Chapter 5
Skeletal System
Study Guide Answers
THE SKELETAL SYSTEM

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.

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

1. Site of spongy bone in the adult  
2. Site of compact bone in the adult  
3. Site of hematopoiesis in the adult  
4. Scientific name for bone shaft  
5. Site of fat storage in the adult  
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  
B. Calcitonin  
C. Gravity  
D. Osteoblast  
E. Osteoclast  
F. Osteocytes  
G. Parathyroid hormone  
H. Stress and/or tension

1. When blood calcium levels begin to drop below homeostatic levels, (G) is released, causing calcium to be released from bones.  
2. Mature bone cells, called (F), maintain bone in a viable state.  
3. Diseuse such as that caused by paralysis or severe lack of exercise results in muscle and bone (A).  
4. Large tubercles and/or increased deposit of bony matrix occur at sites of (H).  
5. Immature, or matrix-depositing, bone cells are referred to as (D).  
6. (B) causes blood calcium to be deposited in bones as calcium salts.  
7. Bone cells that liquify bone matrix and release calcium to the blood are called (E).  
8. Our astronauts must do isometric exercises when in space because bones atrophy under conditions of weightlessness or lack of (C).
5. Five descriptions of bone structure are provided in Column A. First identify the structure by choosing the appropriate term from Column B and placing the corresponding answer in the answer blank. Then consider Figure 5-1A, a diagrammatic view of a cross section of bone, and Figure 5-1B, a higher magnified view of compact bone tissue. Select different colors for the structures and bone areas in Column B, and use them to color the coding circles and corresponding structures on the figure diagrams. Because the concentric lamellae would be difficult to color without confusing other elements, identify one lamella by using a bracket and label.

**Column A**

- B LAMELLAE
  1. Layers of calcified matrix
- C LACUNAE
  2. "Residences" of osteocytes
- A CANAL
  3. Longitudinal canal, carrying blood vessels and nerves
- E BONE MATRIX
  4. Nonliving, structural part of bone
- D CANALICULI
  5. Tiny canals, connecting lacunae

**Column B**

- A. Central (Haversian) canal
- B. Concentric lamellae
- C. Lacunae
- D. Canaliculi
- E. Bone matrix
- F. Osteocyte

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**Figure 5-1**

A[的笑容]

B[的笑容]
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
- Area where red marrow is found
- Epiphyseal plate
- Area where yellow marrow is found

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

2. When trapped in lacunae, osteoblasts change into osteocytes.

**Osteoblast**

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. Epiphyseal plates are made of spongy bone.

**Hyaline Cartilage**

5. In appositional growth, bone reabsorption occurs on the periosteal surface.

**Endosteal**

6. "Maturation" of newly formed (noncalcified) bone matrix takes about 10 days.
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.

<table>
<thead>
<tr>
<th>Bone</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B FRONTAL</td>
<td>1. Forehead bone</td>
</tr>
<tr>
<td>N ZYGOMATIC</td>
<td>2. Cheekbone</td>
</tr>
<tr>
<td>E MANDIBLE</td>
<td>3. Lower jaw</td>
</tr>
<tr>
<td>G NASALS</td>
<td>4. Bridge of nose</td>
</tr>
<tr>
<td>I PALATINES</td>
<td>5. Posterior part of hard palate</td>
</tr>
<tr>
<td>J PARIETALS</td>
<td>6. Much of the lateral and superior cranium</td>
</tr>
<tr>
<td>H OCCIPITAL</td>
<td>7. Most posterior part of cranium</td>
</tr>
<tr>
<td>K SPHENOID</td>
<td>8. Single, irregular, bat-shaped bone, forming part of the cranial floor</td>
</tr>
<tr>
<td>D LACRIMALS</td>
<td>9. Tiny bones, bearing tear ducts</td>
</tr>
<tr>
<td>F MAXILLAE</td>
<td>10. Anterior part of hard palate</td>
</tr>
<tr>
<td>A ETHMOID</td>
<td>11. Superior and middle nasal conchae formed from its projections</td>
</tr>
<tr>
<td>L TEMPORALS</td>
<td>12. Site of mastoid process</td>
</tr>
<tr>
<td>K SPHENOID</td>
<td>13. Site of sella turcica</td>
</tr>
<tr>
<td>A ETHMOID</td>
<td>14. Site of cribiform plate</td>
</tr>
<tr>
<td>E MANDIBLE</td>
<td>15. Site of mental foramen</td>
</tr>
<tr>
<td>L TEMPORAL</td>
<td>16. Site of styloid process</td>
</tr>
<tr>
<td>A ETHMOID</td>
<td>17. B FRONTAL 18. Four bones, containing paranasal sinuses</td>
</tr>
<tr>
<td>H OCCIPITAL</td>
<td>21. Its condyles articulate with the atlas</td>
</tr>
<tr>
<td>H OCCIPITAL</td>
<td>22. Foramen magnum contained here</td>
</tr>
<tr>
<td>L TEMPORALS</td>
<td>23. Middle ear found here</td>
</tr>
<tr>
<td>M VOMER</td>
<td>24. Nasal septum</td>
</tr>
<tr>
<td>A ETHMOID</td>
<td>25. Bears an upward protrusion, the &quot;cock's comb,&quot; or crista galli</td>
</tr>
<tr>
<td>L TEMPORAL</td>
<td>26. Site of external acoustic meatus</td>
</tr>
</tbody>
</table>

