Fig. 7.1

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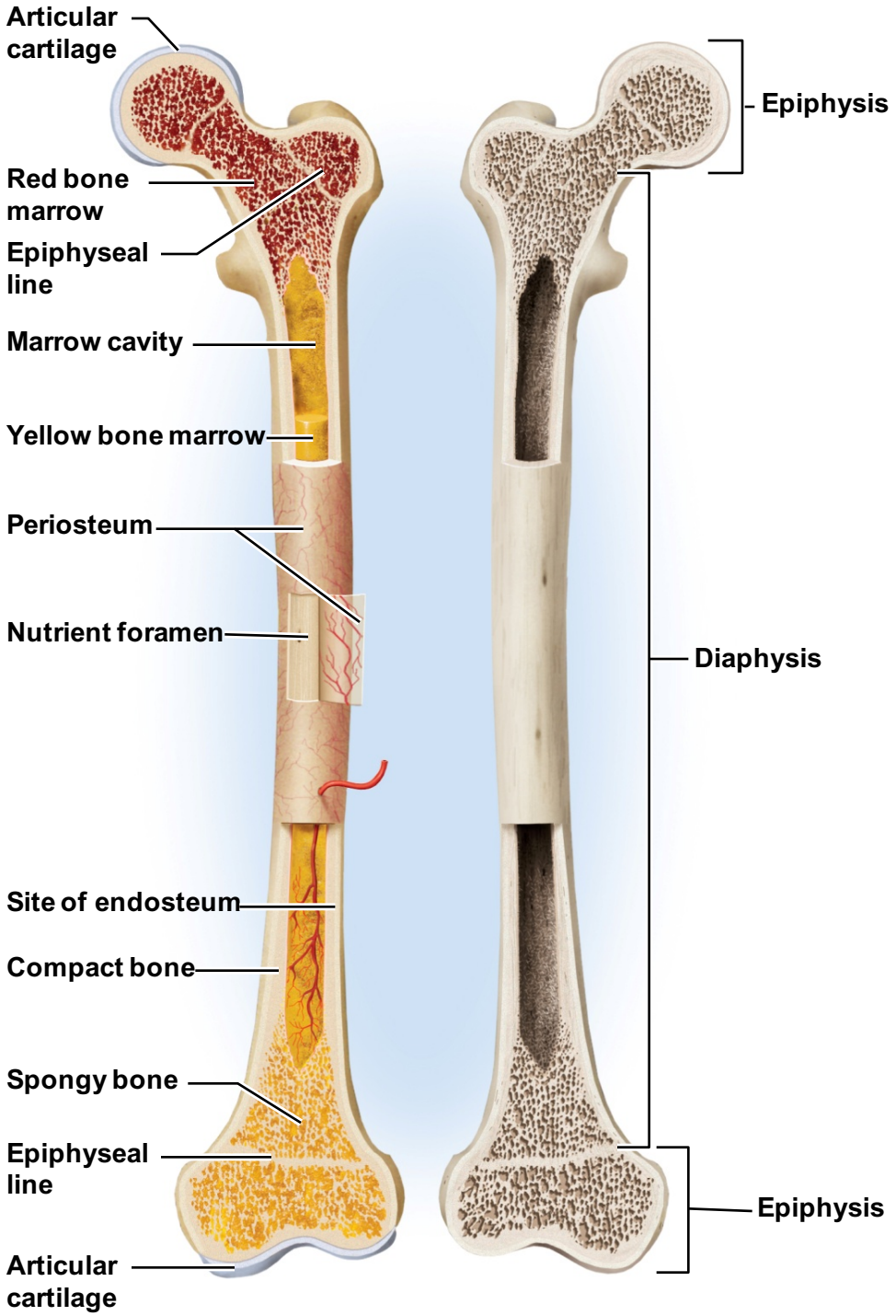

Fig. 7.2

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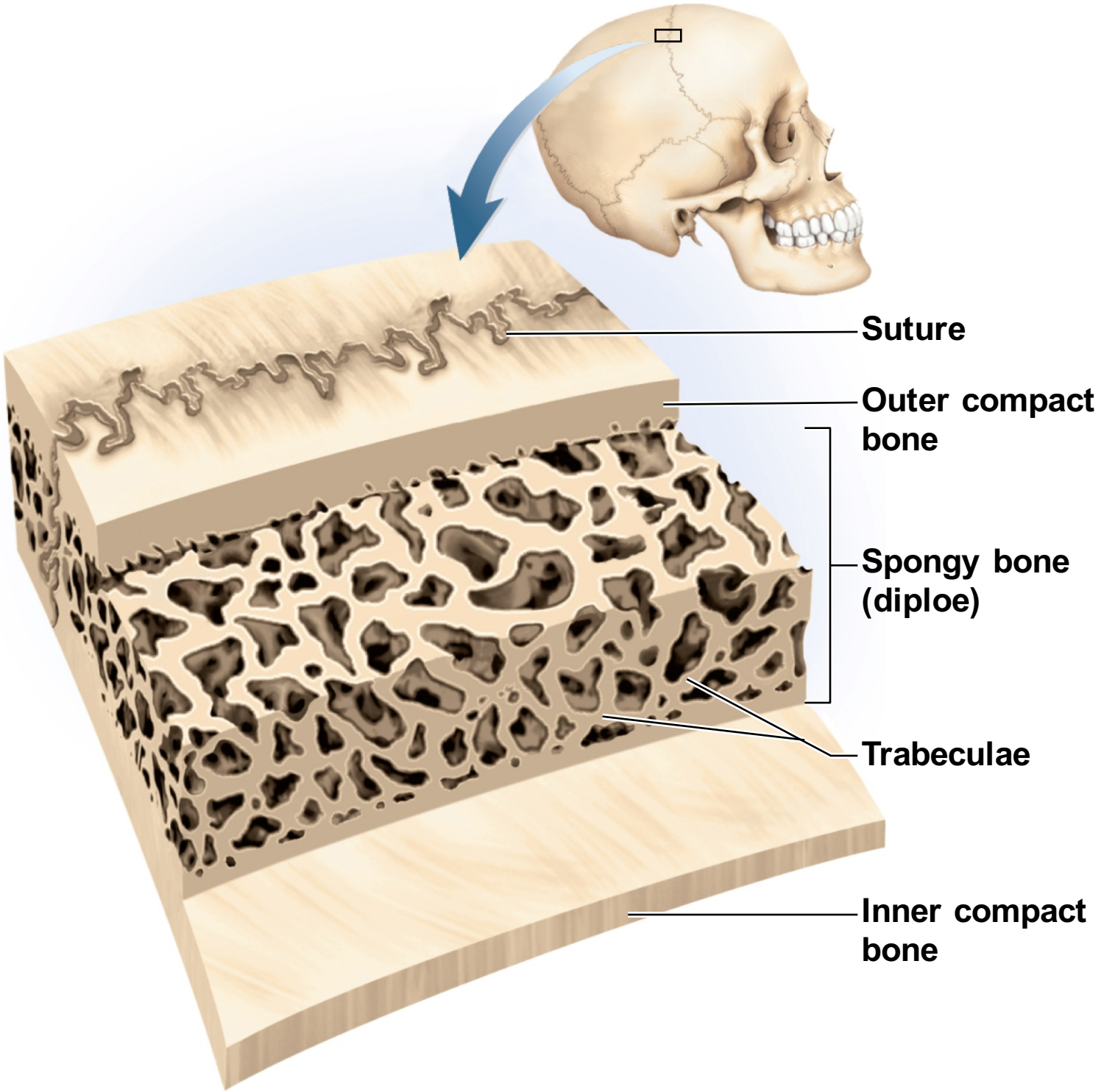

