tendons.
3. Common hip axis: The center of rotation for combined hip motions.
4. Kinesthesia and proprioception: Sensations of movement and body position.
5. Pelvic balance: Equilibrium of the pelvis to maintain posture.
6. Gluteus medius limp: Weakness in the gluteus medius muscle.
7. Patellar plicae: Folds in the synovial membrane of the knee joint.
8. Synergist: Muscle aiding the primary mover in a movement.
9. Angular Velocity: Rate of change of angular position.
10. Concentric Exercise: Muscle shortening during contraction.
11. Acromioclavicular joint: Connection between acromion and clavicle.
12. Line of gravity: Vertical line passing through the body's center of mass.
13. Second-class lever: Effort between fulcrum and resistance.
14. Law of inertia: Object's resistance to change in motion.
15. Lumbricals: Hand muscles for finger flexion and extension.
16. Point of application of force: Where force is exerted on an object.
17. Scaption: Shoulder abduction in scapular plane.
18. Isoinertial exercise: Constant resistance through range of motion.
19. Perturbation: Sudden disturbance affecting stability.
20. Quadriceps angle: Angle between femur and patellar tendon.
21. Convex-concave principle: Joint surfaces' movement in relation to shape.
22. Sustentaculum tali: Bony projection in the calcaneus.
23. Volar wrist musculature: Muscles on the palm side of the wrist.
24. Vincula tendinum: Bands supporting tendons in hand.
25. Reverse action: Origin moves toward insertion during contraction.

26. Bunnell’s sign: Assessment of finger joint mobility.
27. Pes Anserinus: Tendinous insertion on the medial knee.
28. Lister’s tubercle: Bony prominence on the radius.
29. Dowager’s hump: Exaggerated thoracic kyphosis.
30. Sternoclavicular disk: Fibrocartilage between clavicle and sternum.
31. Nutation: Anterior tilt of sacrum relative to ilium.
32. Divergent muscle pull: Muscle fibers angle away from each other.
33. Voluntary control: Conscious control of muscle contraction.
34. Hysteresis: Lag between force and deformation during loading/unloading.
35. Agonists and Antagonists: Muscle pairs for movement and control.
36. Volar plate: Ligament-like structure in the palmar wrist.
37. Pars interarticularis: Segment between superior and inferior articular processes.
38. Subacromial space: Area beneath the acromion process.
39. Functional position of the hand: Slight wrist extension and finger flexion.
40. Close-packed position: Joint position with maximum contact.
41. Carrying angle: Angle between humerus and ulna when elbow is extended.
42. Angulation of the femur: Inclination and torsion of the thigh bone.
43. Torque: Rotational force around an axis.
44. Instantaneous axis of rotation: Point of instantaneous rotation.
45. Motor unit: Motor neuron and the muscle fibers it innervates.
46. Glenoid labrum: Fibrocartilage rim in the shoulder socket.
47. Carrying angle: Angle between humerus and ulna at elbow.
48. Ligaments of Hip joint: Iliofemoral, pubofemoral, and ischiofemoral.
49. Patella baja: Low-lying patella due to restricted movement.
50. Medial collateral ligament attachment: Medial epicondyle and medial meniscus.
51. Ligaments of Talonavicular joint: Dorsal, plantar, and interosseous ligaments.

52. Moment arm: Perpendicular distance from axis to line of force.
53. Pelvic floor muscles: Muscles supporting pelvic organs.
54. Nutation and counternutation: Sacral movement in relation to ilium.
55. Moment arm: Perpendicular distance between force and axis.
56. Fibrous joint: Connective tissue joint with minimal movement.
57. Slow-twitch oxidative fibers: Muscles designed for endurance.
58. Lumbar-pelvic rhythm: Coordination between lumbar and pelvic movement.
59. Cross-eyed patella: Patellar tracking issue causing misalignment.
60. Volar wrist musculature: Muscles on the palm side of the wrist.
61. Juncturae tendinae: Tendon sheaths connecting finger tendons.
62. Pars Interarticularis: Segment between superior and inferior articular processes.
63. Angulations of femur: Inclination and torsion of the thigh bone.
64. Bunnell's sign: Finger joint mobility assessment.
65. Dowager's hump: Exaggerated thoracic kyphosis.
66. Patella Alta and Baja: High-lying and low-lying patella.
67. Sesamoid bone: Small bone embedded in a tendon.
68. Coupled motions: Combined movements of adjacent joints.
69. Claw toe and hammer toe: Abnormal toe deformities.
70. Levers: Simple machines for transmitting force.
71. Carrying angle: Angle between humerus and ulna at elbow.
72. Pulleys: Structures redirecting force through tendons.
73. Pes Planus: Flat foot due to collapsed arches.
74. Supinator twist: Radial head dislocation causing forearm pronation.
75. Vertical steering muscles of Shoulder joint: Upper trapezius and levator scapulae.
76. Fast-twitch fibers: Muscles designed for quick, powerful movements.
77. Cubitus Valgus and Cubitus Varus: Elbow deformities.

