

## Section 1: Gross Anatomy of Long Bones

### Key Vocabulary:

**Diaphysis:** The elongated shaft of a long bone, composed primarily of dense compact bone.

**Epiphysis:** The expanded proximal or distal end of a long bone, consisting of spongy bone encased in a thin layer of compact bone.

**Periosteum:** A fibrous connective tissue membrane covering and protecting the outer surface of the diaphysis.

**Sharpey's fibers:** Perforating collagen fibers that securely anchor the periosteum to the underlying bone matrix.

**Articular cartilage:** Hyaline cartilage covering the joint surfaces of epiphyses, providing a smooth, frictionless gliding surface.

**Epiphyseal line:** A distinct bony line spanning the epiphysis, representing the adult remnant of the childhood epiphyseal growth plate.

**Medullary cavity:** The central internal cylinder of the shaft, lined with endosteum and holding bone marrow.

Long bones (such as the femur, humerus, and tibia) are structured to support body weight and facilitate movement. The hollow cylindrical architecture of the diaphysis provides maximum strength with minimal weight, while the broader epiphyses distribute mechanical stresses across movable joints.



1. Use the diagram above and your understanding of long bone structures to complete parts (a) through (c).

(a) Identify each labelled anatomical feature from the diagram in the table below, and describe its primary physiological function or tissue composition.

| Label | Anatomical Structure | Tissue Composition & Function |
|-------|----------------------|-------------------------------|
| A     |                      |                               |
| B     |                      |                               |
| C     |                      |                               |
| D     |                      |                               |
| E     |                      |                               |
| F     |                      |                               |

(b) How do Sharpey's fibers structurally support the function of the periosteum along the diaphysis?

- ☐ A. They anchor the periosteum to the bone, helping it stay attached when tendons pull on it.
- ☐ B. They form the smooth cartilage covering the ends of long bones.
- ☐ C. They connect the medullary cavity to the central canal.
- ☐ D. They produce red blood cells inside the diaphysis.

(c) What is the developmental relationship between the epiphyseal plate and the epiphyseal line? Explain how this change affects longitudinal bone growth.

- ☐ A. The epiphyseal line is cartilage that remains active and allows the bone to keep growing longer.
- ☐ B. The epiphyseal plate is replaced by bone after growth ends, leaving the epiphyseal line and stopping further lengthwise growth.
- ☐ C. The epiphyseal line forms first and later becomes the growth plate.
- ☐ D. The epiphyseal plate and epiphyseal line are two names for the same structure throughout life.

2. The interior cavities of bones undergo significant functional shifts between infancy and adulthood.

(a) Compare the contents and primary functions of the medullary cavity in infants versus healthy adults in the comparison table below.

| Developmental Stage | Predominant Marrow Type | Primary Physiological Role |
|---------------------|-------------------------|----------------------------|
| Infant              |                         |                            |
| Adult               |                         |                            |

(b) In a healthy adult, where is red bone marrow retained, and what essential physiological process occurs within it?

- ☐ A. In the medullary cavity of the diaphysis, where it primarily stores fat.
- ☐ B. In spongy bone of flat bones and the epiphyses of long bones, where it produces blood cells.
- ☐ C. In compact bone of the diaphysis, where it produces collagen fibers.
- ☐ D. In articular cartilage at the ends of long bones, where it produces calcium salts.

(c) Bone surfaces exhibit distinct surface features termed bone markings. Define the difference between bone **projections** and bone **depressions**, and identify what causes these surface markings to develop.

- ☐ A. Projections are raised areas that commonly provide attachment sites; depressions are indentations that may accommodate vessels, nerves, or articulating bones. These markings develop in response to stresses from muscles and adjacent tissues.
- ☐ B. Projections are indentations that hold marrow; depressions are raised areas that attach muscles. These markings develop only as bones grow longer.
- ☐ C. Projections and depressions are both smooth joint surfaces formed by cartilage, and they develop to reduce friction.
- ☐ D. Projections are openings for blood vessels; depressions are raised areas for tendons. These markings develop independently of surrounding tissues.