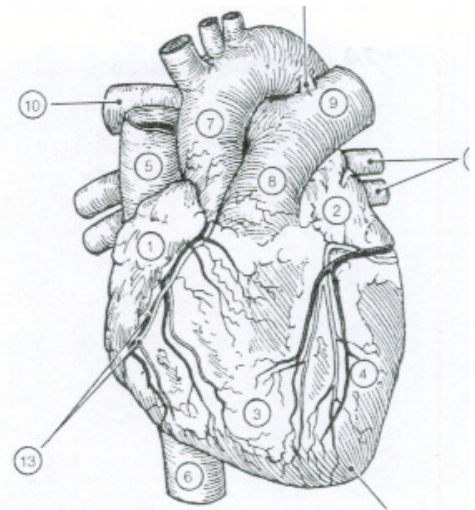


5 THE SKELETAL SYSTEM

Key



The skeleton is constructed of two of the most supportive tissues found in the human body—cartilage and bone. Besides supporting and protecting the body as an internal framework, the skeleton provides a system of levers that the skeletal muscles use to move the body. In addition, the bones provide a storage depot for substances such as lipids and calcium, and blood cell formation goes on within their red marrow cavities.

The skeleton consists of bones connected at joints, or articulations, and is subdivided into two divisions. The axial skeleton includes those bones that lie around the body's center of gravity. The appendicular skeleton includes the bones of the limbs.

Topics for student review include structure and function of long bones, location and naming of specific bones in the skeleton, fracture types, and a classification of joint types in the body.

BONES—AN OVERVIEW

1. Classify each of the following terms as a projection (*P*) or a depression or opening (*D*). Enter the appropriate letter in the answer blanks.

<u>P</u> 1. Condyle	<u>D</u> 4. Foramen	<u>P</u> 7. Ramus
<u>P</u> 2. Crest	<u>P</u> 5. Head	<u>P</u> 8. Spine
<u>D</u> 3. Fissure	<u>D</u> 6. Meatus	<u>P</u> 9. Tuberosity

2. Group each of the following bones into one of the four major bone categories. Use *L* for long bone, *S* for short bone, *F* for flat bone, and *I* for irregular bone. Enter the appropriate letter in the space provided.

<u>S</u> 1. Calcaneus	<u>L</u> 4. Humerus	<u>L</u> 7. Radius
<u>F</u> 2. Frontal	<u>F</u> 5. Mandible	<u>F</u> 8. Sternum
<u>L</u> 3. Femur	<u>L</u> 6. Metacarpal	<u>I</u> 9. Vertebra

3. Using the key choices, characterize the following statements relating to long bones. Enter the appropriate term(s) or letter(s) in the answer blanks.

Key Choices

- A. Diaphysis C. Epiphysis E. Yellow marrow cavity
 B. Epiphyseal plate D. Red marrow

- C; Epiphysis 1. Site of spongy bone in the adult
A; Diaphysis 2. Site of compact bone in the adult
C, D; Epiphysis, BM 3. Site of hematopoiesis in the adult
A; Diaphysis 4. Scientific name for bone shaft
E; Yellow 5. Site of fat storage in the adult
B; E. Plate 6. Site of longitudinal growth in a child

4. Complete the following statements concerning bone formation and destruction, using the terms provided in the key. Insert the key letter or corresponding term in the answer blanks.

Key Choices

- A. Atrophy C. Gravity E. Osteoclasts G. Parathyroid hormone
 B. Calcitonin D. Osteoblasts F. Osteocytes H. Stress and/or tension

- G; PTH 1. When blood calcium levels begin to drop below homeostatic levels, (1) is released, causing calcium to be released from bones.
F; Osteocytes 2. Mature bone cells, called (2), maintain bone in a viable state.
A; Atrophy 3. Disuse such as that caused by paralysis or severe lack of exercise results in muscle and bone (3).
H; Stress/Tension 4. Large tubercles and/or increased deposit of bony matrix occur at sites of (4).
D; Osteoblasts 5. Immature, or matrix-depositing, bone cells are referred to as (5).
B; Calcitonin 6. (6) causes blood calcium to be deposited in bones as calcium salts.
E; Osteoclasts 7. Bone cells that liquefy bone matrix and release calcium to the blood are called (7).
C; Gravity 8. Our astronauts must do isometric exercises when in space because bones atrophy under conditions of weightlessness or lack of (8).

