**Chapter 9**

1. **INTRODUCTION**
2. A joint (articulation or arthrosis) is a point of contact between **two or more bones, between cartilage and bones, or between teeth and bones.**
3. The scientific study of joints is called  **arthrology.**
4. **JOINT CLASSIFICATION**
5. Structural classification is based on the presence or absence of a synovial (joint) cavity and type of connecting tissue. Structurally, joints are classified as **fibrous, cartilaginous, or synovial.**
6. Functional classification of joints is based on the **degree of movement permitted**. Joints may be synarthroses (**immovable**), amphiarthroses (**partially movable**), or diarthroses (**freely movable**).
7. **FIBROUS JOINTS**
8. Fibrous joints lack a synovial cavity, have the articulating bones held together by fibrous connective tissue, and **permit little or no movement.**
9. Types of fibrous joints include **sutures, syndesmoses, and gomphoses**.
10. A suture is a fibrous joint composed of a **thin layer of dense fibrous connective tissue that unites skull bones.**
11. A synostosis is a suture joint that has ossified. An example of a synostosis is the frontal suture between the **left and right sides of the frontal bone**.
12. A synostosis is functionally classified as a synarthrosis.
13. A syndesmosis is a fibrous joint in which there is more **fibrous connective tissue than in a suture.**
14. A gomphosis (dentoalveolar) is a fibrous joint in which a cone-shaped peg fits into a socket. An example is the **root of a tooth in a socket**.
15. **CARTILAGINOUS JOINTS**
16. A cartilaginous joint lacks a synovial cavity, has the articulating bones connected by either fibrocartilage or hyaline cartilage, and ­­­­­­­­­­­­­­­­­**allows little or no movement.**
17. The two types of cartilaginous joints are **synchondroses and symphyses.**
18. A synchrondosis is a cartilaginous joint in **which the connecting material is a hyaline cartilage.**
19. A symphysis is a cartilaginous joint in which the **connecting material a disc of fibrocartilage.**

Examples are the interverterbral discs and the pubic symphysis.

1. **SYNOVIAL JOINTS**
2. Synovial joints have a synovial (joint) cavity between the articulating bone and **are freely movable** (diarthrotic).
3. Structure of Synovial Joints
4. Articular cartilage
5. The articular cartilage covers the bones at **synovial joints**.
6. The articular cartilage reduces **friction at the joint with movement and helps absorb shock.**
7. Techniques for cartilage replacement
8. In cartilage transplantation chondrocytes are **removed from the patient, grown in culture,a nd then placed in the damaged joint.**
9. Eroded cartilage may be replaced with **synthetic materials.**
10. Researchers are also examining the use of **stem cells to replace cartilage.**
11. Articular Capsule
12. The articular capsule surrounds a diarthrosis, encloses the synovial cavity, and **unites the articulating bones.**
13. The articular capsule is composed of two layers - the outer fibrous capsule (which may contain ligaments) and the inner synovial membrane (**which secretes a lubricating and joint nourishing synovial fluid**).
14. The flexibility of the fibrous capsule permits **considerable movement at a joint**, whereas its great tensile strength **helps bones from dislocating.**
15. Other capsule features include ligaments and articular fat pads.
16. Synovial fluid,
17. secreted by the synovial membrane, **lubricates and reduces friction in the joint and supplies nutrients to and removes metabolic wastes from the joint.**
18. When disease or injury leads to a buildup of synovial fluid, **the fluid may be aspirated and medications may be injected into the cavity.**
19. Accessory Ligaments and Articular Discs
20. Many diarthroses also contain accessory ligaments and articular discs (**menisci**).
21. Ligaments help hold **bone to bone**.
22. Articular discs modify the **shape of the joint surfaces of the articulating bones, help maintain the stability of the joint, and direct the flow of synovial fluid to the areas of greatest friction.**
23. Torn cartilage, occurring frequently in the knees of athletes, is **damage to the articular discs that lie between the ends of some bones.** Removal, to prevent erosion and arthritis, is usually accomplished by **arthroscopy.**
24. Nerve and Blood Supply
25. Nerves that supply a joint are the same **as those that supply the skeletal muscles that move the joint.**
26. Numerous arteries and veins supply the **joints and surrounding structures except articular cartilage (supplied by synovial fluid)**
27. Sprain and Strain
28. A sprain is the **forcible wrenching or twisting of a joint that stretches or tears its ligaments but does not dislocate the bone.**
29. A strain is  **a stretched or partially torn muscle.**
30. Bursae and Tendon Sheaths
31. Bursae are synovial fluid filled saclike structures that **cushion the movement of one body part over another**.
32. Tendon sheaths are tubelike bursae that wrap **around tendons where there is considerable friction**, such as the tendon of the biceps brachii at the **shoulder joint**.