Fig. 7.3

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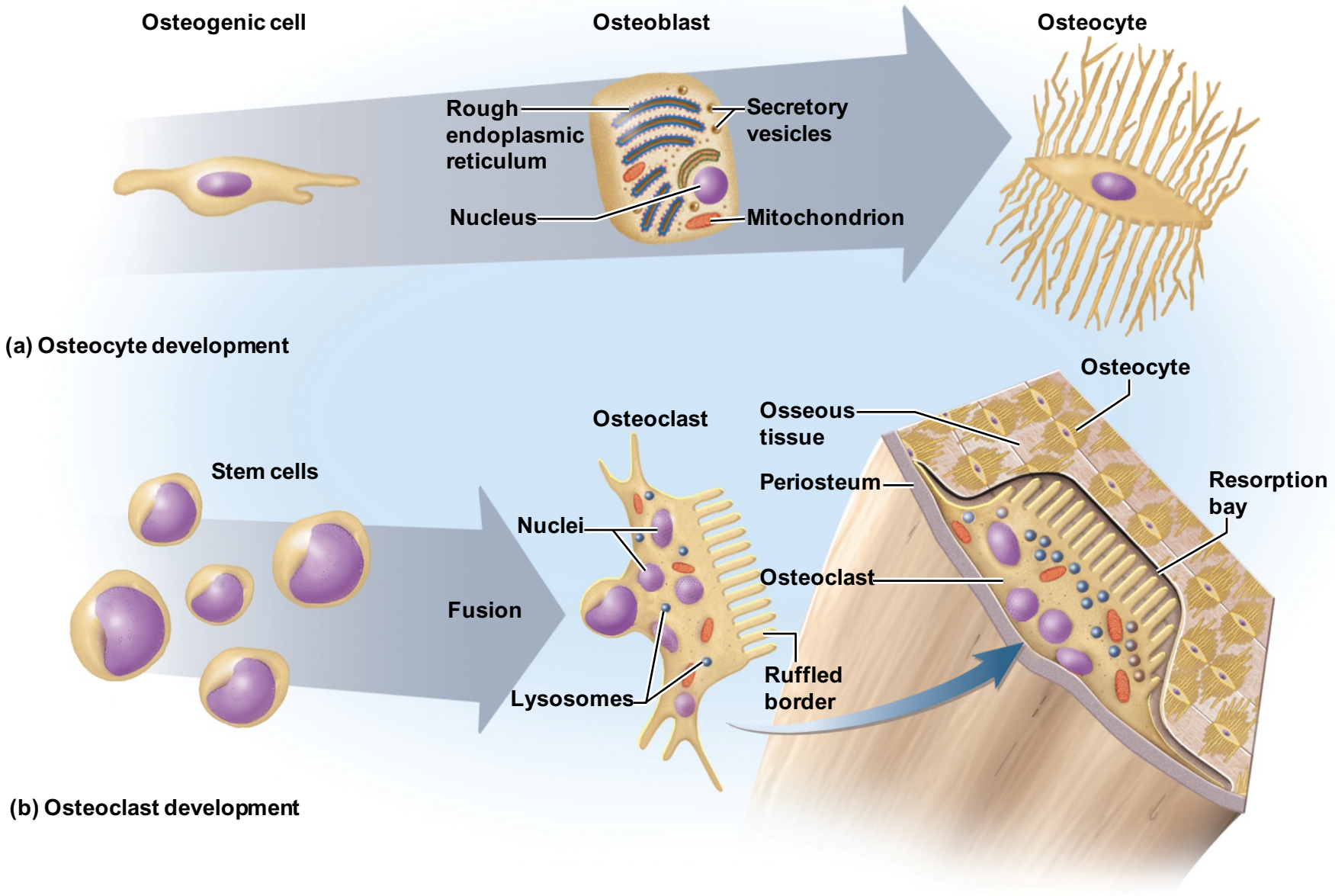

Fig. 7.4

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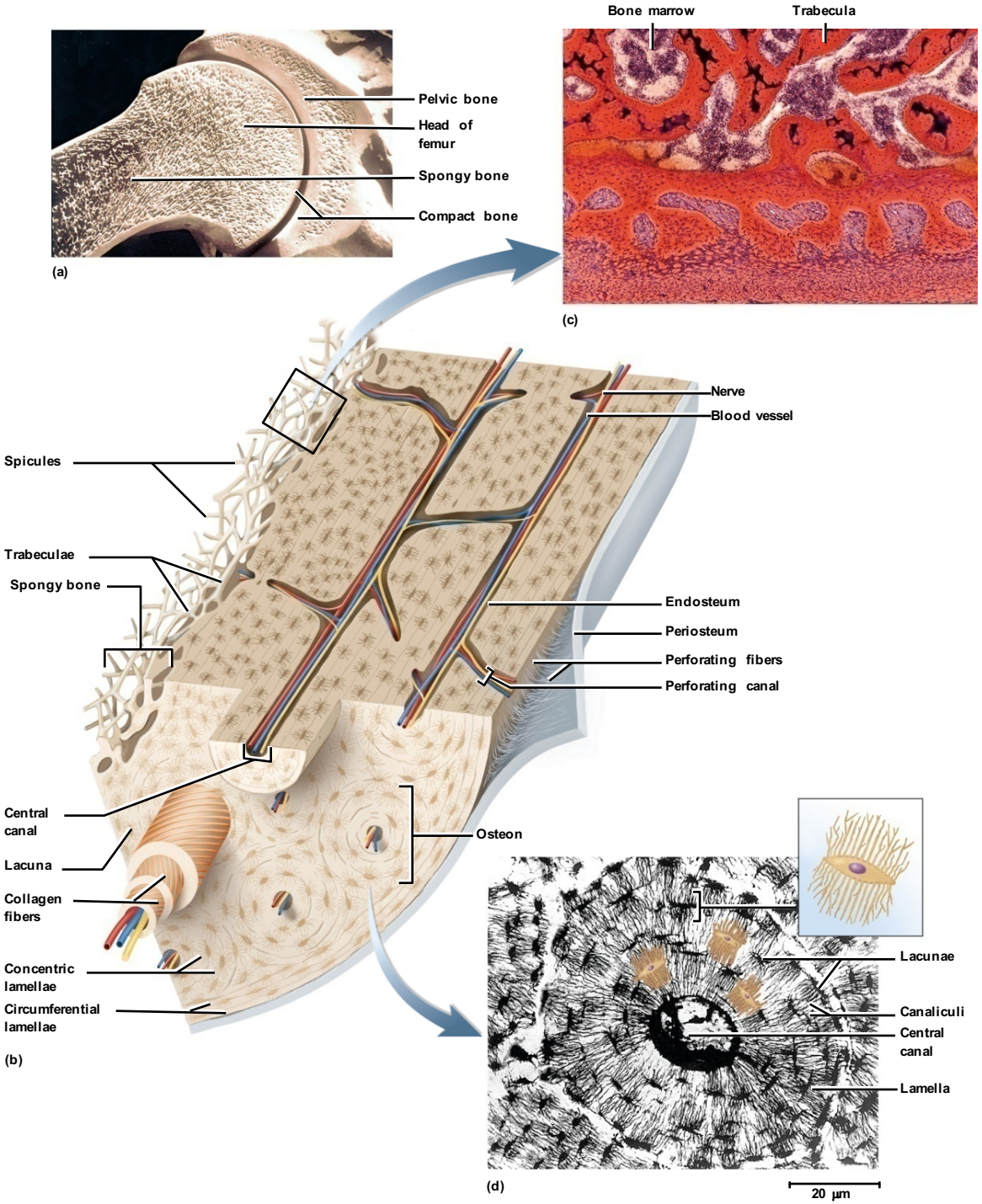

