E. VERTEBRAL COLUMN

1. The vertebral column extends from the skull to the pelvis and forms the vertical axis of the skeleton.

2. The vertebral column is composed of vertebrae that are separated by intervertebral discs.

3. The vertebral column supports the head and the trunk of the body.

4. The vertebral column protects spinal cord
5. The spinal cord passes through **vertebral canal**.

6. An infant has **33** separate bones in the vertebral column.

7. The sacrum is formed by **five fused vertebrae**.

8. The coccyx is formed by **four fused vertebrae**.

9. An adult vertebral column has **26** bones.

10. The four curvatures of the vertebral column are **thoracic, sacral, cervical, and lumbar**.

11. The cervical curvature develops when **baby begins to hold up its head**.

12. The lumbar curvature develops when **a child begins to stand**.
F. A TYPICAL VERTEBRA

1. The body of a vertebra forms the thick, anterior portion of the bone.
2. The intervertebral discs are fastened to the upper and lower surfaces of the vertebral bodies.
3. The discs cushion and soften forces caused by walking and jumping movements.
4. Anterior longitudinal ligaments join the bodies of adjacent vertebrae on their anterior surfaces.
5. Posterior longitudinal ligaments join the bodies of adjacent vertebrae on their posterior surfaces.
6. Pedicles are **two short stalks that project posteriorly** from each vertebral body.

7. Laminae are **two plates that arise from the pedicles and fuse in the back to become spinous processes.**

8. A vertebral arch is formed by the **pedicles, laminae, and spinous processes.**

9. Spinous processes are **structures formed by the fusion of two laminae.**
10. A transverse process projects laterally and posteriorly.
11. Superior and inferior articulating processes project upward and downward from each vertebral arch.
12. Intervertebral foramina provide passageways for spinal nerves.
FIGURE 18A-B

(a) atlas, superior view

Superior articular facet
Posterior tubercle
Posterior arch
Lateral masses
Transverse foramen
Transverse process
Anterior arch
Anterior tubercle

(b) atlas, inferior view

Posterior tubercle
Posterior arch
Lateral masses
Posterior arch
Inferior articular facet
Groove for vertebral artery
Transverse process
Transverse foramen
Facet for dens
Anterior arch
Anterior tubercle

Copyright © 2010 Pearson Education, Inc.
G. CERVICAL VERTEBRA

1. There are 7 cervical vertebrae.
2. The transverse processes of cervical vertebrae are distinctive because they have transverse foramina.
3. The spinous processes of the second through the sixth cervical vertebrae are bifid.
4. The vertebra prominens is the spinous process of the 7th cervical vertebra.
5. The atlas is the 1st cervical vertebra.
6. The atlas supports the head.
7. The facets of the atlas articulate with occipital condyles.
8. The axis is the second cervical vertebra.
9. The dens is a process that projects **upward** and lies in the ring of the atlas.

10. As the head is turned from side to side, the atlas pivots around the dens.
Figure 18 Various views of vertebrae C₁ and C₂

(c) axis, superior view

(d) axis, inferior view

(e) articulated atlas and axis, superior view

Copyright © 2010 Pearson Education, Inc.
1. There are 12 thoracic vertebrae.
2. The facets of thoracic vertebrae articulate with ribs.
3. The bodies of thoracic vertebrae are adapted to bear increasing loads of body weight.
1. There are 5 lumbar vertebrae and they are located in the small of the back.
2. The bodies of lumbar vertebrae are larger and stronger than the superior vertebrae.
3. The transverse processes of lumbar vertebrae project posteriorly and the spinous processes are thick, short, and nearly horizontal.
FIGURE 19A–C

(a) right lateral view of articulated cervical vertebrae

(b) fifth (typical) cervical vertebra, superior view

(c) fifth (typical) cervical vertebra, posterior view

- C₁ (atlas)
- C₂ (axis)
- C₃
- C₄
- C₅
- C₆
- C₇ (vertebra prominens)
- Superior articular process
- Inferior articular process
- Transverse process
- Transverse foramen
- Bifid spinous process
- Lamina
- Vertebral foramen
- Superior articular facet
- Inferior articular process
- Pedicle
- Transverse process
- Body
- Long spinous process of C₇
- Superior articular process
- Transverse process
- Inferior articular process
- Lamina
- Body
- Bifid spinous process
FIGURE 20A

(a) articulated thoracic vertebrae, right lateral view

Transverse process

Spinous process

Intervertebral foramen

Superior articular process

Inferior articular process

Transverse costal facet for tubercle of rib

Superior and inferior costal facets (for head of ribs)