7. Figure 5-2A is a midlevel, cross-sectional view of the diaphysis of the femur. Label the membrane that lines the cavity and the membrane that covers the outside surface.

Figure 5-2B is a drawing of a longitudinal section of the femur. Color the bone tissue gold. Do *not* color the articular cartilage; leave it white. Select different colors for the bone regions listed at the coding circles below. Color the coding circles and the corresponding regions on the drawing. Complete Figure 5-2B by labeling compact bone and spongy bone.

- Diaphysis
- Epiphyseal plate
- Area where red marrow is found
- Area where yellow marrow is found

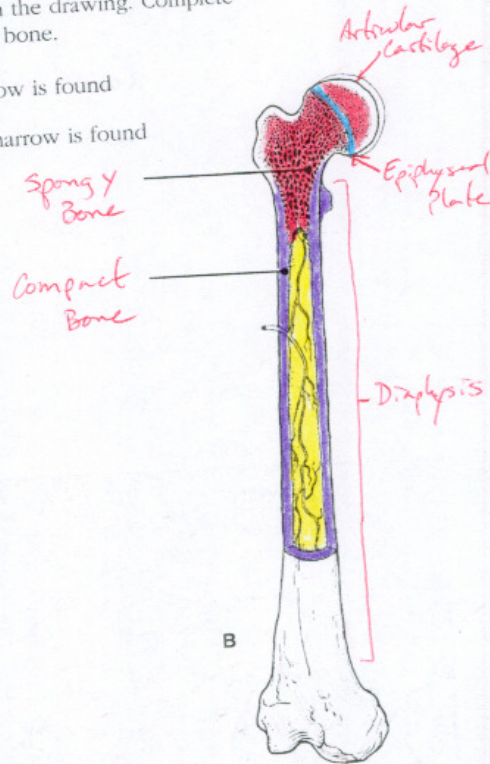
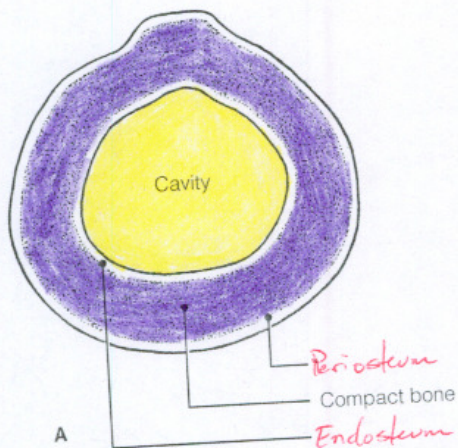


Figure 5-2

8. The following events apply to the endochondral ossification process as it occurs in the primary ossification center. Put these events in their proper order by assigning each a number (1-6).

- 4 1. Cavity formation occurs within the hyaline cartilage.
- 3 2. Collar of bone is laid down around the hyaline cartilage model just beneath the periosteum.
- 2 3. Periosteal bud invades the marrow cavity.
- 1 4. Perichondrium becomes vascularized to a greater degree and becomes a periosteum.
- 5 5. Osteoblasts lay down bone around the cartilage spicules in the bone's interior.
- 6 6. Osteoclasts remove the cancellous bone from the shaft interior, leaving a marrow cavity that houses fat.

AXIAL SKELETON

Skull

9. Using the key choices, identify the bones indicated by the following descriptions. Enter the appropriate term or letter in the answer blanks.