33. Bursitis is a **chronic inflammation of the burse.**.
34. **TYPES OF MOVEMENT AT SYNOVIAL JOINTS**
35. Gliding movements occur when **relatively flat bone surfaces move abck and forth and from side to side with respect to one another.**
36. In gliding joints there **is no significant alteration of the angle between the bones.**
37. Gliding movements occur at plantar joints.
38. Angular Movements
39. In angular movements there is an **increase or a decrease in the angle** between articulating bones.
40. The principal angular movements are flexion, extension and hyperextension.
41. Flexion results in a **decrease in the angle between articulating bones.**
42. Extension results in an **increase in the angle between articulating bones.**
43. Lateral flexion involves the movement **of the trunk sideways to the right or the left at the waist.** The movement occurs in the frontal plane and involves the intervertebral joints.
44. Hyperextension is a continuation of extension **beyond the anatomical position and is usually prevented by the arrangement of ligaments and the anatomical alignment of bones.**
45. Abduction, Adduction, and Circumduction
46. Abduction refers **to the movement of a bone away from the midline.**
47. Adduction refers **to the movement of a bone toward the midline.**
48. Circumduction refers **to movement of the distal end of a part of the ody in a circle.**
    * + 1. Circumduction occurs as a result of a continuous sequence of **flexion, abduction, extension, and adduction.**
        2. Condyloid, saddle, and ball-and-socket joints allow **circumduction.**
49. In rotation, a bone revolves around its own longitudinal axis.
50. Pivot and ball-and-socket joints **permit rotation**.
51. If the anterior surface of a bone of the limb is turned toward the midline, **medial rotation occurs.** If the anterior surface of a bone of the limb is turned away from the midline, **lateral rotation occurs.**
52. Special Movements
53. Elevation is a **an upward movement of a part of the body.**
54. Depression is a **downward movement of a part of the body.**
55. Protraction is a movement of a part of the body **anteriorly in the transverse plane.**
56. Retraction is a movement of a **protracted part back to the anatomical position.**
57. Inversion is movement of the soles **medially at the intertarsal joints so that they face away from each other.**
58. Eversion is a movement of the soles **laterally at the intertarsal joints so that they face away from other other.**
59. Dorsiflexion refers to bending of the foot at **the ankle in the direction of the superior surface.**
60. Plantar flexion involves bending of the foot at **the ankle joint in the direction of the plantar surface.**
61. Supination is a movement of the forearm at the proximal and distal radioulnar joints in **which the palm is turned anteriorly or superiorly.**
62. Pronation is a movement of the forearm at the proximal and distal radioulnar joints in which the distal end of the radius crosses over the distal end of the ulna and the palm is **turned anteriorly or superiorly.**
63. Opposition is the movement of the thumb at the carpometacarpal joint in which the **thumb moves across the palm to touch the tips of the finger on the same hand.**
64. A dislocation or luxation is a **displacement of a bone from a joint.**
65. **TYPES OF SYNOVIAL JOINTS**
66. Plantar joints permit mainly **side-to-side and back-and-forth gliding movements.**  These joints are nonaxial and include the intercarpal, intertarsal, sternoclavicular, acromioclavicular, sternocostal, and vertebrocostal joints.
67. A hinge joint contains the convex surface of one bone fitting into a concave surface of another bone. Movement is primarily flexion or extension in a single plane. Examples include **the elbow, knee, ankle, and interphalangeal joints.**
68. In a pivot joint, a round or pointed surface of one bone fits into a ring formed by another bone and a ligament. Movement is rotational and monaxial. Examples **are the atlas rotating about the axis and turning the palms anterior and posterior.**
69. In a condyloid joint, an oval-shaped condyle of one bone fits into an elliptical cavity of another bone. Movements are flexion-extension, abduction-adduction, and circumduction; an example is **the joint between the carpals and the radius.**
70. A saddle joint contains one bone whose articular surface is saddle-shaped and another bone whose articular surface **is shaped like a rider sitting in the saddle.** Movements are flexion-extension, abduction-adduction, and circumduction.