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Fig. 7.5

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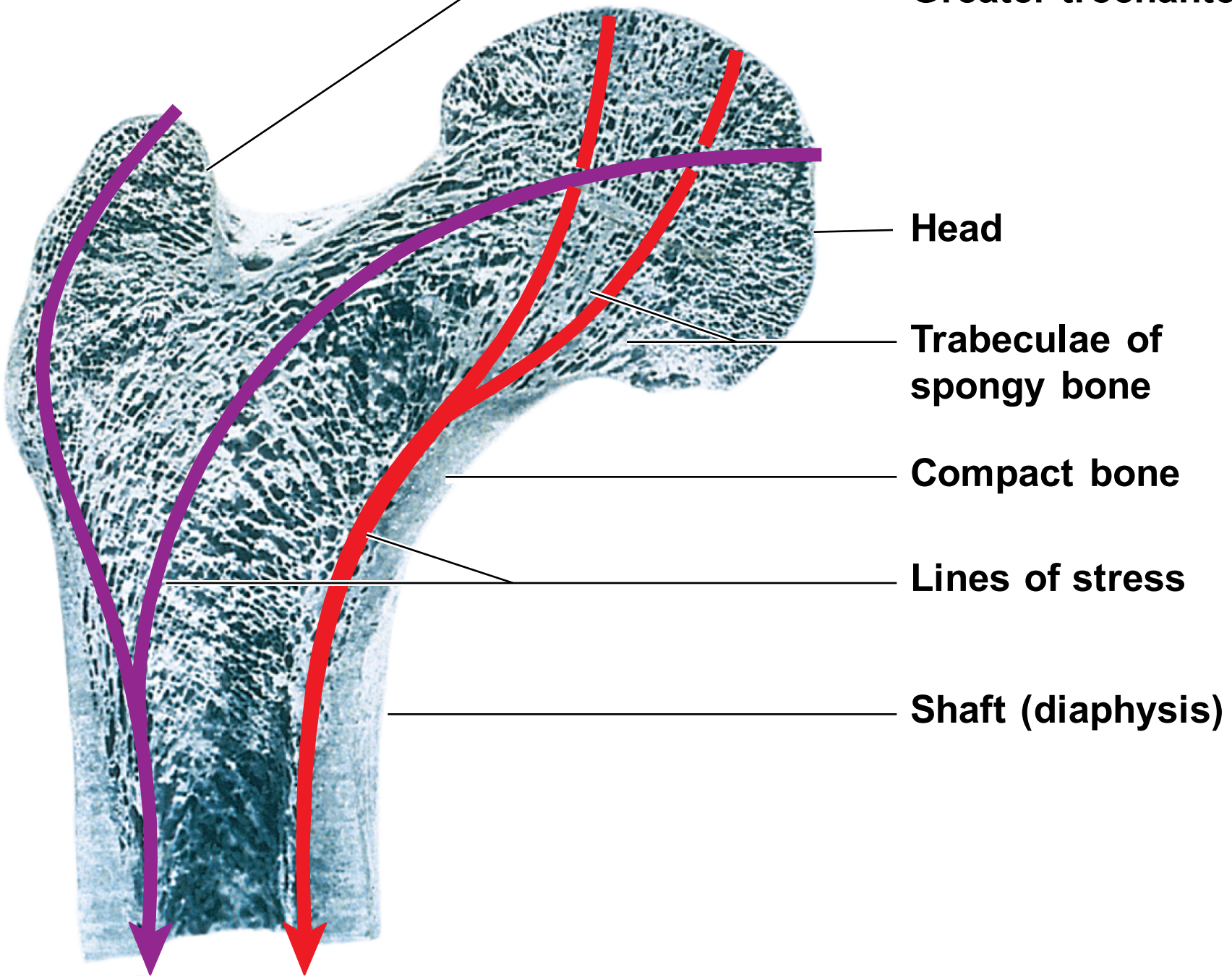

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Fig. 7.6

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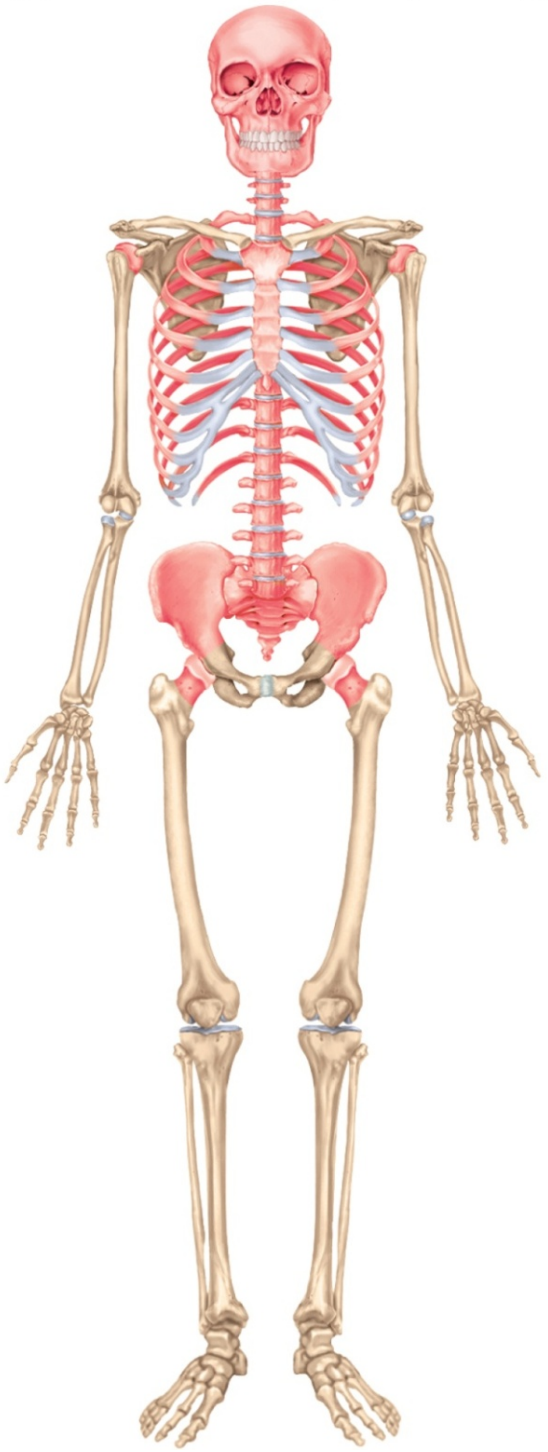