- | | | |
|----------------|--|--|
| <u>B</u> _____ | 1. Forehead bone | Key Choices
A. Ethmoid
B. Frontal
C. Hyoid
D. Lacrimals
E. Mandible
F. Maxillae
G. Nasals
H. Occipital
I. Palatines
J. Parietals
K. Sphenoid
L. Temporals
M. Vomer
N. Zygomatic |
| <u>N</u> _____ | 2. Cheekbone | |
| <u>E</u> _____ | 3. Lower jaw | |
| <u>G</u> _____ | 4. Bridge of nose | |
| <u>I</u> _____ | 5. Posterior part of hard palate | |
| <u>J</u> _____ | 6. Much of the lateral and superior cranium | |
| <u>H</u> _____ | 7. Most posterior part of cranium | |
| <u>K</u> _____ | 8. Single, irregular, bat-shaped bone, forming part of the cranial floor | |
| <u>D</u> _____ | 9. Tiny bones, bearing tear ducts | |
| <u>F</u> _____ | 10. Anterior part of hard palate | |
| <u>A</u> _____ | 11. Superior and middle nasal conchae formed from its projections | |
| <u>L</u> _____ | 12. Site of mastoid process | |
| <u>K</u> _____ | 13. Site of sella turcica | |
| <u>A</u> _____ | 14. Site of cribriform plate | |
| <u>E</u> _____ | 15. Site of mental foramen | |
| <u>L</u> _____ | 16. Site of styloid process | |
| <u>A</u> _____ | 17. <u>B</u> _____ | |
| | 18. Four bones, containing paranasal sinuses | |
| <u>F</u> _____ | 19. <u>K</u> _____ | |
| | 20. | |
| <u>H</u> _____ | 21. Its condyles articulate with the atlas | |
| <u>H</u> _____ | 22. Foramen magnum contained here | |
| <u>L</u> _____ | 23. Middle ear found here | |
| <u>M</u> _____ | 24. Nasal septum | |
| <u>A</u> _____ | 25. Bears an upward protrusion, the "cock's comb," or crista galli | |
| <u>L</u> _____ | 26. Site of external acoustic meatus | |

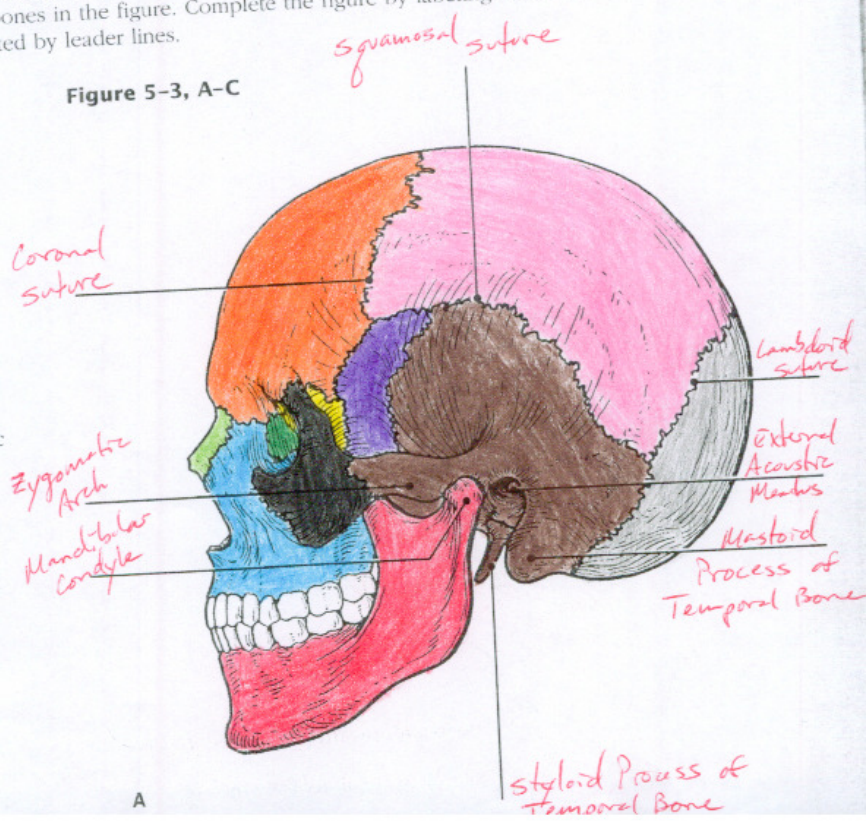
10. For each statement that is true, insert *T* in the answer blank. For false statements, correct the underlined words by inserting the correct words in the answer blanks.

