I. THE VERTEBRAL COLUMN

A. Regions and curvatures of the vertebral column (Fig. 7.13, p. 222 [225])
These curvatures give the vertebral column a slight “S” shape that absorbs shock as we move. Use the hanging vertebral columns.

Cervical (convex curvature)
Thoracic (concave curvature)
Lumbar (convex curvature)
Sacral (concave curvature)
Coccygeal (“cock-sih-jee-al”)

B. Anatomy of a typical vertebra. (Table 7.9, p. 224 [226]) Use any large disarticulated vertebra.; use the hanging vertebral column for the intervertebral foramina.

Body
Pedicle (2)
Lamina (2)
Vertebral foramen (houses spinal cord)
Intervertebral foramen (formed between each two vertebrae)

Transverse processes (2)
Spinous process (1)
Superior articular processes (2)
Inferior articular processes (2)

C. Tips for learning the vertebrae Use skeletons or hanging vertebral columns.

1. Note the intervertebral disks (Fig. 7.15). They form the shock-absorbing joints between the __________ of the vertebra.

2. The inferior articular process of one vertebra articulates with the __________ __________ __________ of the vertebra inferior to it.

3. The vertebral arch is formed from the __________________________ and the __________________________.
D. Classes of vertebral bones  Use disarticulated vertebrae to identify these.

1. **Cervical vertebrae (7)** (Fig. 7.16)

   *Atlas*, the first cervical vertebra, has no body. Its **superior articular facet** articulates with the **occipital condyles** of the skull. Their surfaces permit up and down movement (nodding).

   *Axis*, the second cervical vertebra, has a peg-like process, the **dens**. It articulates with atlas, allowing one to shake the head no.

   All 7 cervical vertebra have a **transverse foramen** in each transverse process for the passage of blood vessels to the brain. *This feature positively identifies a cervical vertebra.*

   These vertebrae are small, with bifid (forked) **spinous processes**.

2. **Thoracic vertebrae (12)** (Fig. 7.17)

   **Facets** are found on each side of the **body** where the head of a rib articulates. *This feature positively identifies a thoracic vertebra.*

   **Facets** on the **transverse processes** attach the rib a second time.

3. **Lumbar vertebrae (5)** (Fig.7.18)

   These are the largest of the vertebrae, with short, thick processes. *They are identified by the lack of the transverse foramina of the cervical vertebrae and the lack of facets of the thoracic vertebrae.*

4. **Sacrum (1)** (Fig. 7.19)

   Five bones fuse to form the sacrum. The **sacroiliac joint** (articular surface for coxa ) articulates with the ilium.

   *The sacral promontory* is used as an obstetrical landmark.  
   *The sacral foramina* allow for the passage of spinal nerves.  
   *The sacral canal* may be seen only on a real sacrum.  
   *The sacral hiatus* is the inverted “U” inferior and posterior.

5. **Coccyx** (Fig. 7.19, p. 232 [7.20, p. 227])

   The coccyx (“cock-six”) is formed from four fused vertebral bones. It attaches muscles which support the pelvic organs.
II. **RIB CAGE**  (Fig. 7.20) Use the disarticulated bones, the skeletons, and articulated rib cage models.

A. **Sternum**  
   - Manubrium  
   - Clavicular notch  
   - Body  
   - Xiphoid process  
   - Jugular notch  
   - Sternal angle

B. **Costal cartilages**  
   - **Costal margin** (shown but not labeled)

C. **Ribs (12 pairs)**  
   - Head  
   - Tubercle  
   - Angle  
   - Body  
   - Sternal end  
   - **Floating ribs** (last two pairs, which do not attach to costal cartilages)

D. **Helpful tips for learning the ribs**

1. Use the skeleton to observe the attachment of the ribs to the vertebral column. The head of most ribs (all but the last 3 pairs) articulates with the facets on the bodies of two adjacent bodies of thoracic vertebrae, and the tubercle articulates with the facet on the transverse process of the lower thoracic vertebra. Have your instructor show you this with disarticulated ribs and a hanging vertebral column.
III. MUSCLES OF THE BACK AND ABDOMEN

A. Deep muscles of the back (Fig. 10.16, p. 338 [341]) These are the hard-working postural muscles that keep the back extended. This large group of muscles may be seen on the orange torso model only.

   **Erector spinae group**  
   Action: Extend vertebral column

B. Abdominal muscles (Fig.10.19) Use the torso models. Practice these actions as you study the muscles.

1. **External oblique**  
   Actions (3): Flex and rotate vertebral column; compress abdomen

2. **Internal oblique**  
   Actions (3): Flex and rotate vertebral column; compress abdomen

3. **Transversus abdominis**  
   Action: Compresses abdomen

4. **Rectus abdominis**  
   Actions (2): Flexes vertebral column; compresses abdomen

C. Helpful hints to learn the abdominal muscles: Note that all four compress the abdomen, three of them flex the abdomen, and two of them rotate the vertebral column. From most superficial to deepest, the three wide muscles: External oblique, internal oblique, transversus abdominus. The older "100" model clearly shows these three muscles from most superficial to deepest.
Optional notes on the vertebral column, rib cage, and trunk muscles

1. **Kyphosis**, or hunchback, is an exaggerated **thoracic curvature**. Severe kyphosis crowds the lungs and abdominal organs. **Lordosis**, or swayback, is an exaggerated **lumbar curvature**. **Scoliosis** is an abnormal lateral curvature of the spine (Fig. A, p. 222 [225]).

2. Even giraffes have only **seven cervical vertebrae**.

3. The **intervertebral discs** are made of fibrocartilage—tough, resilient padding, comparable to the rubbery sole of a shoe in their ability to provide cushioning. A "herniated disc" refers to injury and displacement of the intervertebral discs (Fig. 7C, p. 225 [C, p. 228]; in its abnormal location it can put pressure on the **spinal cord** or **spinal nerves**.

4. **Atlas**, with which the skull articulates, is named after the mythical Atlas, who held up the world on his shoulders (albeit unwillingly).

5. The **coccyx** serves as the attachment for the pelvic floor muscles, which support the pelvic organs. The coccyx is hinge-like, and gives during childbirth.

6. Knowledge of the location of the **xiphoid process** is necessary to perform cardiopulmonary resuscitation (CPR) safely. Xiphoid means "sword-like," and the sharp process can puncture the abdomen if compressed and broken.

7. When the ribs fracture, it most often occurs at the **angle**.

8. A “six-pack stomach” is formed from sheets of connective tissues that separate the **rectus abdominis** muscles.
Notes and Sketches