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
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 Air Cavities**

2. What purpose do they serve in the skull? **Lighten the Skull, Warm & Add Humidity to Air, Act As Resonance Chambers For Speech.**

3. Why are they so susceptible to infection? **Air Breathe in Contains Pathogens.**
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
B. Intervertebral foramina
C. Spinous process
D. Superior articular process
E. Transverse process
F. Vertebral arch

1. Structure that encloses the nerve cord
2. Weight-bearing part of the vertebra
3. Provide(s) levers for the muscles to pull against
4. Provide(s) an articulation point for the ribs
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
B. Axis
C. Cervical vertebra—typical
D. Coccyx
E. Lumbar vertebra
F. Sacrum
G. Thoracic vertebra

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

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. Invertebral discs are made of __ (3) __ tissue. The discs provide __ (4) __ to the spinal column.
FLEXIBILITY OR CUSHIONING 4.

Thoracic Cage

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

LUNGS 5. The organs protected by the thoracic cage include the __ (1) __ and the __ (2) __. Ribs 1 through 7 are called __ (3) __ ribs, whereas ribs 8 through 12 are called __ (4) __ ribs. Ribs 11 and 12 are also called __ (5) __ ribs. All ribs articulate posteriorly with the __ (6) __, and most connect anteriorly to the __ (7) __, either directly or indirectly.
HEART 2.

TRUE 3.

FALSE 4.

FLOATING 5. The general shape of the thoracic cage is __ (8) __.

THORACIC VERTEBRAE 6.

STERNUM 7.

INVERTED CONE 8.

23. Compare the pectoral and pelvic girdles by choosing descriptive terms from the key choices. Insert the appropriate key letters in the answer blanks.

Key Choices
A. Flexibility  D. Shallow socket for limb attachment
B. Massive      E. Deep, secure socket for limb attachment
C. Lightweight   F. Weight-bearing

Pectoral: __ A, C, D __ Pelvic: __ B, E, F __
24. Using the key choices, identify the bone names or markings according to the descriptions that follow. Insert the appropriate term or letter in the answer blanks.

**Key Choices**

|--------------|--------------|------------|-------------|---------------------|-------------------|-----------------------|-------------------|------------|----------------|---------------------|----------------------|-------------|----------------------|----------|-------------|-------------|----------------------|-------------|---------|