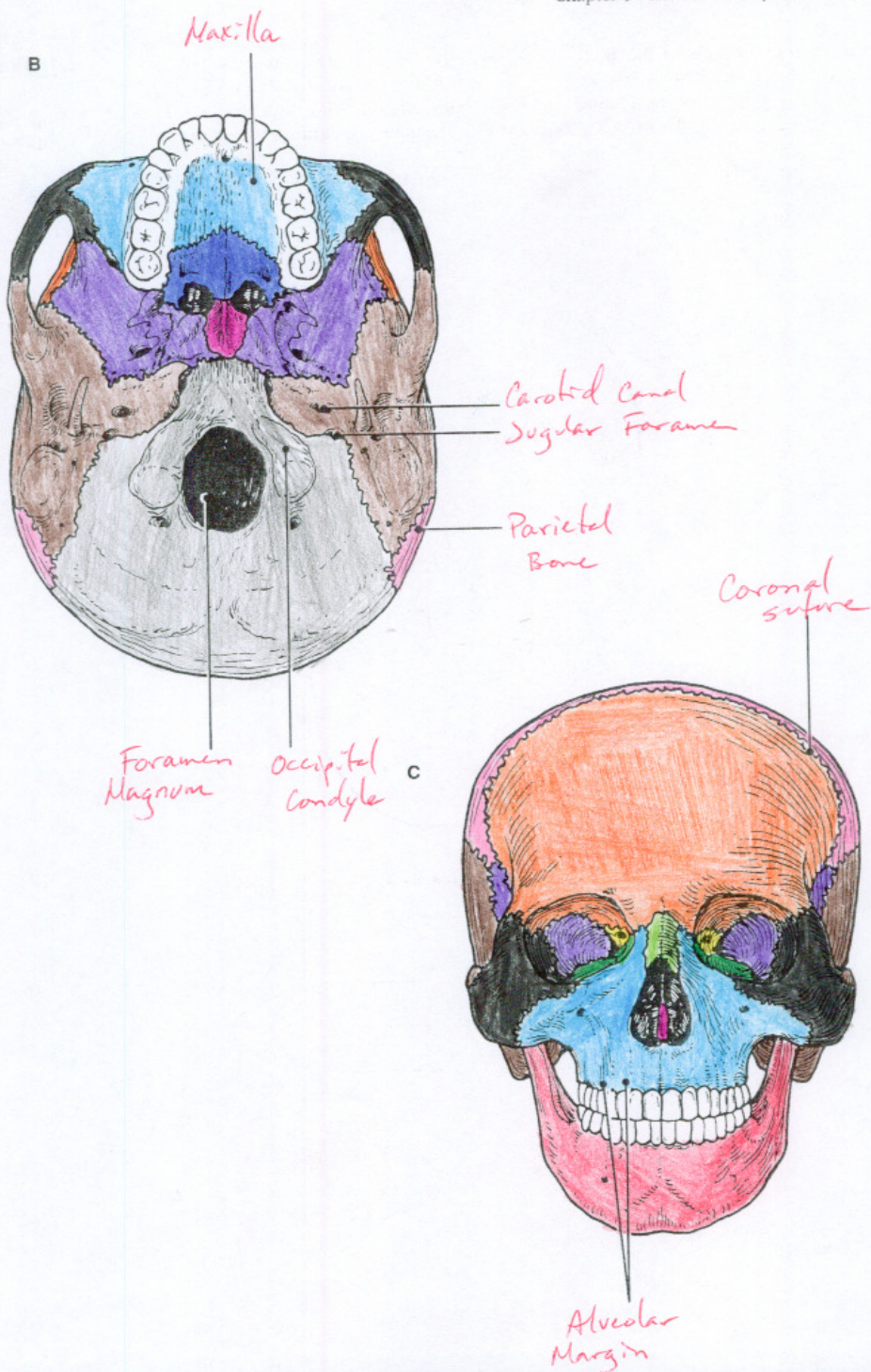
- Membranous _____ 1. When a bone forms from a fibrous membrane, the process is called endochondral ossification.
- T _____ 2. When trapped in lacunae, osteoblasts change into osteocytes.
- Osteoblasts _____ 3. Large numbers of osteocytes are found in the inner periosteum layer.
- Secondary _____ 4. Primary ossification centers appear in the epiphyses of a long bone.
- Agaline Carb. _____ 5. Epiphyseal plates are made of spongy bone.
- Endosteal _____ 6. In appositional growth, bone reabsorption occurs on the periosteal surface.
- T _____ 7. "Maturation" of newly formed (noncalcified) bone matrix takes about 10 days.