Fig. 7.7

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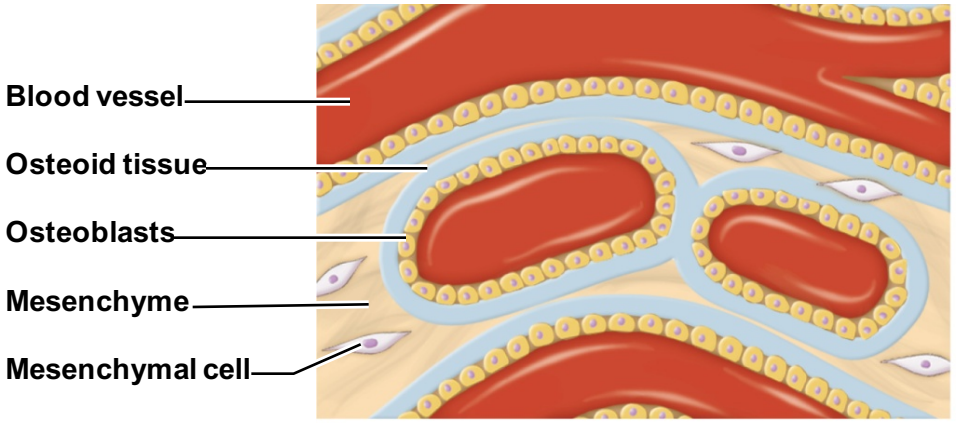
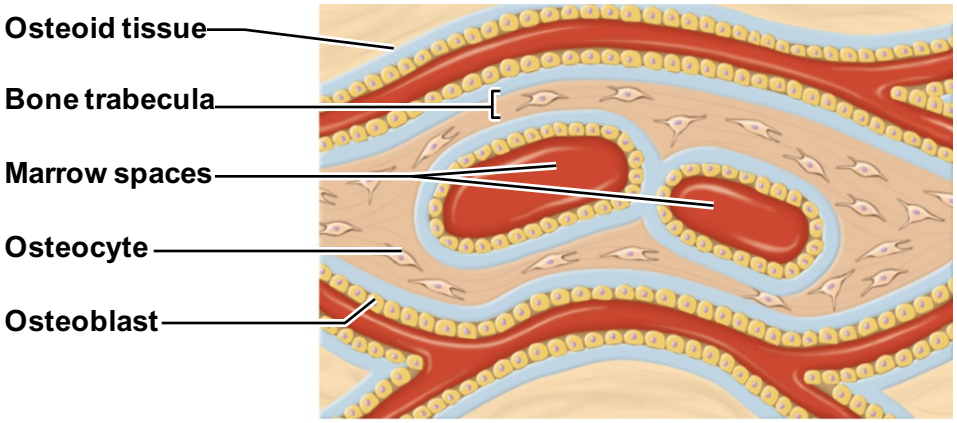
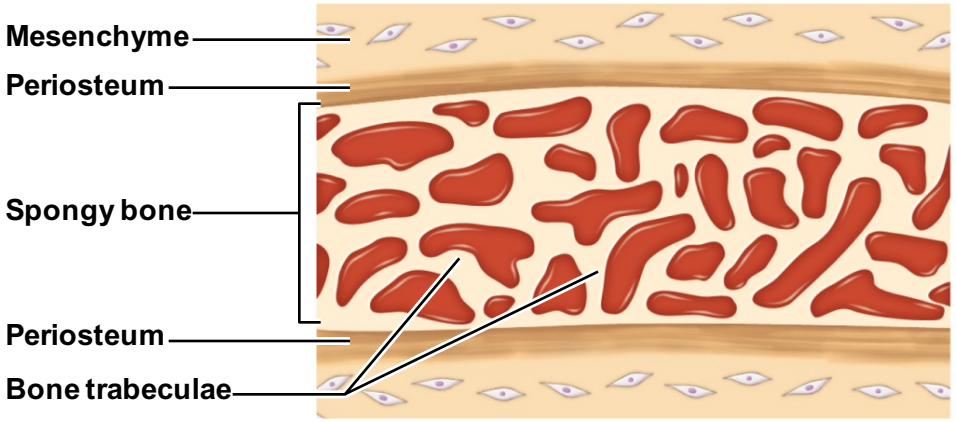


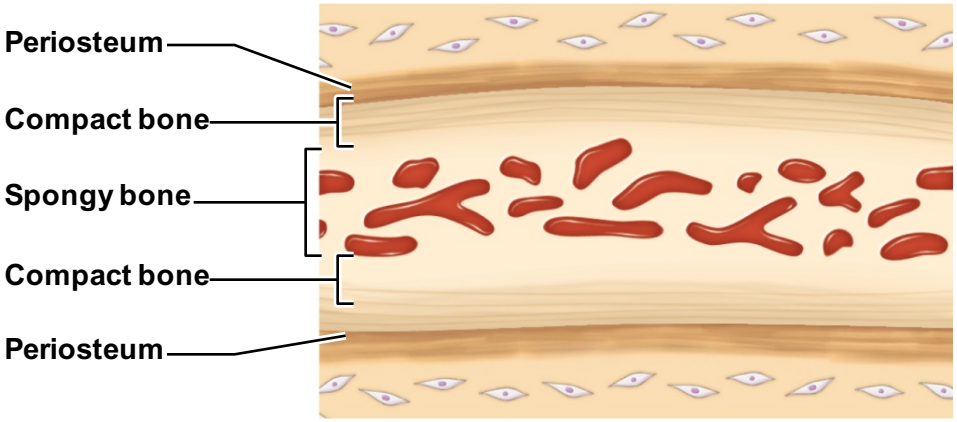
1 Deposition of osteoid tissue into embryonic mesenchyme



2 Calcification of osteoid tissue and entrapment of osteocytes



3 Honeycomb of spongy bone with developing periosteum



4 Filling of space to form compact bone at surfaces, leaving spongy bone in middle

Fig. 7.8

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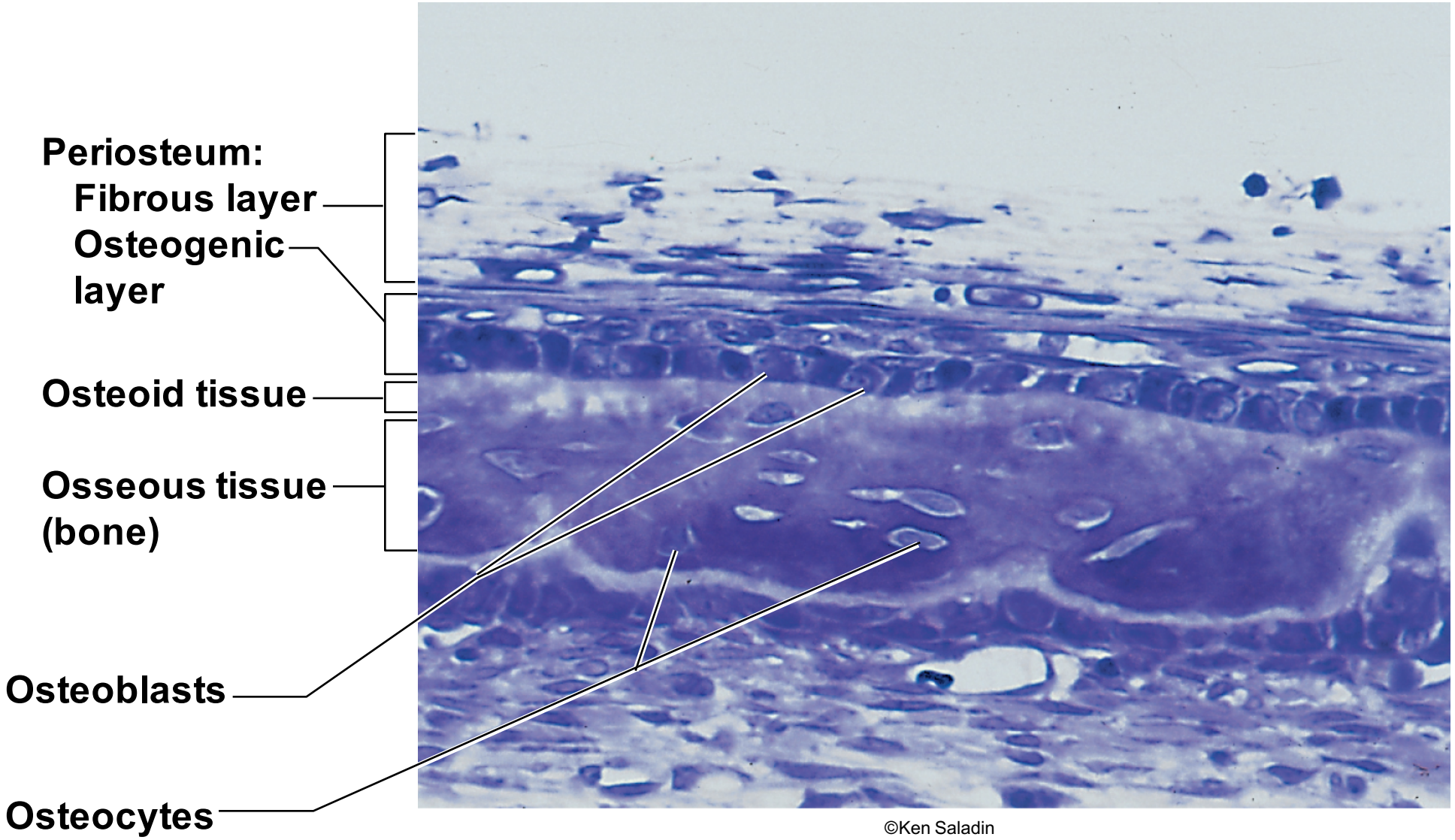