71. In a ball-and-socket joint, the **ball-shaped surface of one bone fits into the cuplike depression of another**. Movements are flexion-extension, abduction-adduction, rotation, and circumduction; the only examples are **the shoulder joint and hip joint.**
72. **SELECTED JOINTS OF THE BODY**
73. Tempromandibular Joint (TMJ)
74. The TMJ is a combined hinge and planar joint formed by the condylar process of the mandible, the mandibular fossa, and the articular tubercle of the temporal bone.
75. **Movements include opening and closing and protraction and retraction of the jaw.**
76. **When dislocation occurs, the mouth remains open.**
77. Shoulder Joint.
78. This is a ball-and-socket joint formed by the head of **the humerous and the glenoid cavity** of the scapula.
79. **Movements at the joint include flexion, extension, abduction, adduction, medial and lateral rotation, and circumduction of the arm.**
80. This joint shows extreme **freedom of movement at the expense of stability.**
81. **Rotator cuff injury and dislocatin or separated shoulder** are common injuries to this joint.
82. Elbow Joint
83. This is a hinge joint formed by the trochlea of the humerus, the trochlear notch of the ulna, and the head of the radius.
84. **Movements at this joint are flexion and extension of the forearm.**
85. **Tennis elbow, little elbos, and dislactation of the radial head** are common injuries to this joint.
86. Hip Joint
87. **This ball-and-socket joint is formed by the head of the femur abd the acetabulum of the hipbone.**
88. Movements at this joint include  **flexion, extension, abduction, adduction, circumduction, and medial and lateral rotation of the thigh.**
89. This is an extremely **stable joint due to the bones making up the joint and the accessory ligaments and muscles.**
90. Knee Joints
91. **This is the largest and most complex joint of the body and consists of three joints within a single synovial cavity.**
92. **Movements at this joint include flexion, extension, slight medial rotation, and lateral rotation of the leg in a flexed position.**
93. Some common injuries are rupture of the tibial colateral ligament and a dislocation of the knee.
94. **FACTORS AFFECTING CONTACT AND RANGE OF MOTION AT SYNOVIAL JOINTS**
95. **Structure and shape of the articulating bone**
96. **Strength and tautness of the joint ligaments**
97. **Arrangement and tension of the muscles**
98. **Contact of soft parts**
99. **Hormones**
100. **Disuse**
101. **AGING AND JOINTS**
102. Various aging effects on joints include **decreased production of synovial fluid, a thinning of the articular cartilage, and loss of ligament length and flexibility.**
103. The effects of aging on joints are due to **genetic factors as well as wear and tear on joints.**
104. **ARTHROPLASTY**
105. Arthroplasty isthe **surgical replacement of a joint with an artificial joint**.
106. The most commonly replaced joints are **hips, knees, and shoulders.**
107. **DISORDERS: HOMEOSTATIC IMBALANCES**
108. Rheumatism and Arthritis
109. Rheumatism refers to any painful state of the supporting structures of the body – **bones, ligaments, joints, tendons, or muscles.**
110. Arthritis is a form of **rheumatism in which the joints become inflamed.**
111. Rheumatoid arthritis is an autoimmune disease in which **body’s immune system attacks its own cartilage and joint linings resulting in loss of joint.**
112. Osteoarthritis is a degenerative joint disease commonly known as “wear-and-tear” arthritis. It is characterized by deterioration of articular cartilage and bone spur formation. It is **noninflammatory and primarily affects weight-bearing joints.**
113. Gouty arthritis is a condition in which sodium urate crystals are deposited in soft tissues of joints, causing inflammation, swelling, and pain. If not treated, bones at affected joints **will eventually fuse, rendering the joints immovable.**
114. Lyme disease is a bacterial disease which is transmitted by deer ticks. Symptoms include **joint stiffness, fevers, chills, headache, and stiff neck.**
115. Ankylosing spondylitis affects joints between **the vertebrae and between the sacrum and hip bone.** Its cause is unknown.
116. Ankle Sprains: The ankle is the most frequently injured major joint. **Sprains** are the most common injury to the ankle.