

Chapter 11

Lubrication of Joints and Transport in Bone

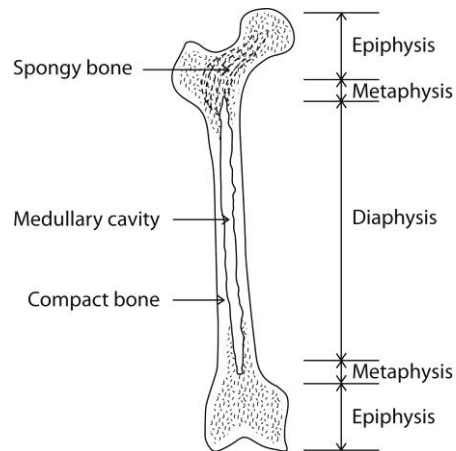


Figure 11.1 A representative long bone, showing the various regions within the bone. Long bones are composed of both compact bone and spongy bone. Regions of the bone are classified both by the bone type that composes the majority of the section and by the load direction that the bone normally experiences in that region. *Source: Adapted from Martini and Nath (2009).*

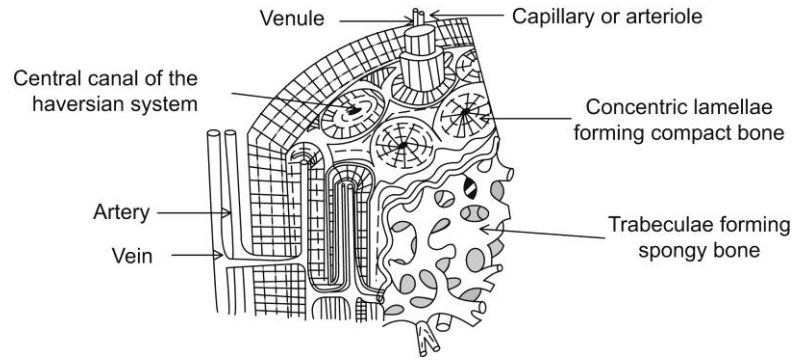


Figure 11.2 Schematic of the structure of compact bone. Compact bone is formed from multiple Haversian canal systems that are composed of concentric lamellae. Each Haversian canal has its own venule and capillary (possible arteriole) to provide the osteocytes with nutrients and oxygen. On the interior surface of the compact bone, trabeculae can be found to form a spongy bone marrow within long bones. Osteocytes can be found between the lamellae (black ovals on figure), within a lacuna. *Source: Adapted from Martini and Nath (2009).*

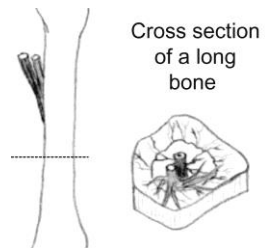


Figure 11.3 Blood supply of a long bone, illustrating that an artery and vein are paired along the medullary cavity. Branches of these vessels penetrate into the bone at various levels (see Figure 11.8).

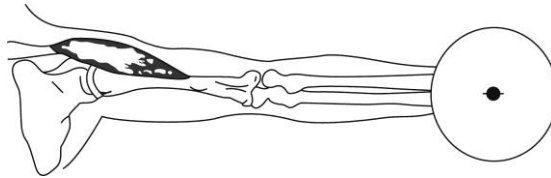


Figure 11.4 Diagram of a shoulder joint for the in-text example. *Source: Adapted from Ozkaya and Nordin (1999).*

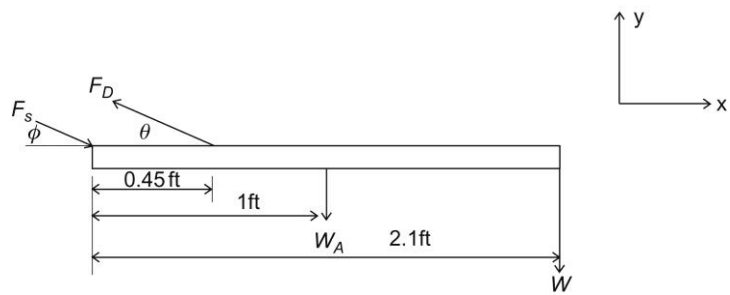


Figure 11.5 Free-body diagram of a shoulder joint.

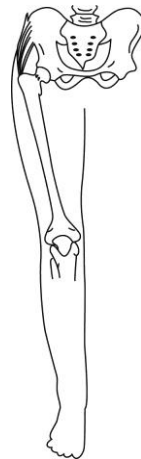


Figure 11.6 Diagram of a hip joint during running. *Source: Adapted from Ozkaya and Nordin (1999).*

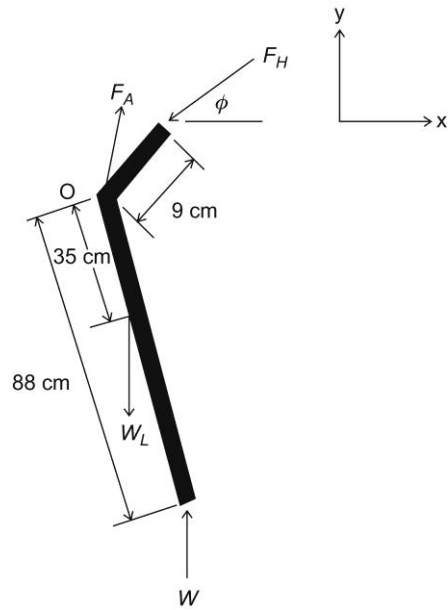


Figure 11.7 Free-body diagram for a hip joint.

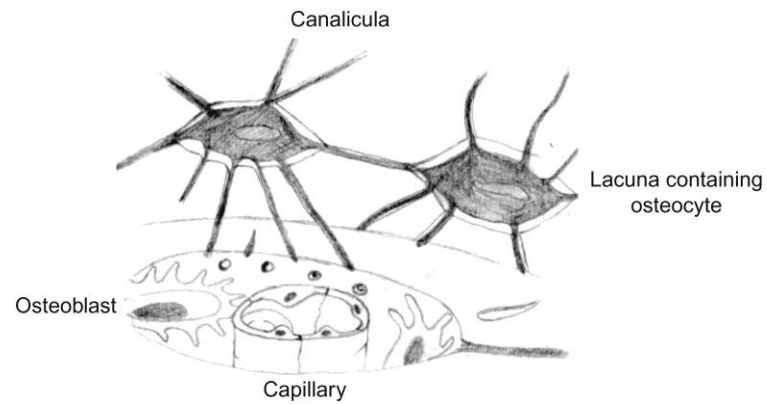


Figure 11.8 Relationship between capillaries and the osteoblasts/osteocytes within a lacunae. As illustrated in this figure, canalicula penetrate toward the central canal and help nutrient delivery throughout the entire bone. *Source: Adapted from Handbook of Physiology—The Cardiovascular System Volume 3.*

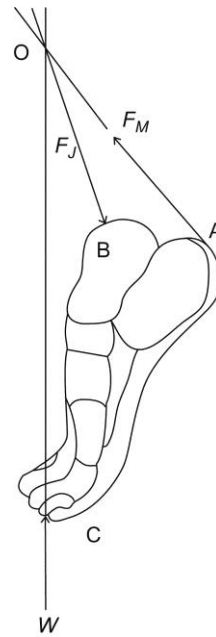


Figure 11.9 Diagram of a foot for homework problem 11.9. *Source: Adapted from Ozkaya and Nordin (1999).*