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Fig. 7.9

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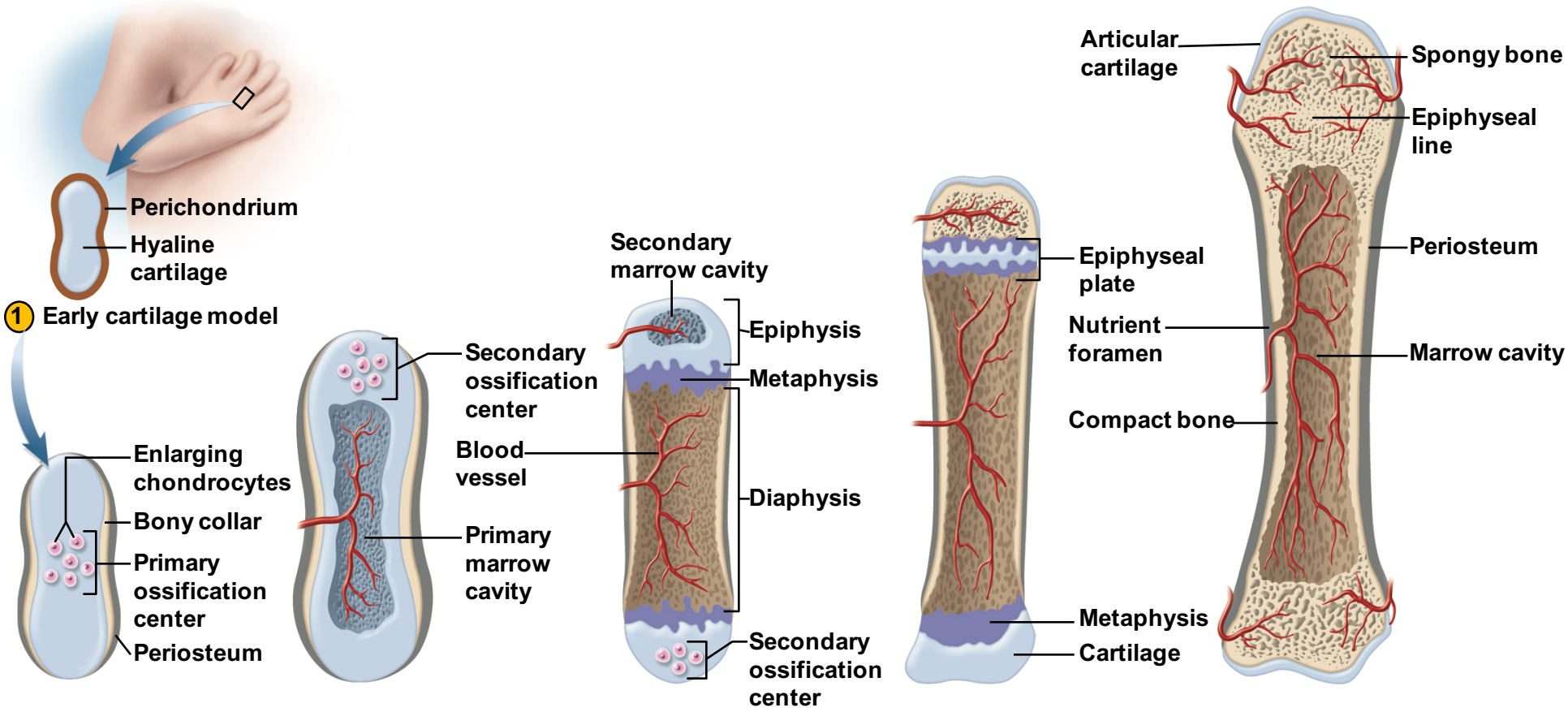

2 Formation of primary ossification center, bony collar, and periosteum

3 Vascular invasion, formation of primary marrow cavity, and appearance of secondary ossification center

4 Bone at birth, with enlarged primary marrow cavity and appearance of secondary marrow cavity in one epiphysis

5 Bone of child, with epiphyseal plate at distal end

6 Adult bone with a single marrow cavity and closed epiphyseal plate

Fig. 7.10

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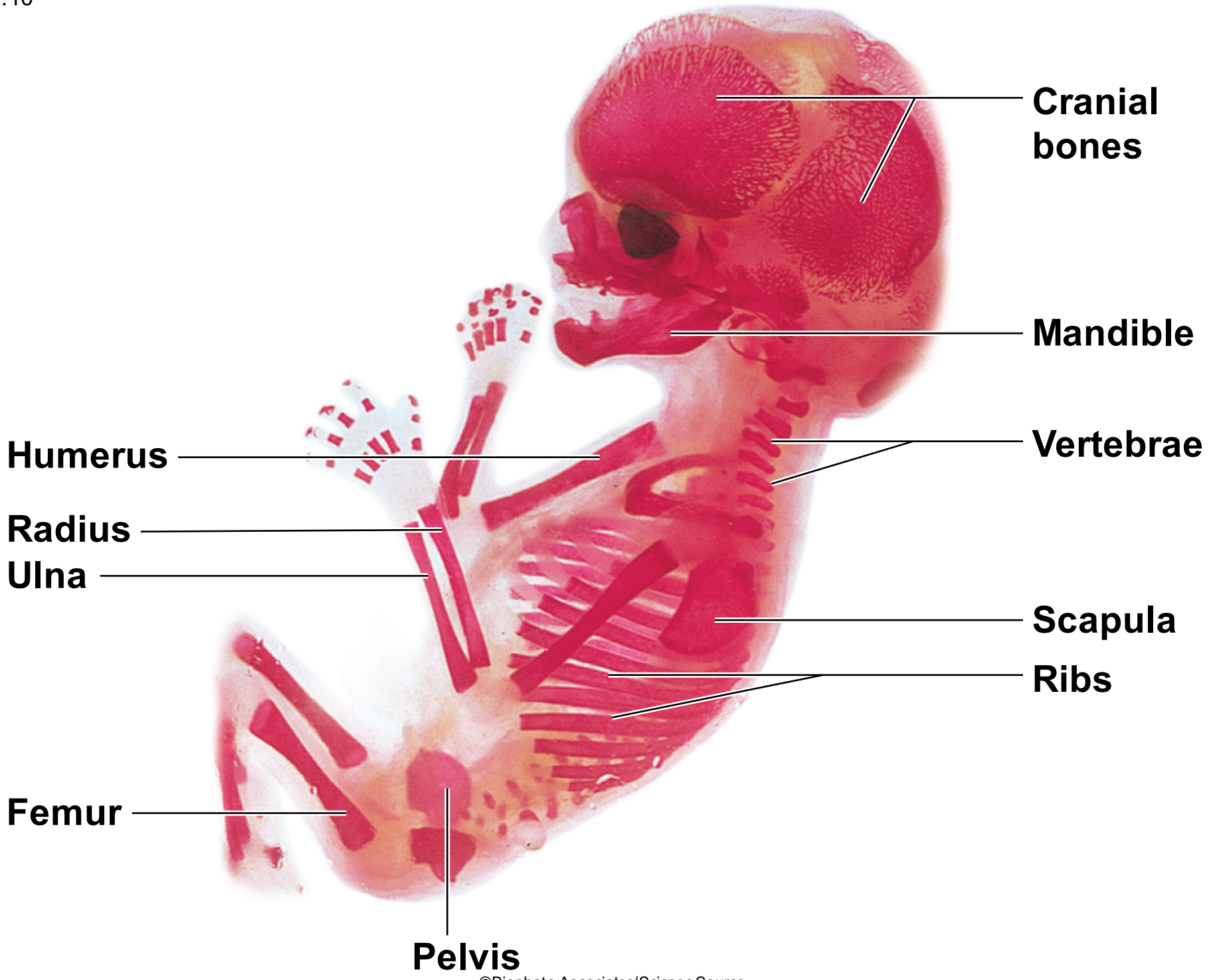