Pedicle

T₁

T₆

T₁₂
FIGURE 20B–C

(b) seventh (typical) thoracic vertebra, superior view

(c) seventh (typical) thoracic vertebra, posterior view

- Transverse process
- Superior articular process
- Superior costal facet (for head of rib)
- Body
- Lamina
- Spinous process
- Vertebral arch
- Transverse costal facet for tubercle of rib
- Pedicle
- Vertebral foramen
- Superior articular facet
- Inferior articular process
- Transverse process
- Spineous process
FIGURE 21A–B

(a) articulated lumbar vertebrae and rib cage, right lateral view

(b) second lumbar vertebra, superior view
Figure 21 Lumbar vertebrae.
J. Sacrum

1. The sacrum is triangular in shape.
2. The median sacral crest is a ridge of tubercles where the spinous process of sacral vertebrae fused together.
3. Posterior sacral foramina are rows of openings located to the sides of the tubercles.
4. The sacrum is wedged between the coxae and is united to them at its articular surfaces.
5. The sacrum forms the posterior wall of the pelvic cavity.
6. The sacral promontory is upper anterior margin of the sacrum.
7. Anterior sacral foramina provide passageways for nerves and blood vessels.
FIGURE 22A–B

(a) posterior view

(b) right lateral view

- Coccyx
- Coccygeal cornu
- Sacral hiatus
- Posterior sacral foramina
- Lateral sacral crest
- Ala
- Entrance to sacral canal
- Superior articular facet
- Median sacral crest
- Body
- Auricular surface (for sacroiliac joint)
K. Coccyx

1. The coccyx is the lowest part of the vertebral column.
2. Sitting presses on the coccyx, and it moves forward, acting like a shock absorber.
FIGURE 22C

Sacrum and coccyx.

- Base (superior part)
- Ala
- Sacral promontory
- Body of first sacral vertebra
- Transverse ridges (site of vertebral fusion)
- Anterior sacral foramina
- Apex
- Coccyx

(c) anterior view
1. The thoracic cage includes the ribs, thoracic vertebrae, the sternum, and the costal cartilages that attach the ribs to the sternum.

2. The thoracic cage supports the shoulder girdle and upper limb and protects the viscera in the thoracic and upper abdominal cavities.
1. The usual number of ribs is 24.
2. The true ribs are the first 7 pairs of ribs.
3. The false ribs are the last five pairs of ribs.
4. Floating ribs are the last two pairs of false ribs.
5. A typical rib has a long, slender shaft.
6. The head of a rib is an enlarged portion of a rib at its posterior end.

7. The head of a rib articulates with a facet on the body of its own vertebra and with the body of the next higher vertebra.

8. A tubercle of a rib articulates with the transverse process of the vertebra.

9. Costal cartilages are composed of hyaline cartilage.

10. Costal cartilages are attached to the anterior ends of a rib.
Clavicle
Scapula
True ribs (1–7)
False ribs (8–12)
Floating ribs (11, 12)
Intercostal spaces

(b) posterior view

Figure 23  Bony thorax.
1. The sternum is located along the midline in the anterior portion of the thoracic cage.
2. The three parts of the sternum are manubrium, body, and xiphoid process.
3. The xiphoid process projects downward.
4. The manubrium articulates with clavicles.
5. The manubrium and body articulate with ribs.
O. PECTORAL GIRDLE

1. The four parts of the pectoral girdle are two clavicles and two scapulae.
2. The pectoral girdle supports the upper limbs and is an attachment for several muscles that move the arm.

P. Clavicles

1. A clavicle has an S shape.
2. Clavicles run between the sternum and the shoulders.
3. The sternal ends of the clavicles articulate with the manubrium.
4. The acromial ends of the clavicles articulate with the scapulae.
5. The clavicles brace the freely movable scapulae and are attachment sites for muscles of the upper limbs, chest, and back.
Figure 23E–F

Thoracic cage (continued).

(e) typical left rib, medial view

(f) articulated typical rib and vertebra, superior view (left); lateral view (right)

Figure 23 Thoracic cage (continued).
1. The scapulae are shaped like triangles.
2. The spine of a scapula divides it into a supraspinous fossa and infraspinous fossa.
3. The acromion process forms the tip of the shoulder.
4. The acromion process articulates with the clavicle.
5. The coracoid process curves anteriorly and inferiorly to the acromion process.
6. The glenoid cavity is a depression on the lateral surface of a scapula.
7. The glenoid cavity articulates with the head of the humerus.
8. The three borders of the scapulae are superior, lateral, and medial.