78. Force and Acceleration: Newton's second law relating them.
79. Load deformation curve: Relationship between load and tissue deformation.
80. Extensor hood: Expansion of finger extensor tendons.
81. Trendelenberg sign: Gait abnormality due to hip abductor weakness.
82. Line of gravity: Vertical line through the body's center of mass.
83. Accessory movements: Joint movements not under voluntary control.
84. Rocker bottom foot: Flat foot with prominent metatarsal heads.
85. Grip: Holding or grasping something.
86. Osteokinematics: Bone movement during joint motion.
87. Arcuate lines: Curved lines on bones marking muscle attachment areas.
88. Tensile forces: Pulling forces stretching a material.
89. Grasp: Precise and coordinated hand movement.
90. Angle of femoral torsion: Angle between femoral head and shaft.
91. Functional position of hand: Slight wrist extension and finger flexion.
92. Hooke’s law: Stress is proportional to strain in elastic materials.
93. Optimal length: Length at which a muscle produces maximal force.
94. Nursemaid’s elbow: Radial head subluxation in children.
95. Extensor expansion: Tendons spanning fingers for extension.
96. Force couple: Two equal, parallel forces producing rotation.
97. Arthrokinematics: Joint surface movement during osteokinematics.
98. Mechanical advantage: Ratio of force output to force input.
99. Factors affecting muscle function: Muscle architecture, length-tension relationship, etc.
100. Shunt and spurt muscles: Muscles contributing to slow and fast movements.
101. Center of gravity: Point where body's weight is evenly distributed.
102. Active insufficiency: Inability of a muscle to contract further.
103. Open kinematic chain: Distal segment moves freely.

104. Glenohumeral rhythm: Ratio of scapular to humeral movement.
105. Ligaments of shoulder joint: Glenohumeral, coracohumeral, transverse humeral.
106. Functions of Meniscus: Shock absorption and joint stability in knee.
107. Clinical significance of plantar arches: Support and shock absorption in foot.
108. Agonists: Muscles causing desired movement.
109. Thumb opposition: Unique movement of thumb across palm.
110. Index plus-minus foot: Compensatory pronation or supination of foot.
111. Angle of inclination: Angle between the femoral neck and shaft.
112. Patella plica: Fold in the synovial membrane of the knee.
113. Plantar aponeurosis: Connective tissue supporting the arch of the foot.
114. Carrying angle: Angle between humerus and ulna when elbow is extended.
115. Scoliosis: Lateral curvature of the spine.
116. Concurrent force systems: Multiple forces applied at a single point.
117. Stair climbing: Gait pattern involving ascending or descending stairs.
118. Patella plica: Fold in the synovial membrane of the knee.
119. Viscoelasticity: Material's ability to exhibit both viscosity and elasticity.
120. Pes Planus and Pes Cavus: Flat foot and high-arched foot.
121. Pulleys: Structures redirecting force through tendons.
122. Open Kinematic chain: Distal segment moves freely.
123. Palmar arches: Arches in the hand formed by tendons.
124. Ground reaction force: Force exerted by the ground on a body in contact.
125. Hooke’s law: Stress is proportional to strain in elastic materials.
126. Isometric exercises: Muscle contraction without joint movement.
127. Convex-Concave rule: Joint surfaces' movement in relation to shape.
128. Isotonic contraction: Muscle shortening with constant tension.
129. Patellar movements: Tracking of the kneecap during knee flexion.

130. Open and closed kinematic chain exercises: Distal segment fixed vs. free.
131. Gait deviations: Abnormalities in walking; e.g., Trendelenburg gait.
132. Rib cage movement during inspiration: Ribs elevate and expand.
133. Flat back posture: Reduced lumbar lordosis.
134. Scoliosis: Lateral curvature of the spine.
135. Step length and stride length: Distance between steps and full cycles.
136. Scoliosis: Lateral curvature of the spine.
137. Dynamic posture: Alignment during movement.
138. Muscles responsible for normal ventilation: Diaphragm and intercostals.
139. Good and bad posture: Ideal vs. poor alignment.
140. Pathological gait deviations: Abnormal walking patterns; e.g., Trendelenburg gait.
141. Scoliosis: Lateral curvature of the spine.
142. Postural sway: Small shifts in the body's center of mass.
143. Primary and secondary curves of vertebral column: Thoracic and lumbar curves.
144. Muscles of Inspiration and Expiration: Diaphragm, intercostals, and abdominals.
145. Running gait: Pattern of movement during running.
146. Ligaments of spine: Anterior and posterior longitudinal ligaments, etc.
147. Postural set: Initial body posture before movement.
148. Lordosis: Exaggerated lumbar curvature.
149. Pes Anserinus: Tendinous insertion on the medial knee.
150. Cadence: Steps taken per unit of time.
151. Attachment of thoracolumbar fascia: Connective tissue in the back.
152. Calcaneal gait: Walking on the heels.
153. Normal postural sway: Minor movements to maintain balance.
154. Zygapophyseal joints: Synovial joints between adjacent vertebrae.
155. Lumbosacral angle: Angle between lumbar and sacral vertebrae.

156. Role of upper limb in gait: Counterbalances leg movements.
157. Trendelenberg sign: Hip drop during single-leg stance.
158. Nucleus pulposus: Gel-like core of an intervertebral disc.
159. Posture: Body's alignment and positioning.
160. Effects of gravity on posture: Influence on spinal curvature.
161. Temporal and distance variables in gait: Time and space measures.
162. Ataxic gait: Uncoordinated, unsteady walking.
163. Frontal plane deviations: Lateral spine shifts from optimal alignment.
164. Equinus gait: Walking on the toes due to calf muscle tightness.
165. Static and dynamic balance: Stationary and moving stability.
166. Flat back posture: Reduced lumbar lordosis.
167. Scoliosis: Lateral curvature of the spine.
168. Forward head posture: Anterior positioning of the head.
169. Function of diaphragm in tidal breathing: Primary muscle of inspiration.
170. Atypical vertebrae of cervical spine: C1 (Atlas) and C2 (Axis).