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Fig. 7.12

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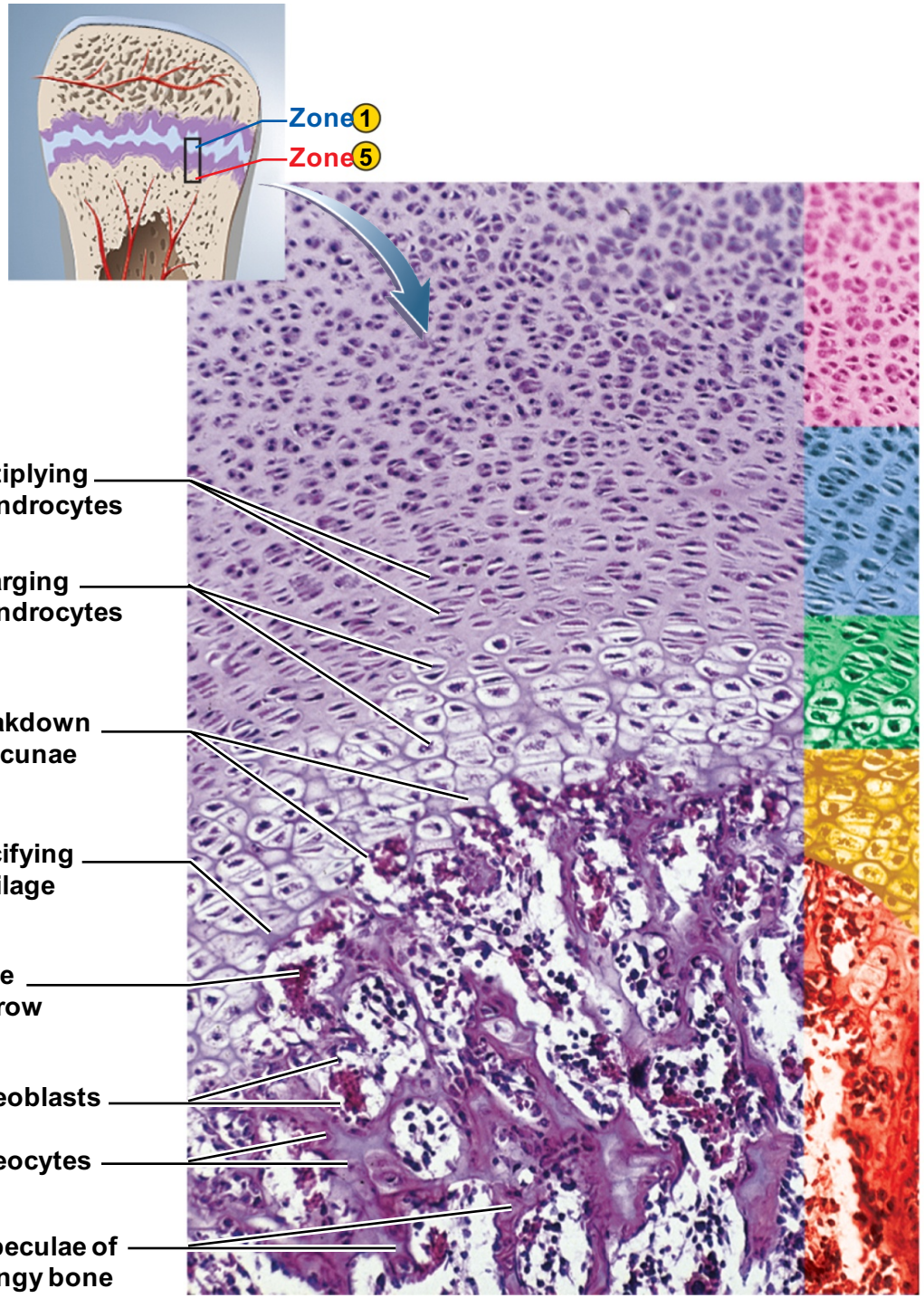

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1. **Zone of reserve cartilage**
   Typical histology of resting hyaline cartilage

2. **Zone of cell proliferation**
   Chondrocytes multiplying and lining up in rows of small flattened lacunae

3. **Zone of cell hypertrophy**
   Cessation of mitosis; enlargement of chondrocytes and thinning of lacuna walls

4. **Zone of calcification**
   Temporary calcification of cartilage matrix between columns of lacunae

5. **Zone of bone deposition**
   Breakdown of lacuna walls, leaving open channels; death of chondrocytes; bone deposition by osteoblasts, forming trabeculae of spongy bone