11. Figure 5-3, A-C shows lateral, anterior, and inferior views of the skull. Select different colors for the bones listed below and color the coding circles and corresponding bones in the figure. Complete the figure by labeling the bone markings indicated by leader lines.

- Frontal
- Parietal
- Mandible
- Maxilla
- Sphenoid
- Ethmoid
- Temporal
- Zygomatic
- Palatine
- Occipital
- Nasal
- Lacrimal
- Vomer

Figure 5-3, A-C





12. An anterior view of the skull, showing the positions of the sinuses, is provided in Figure 5-4. First select different colors for each of the sinuses and use them to color the coding circles and the corresponding structures on the figure. Then briefly answer the following questions concerning the sinuses.

- Sphenoid sinus
- Ethmoid sinuses
- Frontal sinus
- Maxillary sinus

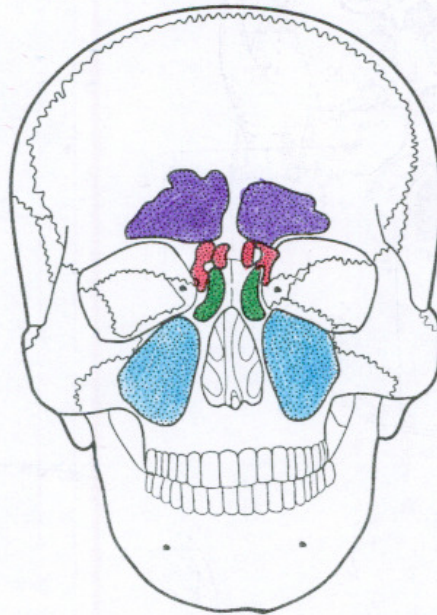


Figure 5-4

1. What are sinuses? Mucous Membrane-lined, hollow bone cavities
2. What purpose do they serve in the skull? Lighten the facial bones and act as resonating chambers for speech.
3. Why are they so susceptible to infection? Mucosa is part of nasal passages, which can easily become clogged/congested.

Vertebral Column

13. Using the key choices, correctly identify the vertebral parts/areas described as follows. Enter the appropriate term(s) or letter(s) in the spaces provided.

Key Choices

- | | | |
|----------------------------|-------------------------------|-----------------------|
| A. Body | C. Spinous process | E. Transverse process |
| B. Intervertebral foramina | D. Superior articular process | F. Vertebral arch |

- F _____ 1. Structure that encloses the nerve cord
- A _____ 2. Weight-bearing part of the vertebra
- C, E _____ 3. Provide(s) levers for the muscles to pull against
- A, E _____ 4. Provide(s) an articulation point for the ribs
- B _____ 5. Openings allowing spinal nerves to pass

14. The following statements provide distinguishing characteristics of the vertebrae composing the vertebral column. Using the key choices, identify each described structure or region by inserting the appropriate term(s) or letter(s) in the spaces provided.

Key Choices

- | | | |
|------------------------------|--------------------|----------------------|
| A. Atlas | D. Coccyx | F. Sacrum |
| B. Axis | E. Lumbar vertebra | G. Thoracic vertebra |
| C. Cervical vertebra—typical | | |

- C _____ 1. Type of vertebra(e) containing foramina in the transverse processes, through which the vertebral arteries ascend to reach the brain
- B _____ 2. Its dens provides a pivot for rotation of the first cervical vertebra
- G _____ 3. Transverse processes have facets for articulation with ribs; spinous process points sharply downward
- F _____ 4. Composite bone; articulates with the hip bone laterally
- E _____ 5. Massive vertebrae; weight-sustaining
- D _____ 6. Tailbone; vestigial fused vertebrae
- A _____ 7. Supports the head; allows the rocking motion of the occipital condyles
- C _____ 8. Seven components; unfused
- G _____ 9. Twelve components; unfused