**Deltoide Tuberosity**

1. Raised area on lateral surface of humerus to which deltoide muscle attaches

**I. Humerus**

2. Arm bone

**D. Clavicle**

3. **P. Scapula**

4. Bones composing the shoulder girdle

**O. Radius**

5. **T. Ulna**

6. Forearm bones

**A. Acromion**

7. Point where scapula and clavicle connect

**P. Scapula**

8. Shoulder girdle bone that has no attachment to the axial skeleton

**D. Clavicle**

9. Shoulder girdle bone that articulates anteriorly with the sternum

**H. Glenoid Cavity**

10. Socket in the scapula for the arm bone

**E. Coracoid Process**

11. Process above the glenoid cavity that permits muscle attachment

12. Commonly called the collarbone

**D. Clavicle**

13. Distal medial process of the humerus; joins the ulna

**T. Ulna**

14. Medial bone of the forearm in anatomical position

**B. Capitulum**

15. Rounded knob on the humerus that articulates with the radius

**F. Coronoid Fossa**

16. Anterior depression; superior to the trochlea; receives part of the ulna when the forearm is flexed

**T. Ulna**

17. Forearm bone involved in formation of elbow joint

**P. Scapula**

18. **Q. Sternum**

19. Bones that articulate with the clavicle

**C. Carpals**

20. Bones of the wrist

**M. Phalanges**

21. Bones of the fingers

**J. Metacarpals**

22. Heads of these bones form the knuckles

**Continued...**
APPENDICULAR SKELETON

27. Using the key choices, identify the bone names and markings, according to the descriptions that follow. Insert the appropriate key term(s) or letter(s) in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>A. Acetabulum</th>
<th>I. Ilium</th>
<th>Q. Patella</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Calcaneus</td>
<td>J. Ischial tuberosity</td>
<td>R. Pubic symphysis</td>
</tr>
<tr>
<td>C. Femur</td>
<td>K. Ischium</td>
<td>S. Pubis</td>
</tr>
<tr>
<td>D. Fibula</td>
<td>L. Lateral malleolus</td>
<td>T. Sacroiliac joint</td>
</tr>
<tr>
<td>E. Gluteal tuberosity</td>
<td>M. Lesser sciatic notch</td>
<td>U. Talus</td>
</tr>
<tr>
<td>F. Greater sciatic notch</td>
<td>N. Medial malleolus</td>
<td>V. Tarsals</td>
</tr>
<tr>
<td>G. Greater and lesser trochanters</td>
<td>O. Metatarsals</td>
<td>W. Tibia</td>
</tr>
<tr>
<td>H. Iliac crest</td>
<td>P. Obturator foramen</td>
<td>X. Tibial tuberosity</td>
</tr>
</tbody>
</table>

1. Fuse to form the coxal bone (hip bone)
2. Receives the weight of the body when sitting
3. Point where the coxal bones join anteriorly
4. Upper margin of iliac bones
5. Deep socket in the hip bone that receives the head of the thigh bone
6. Point where the axial skeleton attaches to the pelvic girdle
7. Longest bone in body; articulates with the coxal bone
8. Lateral bone of the leg
9. Medial bone of the leg
10. Bones forming the knee joint
11. Point where the patellar ligament attaches
12. Kneecap
13. Shinbone
14. Distal process on medial tibial surface
15. Process forming the outer ankle
16. Heel bone

CONTINUED →
17. Bones of the ankle
18. Bones forming the instep of the foot
19. Opening in a coxal bone formed by the pubic and ischial rami
20. Site of muscle attachment on the proximal end of the femur
21. Tarsal bone that articulates with the tibia

For each of the following statements that are true, insert T in the answer blank.
If any of the statements are false, correct the underlined term by inserting the correct term in the answer blank.

**PELVIC**
1. The pectoral girdle is formed by the articulation of the hip bones and the sacrum.

**PHALANGES**
2. Bones present in both the hand and the foot are **carpals**.

**T**
3. The tough, fibrous connective tissue covering of a bone is the periosteum.

**ACETABULUM**
4. The point of fusion of the three bones forming a coxal bone is the glenoid cavity.

**SCIATIC**
5. The large nerve that must be avoided when giving injections into the buttock muscles is the femoral nerve.

**T**
6. The long bones of a fetus are constructed of **hyaline** cartilage.

**PELVIC BONES**
7. Bones that provide the most protection to the abdominal viscera are the ribs.

**T**
8. The largest foramen in the skull is the foramen magnum.

**FEMUR**
9. The intercondylar fossa, greater trochanter, and tibial tuberosity are all bone markings of the humerus.

**T**
10. The first major event of fracture healing is hematoma formation.
BONE FRACTURES

31. Using the key choices, identify the fracture (fx) types shown in Figure 5-14 and the fracture types and treatments described below. Enter the appropriate key letter or term in each answer blank.

Key Choices
A. Closed reduction
B. Compression fracture
C. Compound fracture
D. Depressed fracture
E. Greenstick fracture
F. Open reduction
G. Simple fracture
H. Spiral fracture

1. Bone is broken cleanly; the ends do not penetrate the skin
2. Nonsurgical realignment of broken bone ends and splinting of bone
3. A break common in children; bone splinters, but break is incomplete
4. A fracture in which the bone is crushed; common in the vertebral column
5. A fracture in which the bone ends penetrate through the skin surface
6. Surgical realignment of broken bone ends
7. A result of twisting forces

Figure 5-14
For each of the following statements that is true about bone breakage and the repair process, insert T in the answer blank. For false statements, correct the underlined terms by inserting the correct term in the answer blank.