Fig. 7.14

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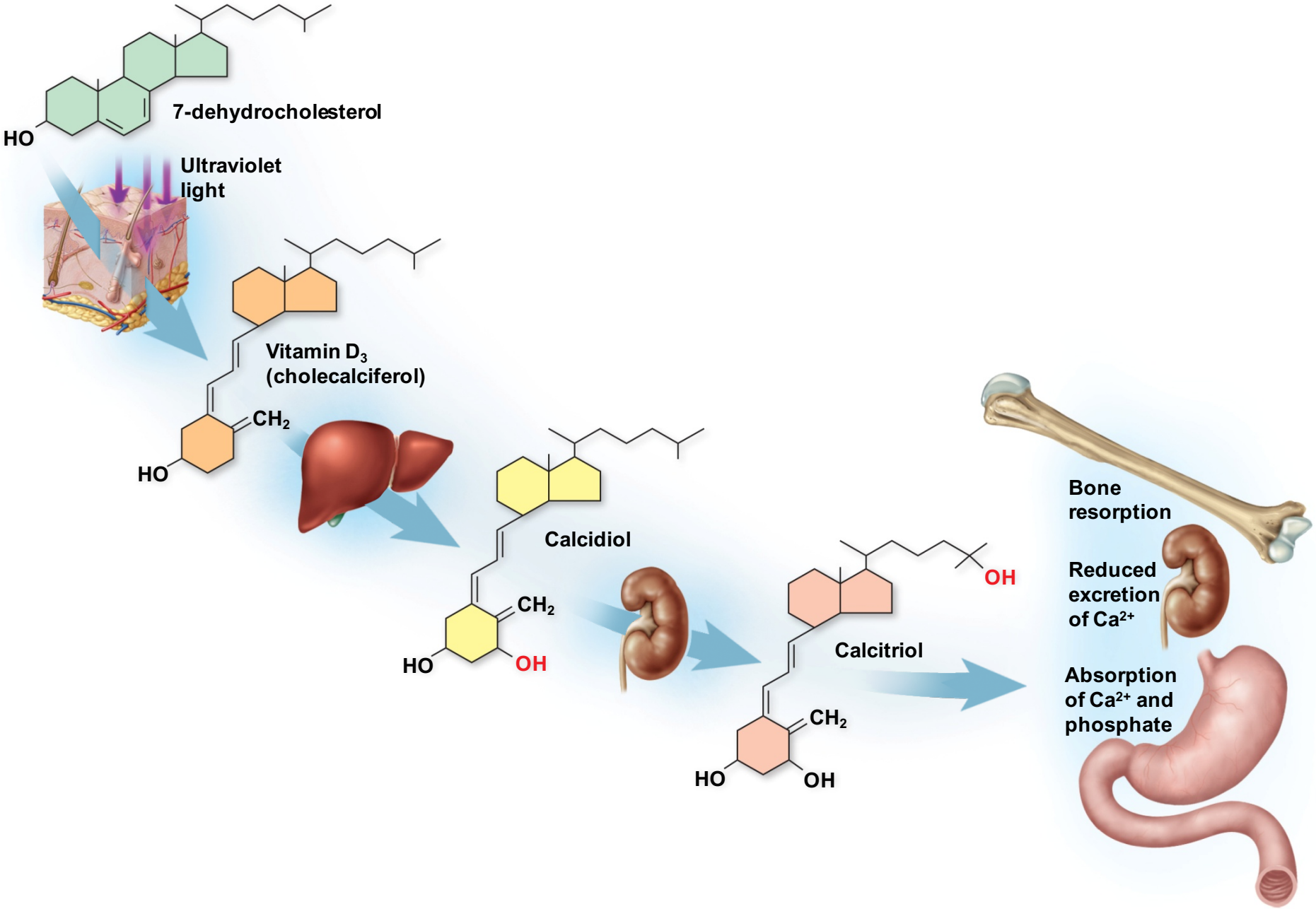

Fig. 7.16

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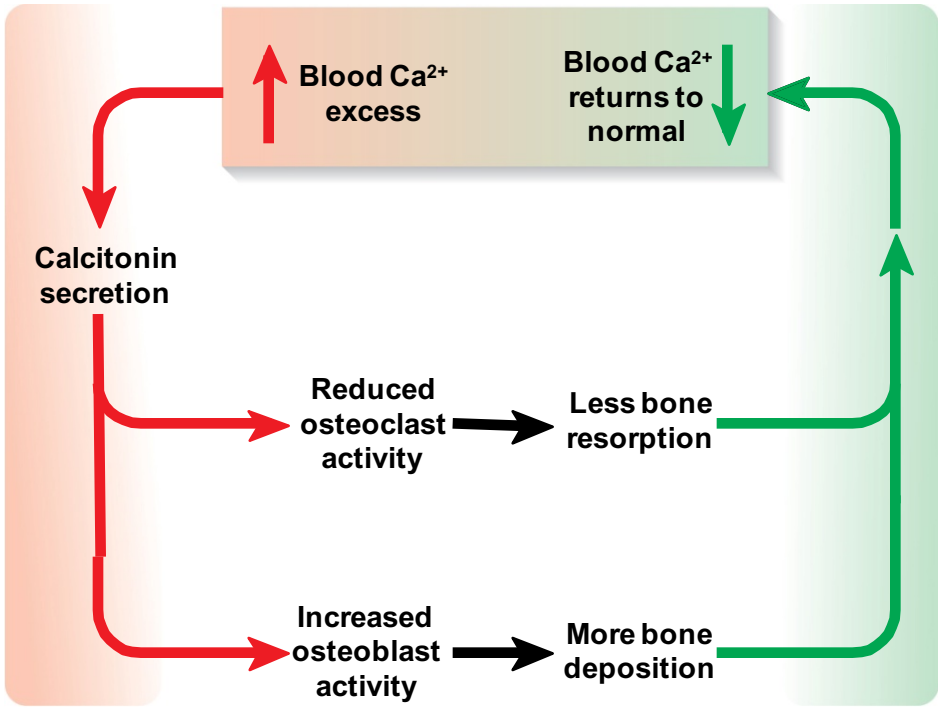
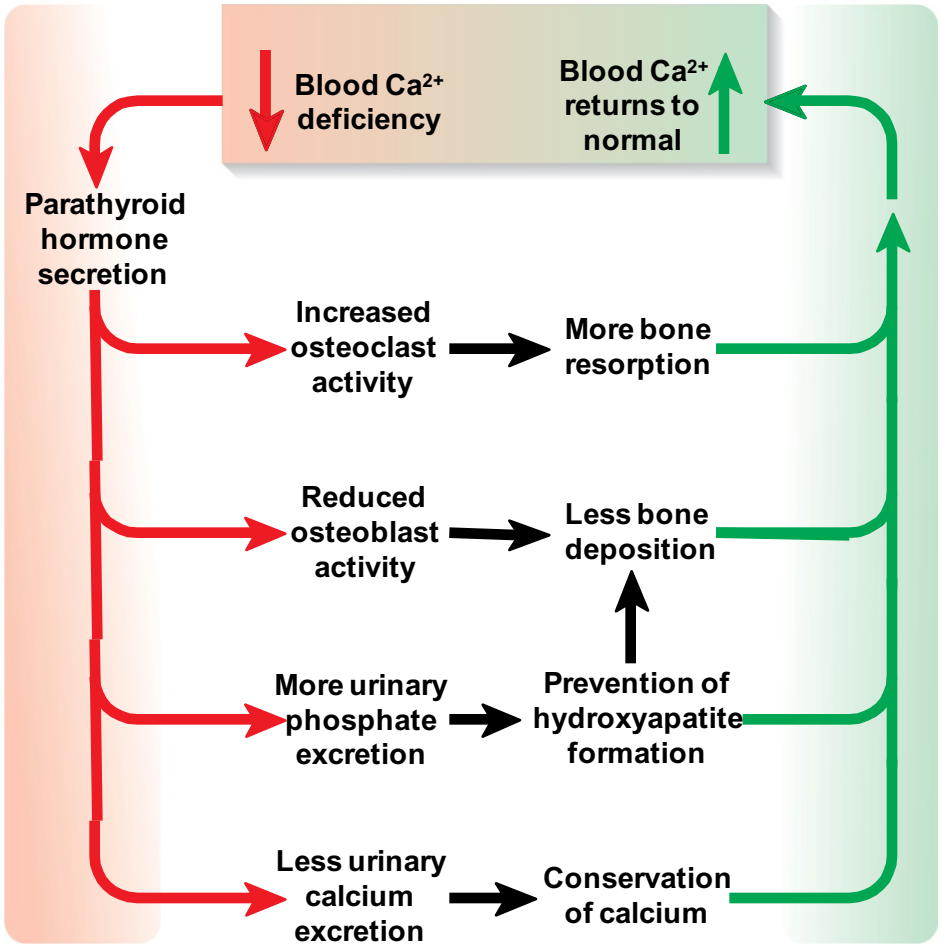