15. Complete the following statements by inserting your answers in the answer blanks.

- Kyphosis 1. In describing abnormal curvatures, it could be said that (1) is an exaggerated thoracic curvature, and in (2) the vertebral column is displaced laterally.
- Scoliosis 2.
- Fibrocartilage 3. Intervertebral discs are made of (3) tissue. The discs provide (4) to the spinal column.
- Flexibility 4.

16. Figure 5-5, A-D shows superior views of four types of vertebrae. In the spaces provided below each vertebra, indicate in which region of the spinal column it would be found. In addition, specifically identify Figure 5-5A. Where indicated by leader lines, identify the vertebral body, spinous and transverse processes, superior articular processes, and vertebral foramen.

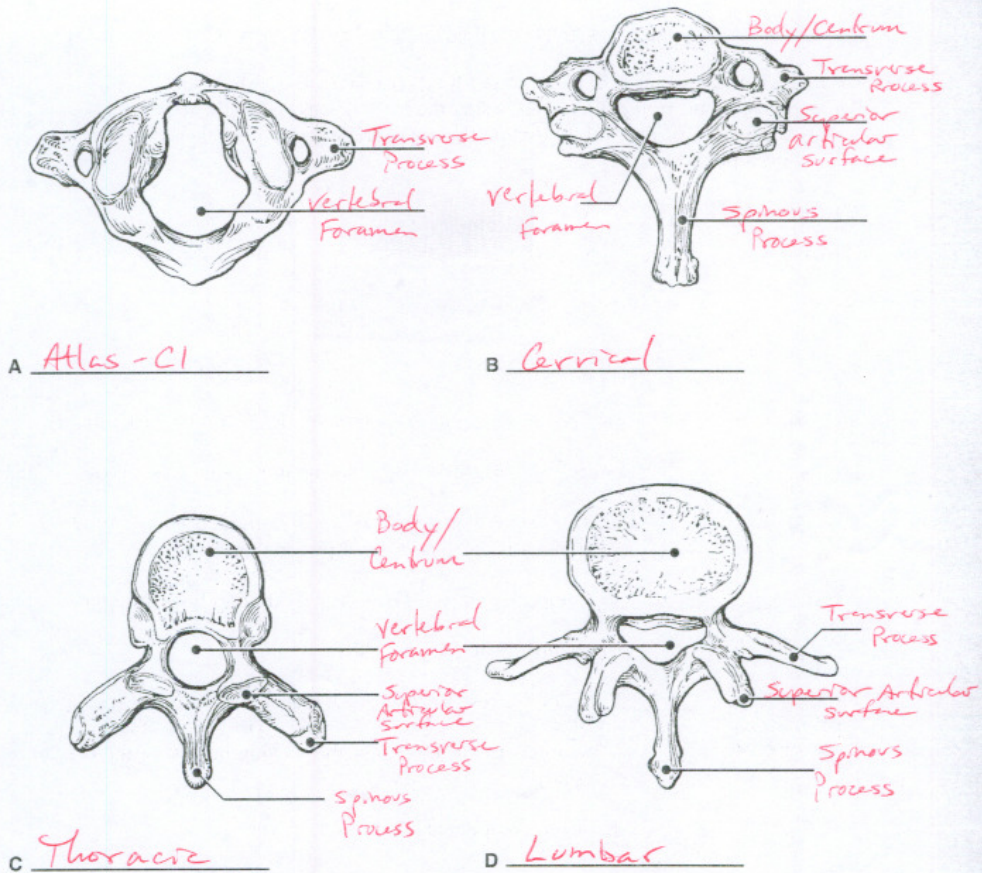


Figure 5-5

17. Figure 5-6 is a lateral view of the vertebral column. Identify each numbered region of the column by listing in the numbered answer blanks the region name first and then the specific vertebrae involved (for example, sacral region, S# to S#). Also identify the modified vertebrae indicated by numbers 6 and 7 in Figure 5-6. Select different colors for each vertebral region and use them to color the coding circles and the corresponding regions.