1. A **hematoma** usually forms at a fracture site.  
2. Deprived of nutrition, **osteocytes** at the fracture site die.
3. Nonbony debris at the fracture site is removed by **osteoclasts**.
4. Growth of a new capillary supply into the region produces **granulation tissue**.
5. Osteoblasts from the **medullary cavity** migrate to the fracture site.
6. The **fibrocartilage callus** is the first repair mass to splint the broken bone.
7. The bony callus is initially composed of **compact** bone.

**JOINTS**

3. Figure 5-15 shows the structure of a typical diarthrotic joint. Select different colors to identify each of the following areas and use them to color the coding circles and the corresponding structures on the figure. Then, complete the statements below the figure.

- **Articular cartilage of bone ends**
- **Fibrous capsule**
- **Synovial membrane**
- **Joint cavity**

**Figure 5-15**

1. **SYNOVIAL FLUID** The lubricant that minimizes friction and abrasion of joint surfaces is (1).
2. **HYALINE OR ARTICULAR CARTILAGE** The resilient substance that keeps bone ends from crushing when compressed is (2).
3. **LIGAMENTS** (3) which reinforce the fibrous capsule, help to prevent dislocation of the joint.
34. For each joint described below, select an answer from Key A. Then, if the Key A selection is other than C (a synovial joint), see if you can classify the joint further by making a choice from Key B.

**Key Choices**

**Key A:**
- A. Cartilaginous
- B. Fibrous
- C. Synovial

**Key B:**
- 1. Epiphyseal disk
- 2. Suture
- 3. Symphysis

- **A**
  - 1. Has amphiarthritic and synarthritic examples

- **C**
  - 2. All have a fibrous capsule lined with synovial membrane surrounding a joint cavity

- **B, 2**
  - 3. Bone regions united by fibrous connective tissue

- **B, 2**
  - 4. Joints between skull bones

- **C**
  - 5. Joint between the atlas and axis

- **C**
  - 6. Hip, elbow, and knee

- **C**
  - 7. All examples are diarthroses

- **A, 3**
  - 8. Pubic symphysis

- **C**
  - 9. All are reinforced by ligaments

- **B, 2**
  - 10. Joint providing the most protection to underlying structures

- **C**
  - 11. Often contains a fluid-filled cushion

- **A, 1**
  - 12. Child's long-bone growth plate made of hyaline cartilage

- **C**
  - 13. Most joints of the limbs

- **C**
  - 14. Often associated with bursae

- **C**
  - 15. Have the greatest mobility

35. Which structural joint type is not commonly found in the axial skeleton and why not?

S **YNOVIAL JOINTS (DIARTHRITIC JOINTS), THEY ARE FREELY MOVABLE JOINTS AND THE AXIAL SKELETON IS DESIGNED FOR STRENGTH; NOT MOBILITY**
Homeostatic Imbalances of Bones and Joints

36. For each of the following statements that is true, enter T in the answer blank. For each false statement, correct the underlined words by writing the correct words in the answer blank.

1. In a sprain, the ligaments reinforcing a joint are excessively stretched or torn.

2. Underlined: Age-related erosion of articular cartilages and formation of painful bony spurs are characteristic of gouty arthritis.

3. Chronic arthritis usually results from bacterial invasion.

4. Underlined: Healing of a partially torn ligament is slow because its hundreds of fibrous strands are poorly aligned.

5. Rheumatoid arthritis is an autoimmune disease.

6. Underlined: High levels of uric acid in the blood may lead to rheumatoid arthritis.

7. A “soft” bone condition in children, usually caused by a lack of calcium or vitamin D in the diet, is called osteomyelitis.

8. Atrophy and thinning of bone owing to hormonal changes or inactivity (generally in the elderly) is called osteoporosis.

Developmental Aspects of the Skeleton

37. Using the key choices, identify the body systems that relate to bone tissue viability. Enter the appropriate key terms or letters in the answer blanks.

Key Choices

A. Endocrine
B. Integumentary
C. Muscular
D. Nervous
E. Reproductive
F. Urinary

1. Conveys the sense of pain in bone and joints

2. Activates vitamin D for proper calcium usage

3. Regulates uptake and release of calcium by bones

4. Increases bone strength and viability by pulling action

5. Influences skeleton proportions and adolescent growth of long bones

Provides vitamin D for proper calcium absorption
34. Complete the following statements concerning fetal and infant skeletal development. Insert the missing words in the answer blanks.