(a) Correction for hypercalcemia



(b) Correction for hypocalcemia

Fig. 7.18

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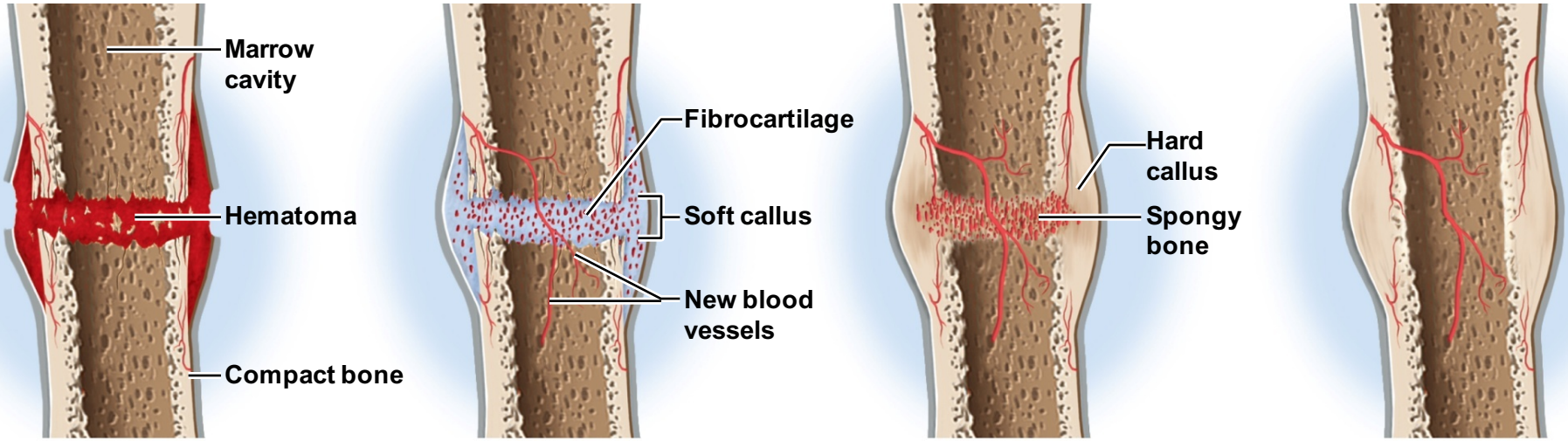

1 Hematoma formation
The hematoma is converted to granulation tissue by invasion of cells and blood capillaries.

2 Soft callus formation
Deposition of collagen and fibrocartilage converts granulation tissue to a soft callus.

3 Hard callus formation
Osteoblasts deposit a temporary bony collar around the fracture to unite the broken pieces while ossification occurs.

4 Bone remodeling
Small bone fragments are removed by osteoclasts, while osteoblasts deposit spongy bone and then convert it to compact bone.

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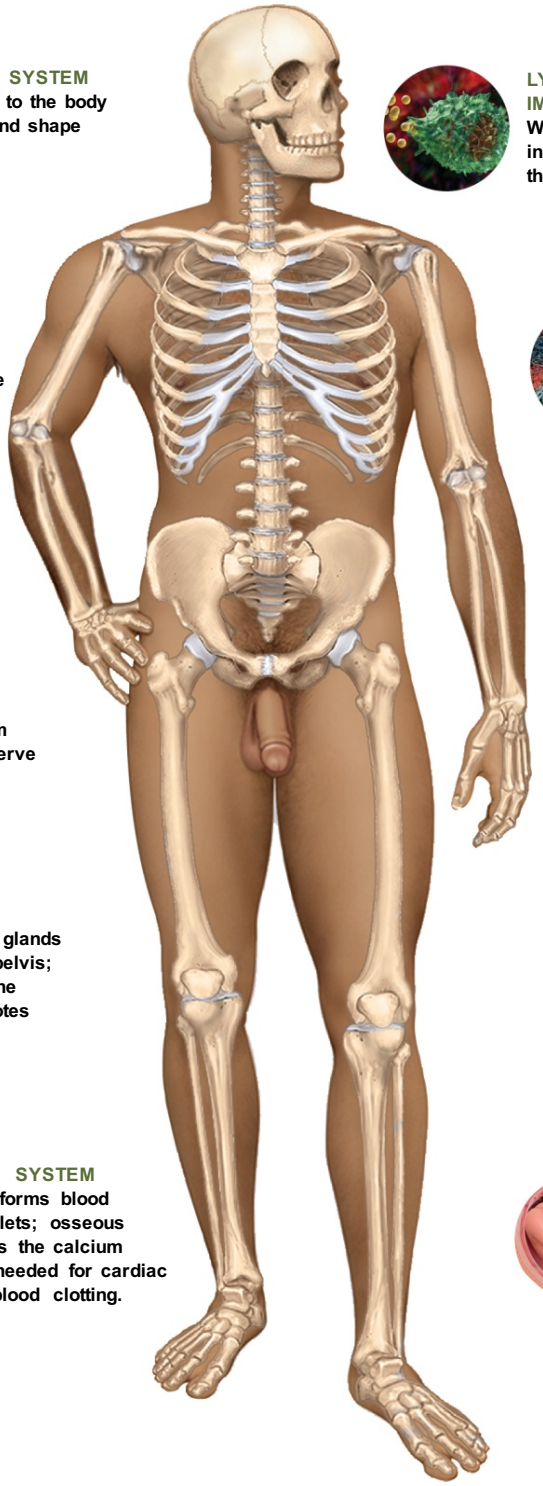


INTEGUMENTARY SYSTEM
Bones lying close to the body surface support and shape the skin.

LYMPHATIC/ IMMUNE SYSTEM
White blood cells produced in the bone marrow carry out the body's immune functions.

MUSCULAR SYSTEM
Bones are the attachment sites for most skeletal muscles and provide leverage for muscle action; calcium homeostasis, important for muscle contraction, is achieved partly through a balance between bone deposition and resorption.

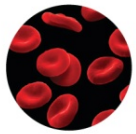
RESPIRATORY SYSTEM
Ventilation of the lungs is achieved by musculoskeletal actions of the thoracic cage; the thoracic cage protects the delicate lungs from trauma; bones support and shape the nasal cavity.

NERVOUS SYSTEM
The cranium and vertebral column protect the brain and spinal cord; osseous tissue provides the calcium homeostasis needed for nerve function.

URINARY SYSTEM
The thoracic cage partially protects the kidneys, and the pelvic girdle protects the lower urinary tract.

ENDOCRINE SYSTEM
Bones protect endocrine glands in the head, thorax, and pelvis; bones secrete the hormone osteocalcin, which promotes insulin action.

DIGESTIVE SYSTEM
Osseous tissue interacts with the digestive system in maintaining calcium homeostasis; the thoracic cage and pelvic girdle protect portions of the digestive tract; musculoskeletal movements are necessary for chewing.



CIRCULATORY SYSTEM
Bone marrow forms blood cells and platelets; osseous tissue provides the calcium homeostasis needed for cardiac function and blood clotting.

REPRODUCTIVE SYSTEM
The pelvic girdle protects the internal reproductive organs; childbirth is adapted to the anatomy of the female pelvic girdle; ligaments anchor the penis and clitoris to the pelvic girdle.