- 1. Cervical C₁-C₇ ●
- 2. Thoracic T₁-T₁₂ ●
- 3. Lumbar L₁-L₅ ●
- 4. Sacrum ●
- 5. Coccyx ●
- 6. Atlas C₁ ●
- 7. Axis C₂ ●

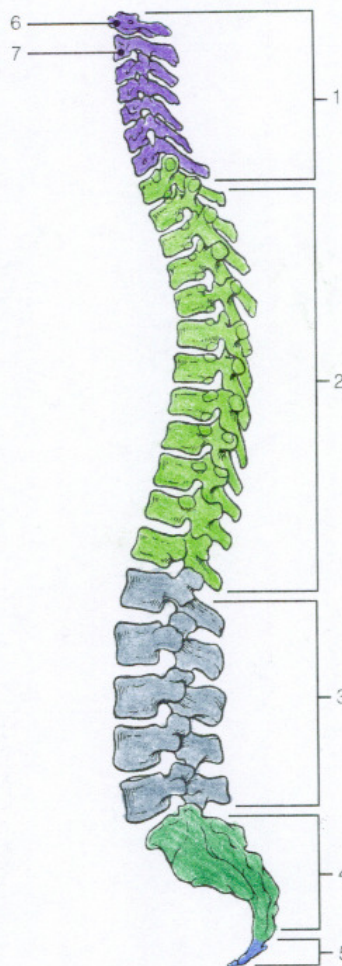


Figure 5-6

Thoracic Cage

18. Complete the following statements referring to the thoracic cage by inserting your responses in the answer blanks.

- Lungs 1. The organs protected by the thoracic cage include the (1)
Heart 2. and the (2). Ribs 1 through 7 are called (3) ribs,
True 3. whereas ribs 8 through 12 are called (4) ribs. Ribs 11 and
False 4. 12 are also called (5) ribs. All ribs articulate posteriorly
with the (6), and most connect anteriorly to the (7),
either directly or indirectly.
- Floating 5. The general shape of the thoracic cage is (8).
Thoracic Vertebrae 6.
Sternum 7.
Inverted Cone 8.

19. Figure 5-7 is an anterior view of the thoracic cage. Select different colors to identify the structures below and color the coding circles and corresponding structures. Then label the subdivisions of the sternum indicated by leader lines.

- All true ribs
- All false ribs
- Costal cartilages
- Sternum

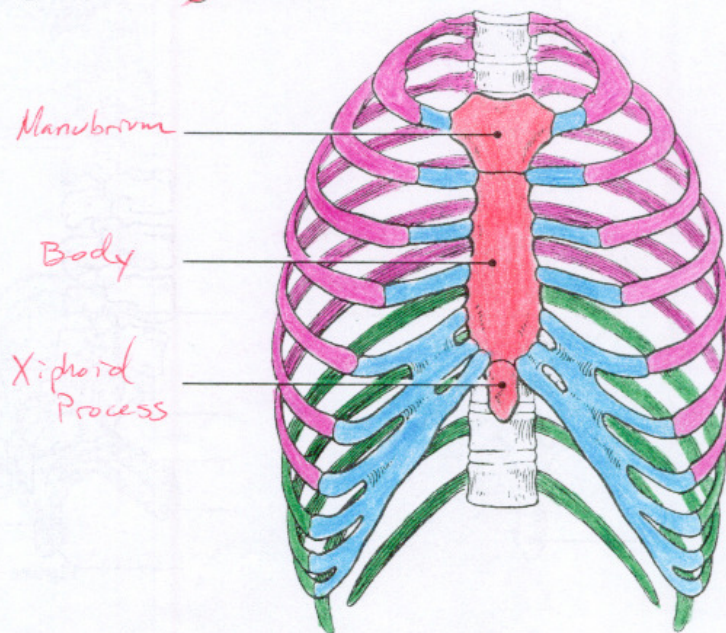


Figure 5-7