**FONTANELS**
1. “Soft spots,” or membranous joints called (1) in the fetal skull, allow the skull to be (2) slightly during birth passage. They also allow for continued brain (3) during the later months of fetal development and early infancy. Eventually these soft spots are replaced by immovable joints called (4).

**COMPRESSED**
2.

**GROWTH**
3.

**SUTURES**
4.

**THORACIC**
5. The two spinal curvatures well developed at birth are the (5) and (6) curvatures. Because they are present at birth, they are called (7) curvatures. The secondary curvatures develop as the baby matures. The (8) curvature develops as the baby begins to lift his or her head. The (9) curvature matures when the baby begins to walk or assume the upright posture.
THE FINALE: MULTIPLE CHOICE

48. Select the best answer or answers from the choices given.

1. Important bone functions include:
   A. support of the pelvic organs
   B. protection of the brain
   C. providing levers for movement of the limbs
   D. protection of the skin and limb musculature
   E. storage of water

2. A passageway connecting neighboring osteocytes in an osteon is a:
   A. central canal
   B. lamella
   C. lacuna
   D. canaliculus
   E. perforating canal

3. What is the earliest event (of those listed) in endochondral ossification?
   A. Ossification of proximal epiphysis
   B. Appearance of the epiphyseal plate
   C. Invasion of the shaft by the periosteal bud
   D. Cavitation of the cartilage shaft
   E. Formation of secondary ossification centers

4. The growth spurt of puberty is triggered by:
   A. high levels of sex hormones
   B. the initial, low levels of sex hormones
   C. growth hormone
   D. parathyroid hormone
   E. calcitonin

5. Deficiency of which of the following hormones will cause dwarfism?
   A. Growth hormone
   B. Sex hormones
   C. Thyroid hormones
   D. Calcitonin
   E. Parathyroid hormone

6. Women suffering from osteoporosis are frequent victims of fractures of the vertebral.
   A. compound
   B. spiral
   C. comminuted
   D. compression
   E. depression

7. Which of the following bones are part of the axial skeleton?
   A. Vomer
   B. Clavicle
   C. Sternum
   D. Parietal
   E. Coxa bone

8. A blow to the cheek is most likely to break what superficial bone or bone part?
   A. Superciliary arches
   B. Zygomatic process
   C. Mandibular ramus
   D. Styloid process

9. Which of the following are part of the sphenoid?
   A. Crista galli
   B. Pterygoid process
   C. Sella turcica
   D. Lesser wings
   E. Petrous portion

10. Structural characteristics of all cervical vertebrae are:
    A. small body
    B. bifid spinous process
    C. transverse foramina
    D. small vertebral foramen
    E. costal facets

11. Which of the following bones exhibit a styloid process?
    A. Hyaoid
    B. Radius
    C. Humerus
    D. Temporal
    E. Ulna
12. Hip bone markings include:
   A. ala  D. pubic ramus
   B. sacral hiatus  E. fovea capitis
   C. gluteal surface

13. Cartilaginous joints include:
   A. syndesmoses  C. synostoses
   B. symphyses  D. synchondroses

14. Considered to be part of a synovial joint are:
   A. bursae  C. tendon sheath
   B. articular cartilage  D. capsular ligaments

15. Abduction is:
   A. moving the right arm out to the right
   B. spreading out the fingers
   C. wiggling the toes
   D. moving the sole of the foot laterally

16. In comparing two joints of the same type, what characteristic(s) would you use to determine strength and flexibility?
   A. Depth of the depression of the concave bone of the joint
   B. Snugness of fit of the bones
   C. Size of bone projections for muscle attachments
   D. Presence of menisci

17. Which of the following joints has the greatest freedom of movement?
   A. interphalangeal
   B. saddle joint of thumb
   C. distal tibiofibular
   D. Coxal

18. Which specific joint does the following description identify? “Articular surfaces are deep and secure, multiarticulate; capsule heavily reinforced by ligaments; labrum helps prevent dislocation, the first joint to be built artificially; very stable.”
   A. Elbow  C. Knee
   B. Hip  D. Shoulder

19. An autoimmune disease resulting in inflammation and eventual fusion of diarthrotic joints is:
   A. gout
   B. rheumatoid arthritis
   C. degenerative joint disease
   D. pannus

20. Plane joints allow:
   A. pronation  C. rotation
   B. flexion  D. gliding