

## LABORATORY EXERCISE 15

# VERTEBRAL COLUMN AND THORACIC CAGE

### MATERIALS NEEDED

Textbook  
Human skeleton, articulated  
Samples of cervical, thoracic, and lumbar vertebrae  
Human skeleton, disarticulated

The vertebral column, consisting of twenty-six bones, extends from the skull to the pelvis and forms the vertical axis of the human skeleton. The column is composed of many vertebrae, which are separated from one another by cartilaginous intervertebral discs and are held together by ligaments.

The thoracic cage surrounds the thoracic and upper abdominal cavities. It includes the ribs, the thoracic vertebrae, the sternum, and the costal cartilages.

### PURPOSE OF THE EXERCISE

To examine the vertebral column and the thoracic cage of the human skeleton and to identify the bones and major features of these parts.

### LEARNING OBJECTIVES

After completing this exercise, you should be able to

1. Identify the major features of the vertebral column.
2. Name the features of a typical vertebra.
3. Distinguish among a cervical, thoracic, and lumbar vertebra and locate the sacrum and coccyx.
4. Identify the structures of the thoracic cage.
5. Distinguish between true and false ribs.

### PROCEDURE A—THE VERTEBRAL COLUMN

1. Review the section entitled "Vertebral Column" in chapter 7 of the textbook.
2. As a review activity, label figures 15.1, 15.2, 15.3, and 15.4.

3. Examine the vertebral column of the human skeleton and locate the following bones and features. At the same time, locate as many of the corresponding bones and features in your own skeleton as possible.

atlas 1

axis 1

cervical vertebrae  
(includes atlas and axis) 7

thoracic vertebrae 12

lumbar vertebrae 5

intervertebral discs

vertebral canal

sacrum 1

coccyx 1

cervical curvature

thoracic curvature

lumbar curvature

pelvic curvature

intervertebral  
foramina



### Critical Thinking Application

Note the four curvatures of the vertebral column. What functional advantages exist with curvatures for skeletal structure instead of a straight vertebral column?

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4. Compare the available samples of cervical, thoracic, and lumbar vertebrae by noting differences in size and shape, and by locating the following features:

body

pedicles

vertebral foramen

laminae

spinous process

vertebral arch

transverse processes

superior articular  
processes

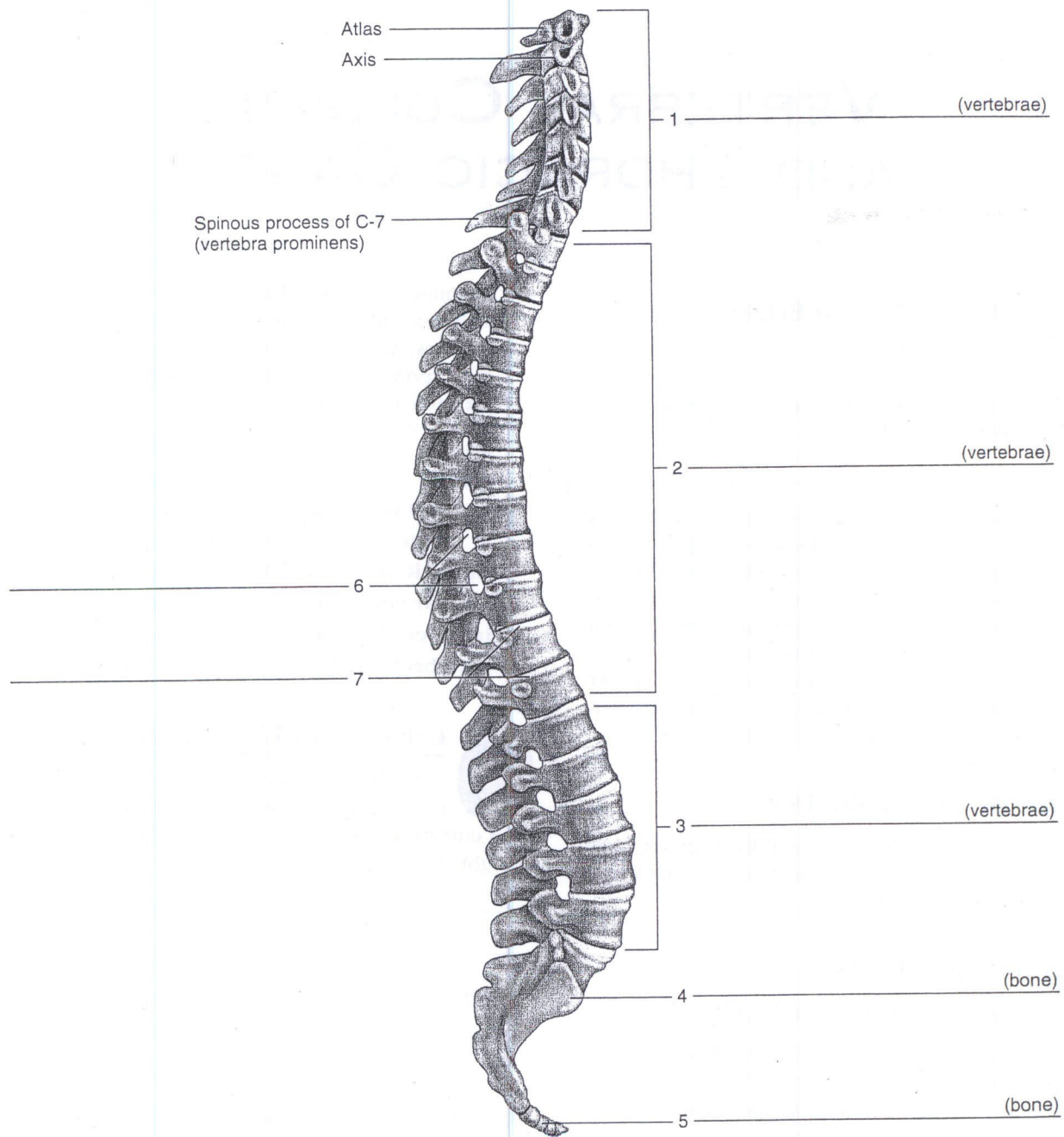
inferior articular  
processes

transverse foramina

facets

dens of axis

Figure 15.1 Label the bones and features of the vertebral column (right lateral view).

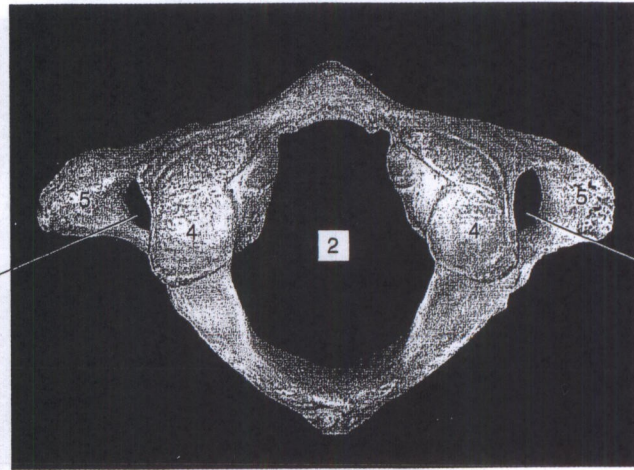


**Figure 15.2** Label the superior features of (a) the atlas and the superior and right lateral features of (b) the axis by placing the correct numbers in the spaces provided. (The broken arrow indicates a transverse foramen.)

- \_\_\_ Body
- \_\_\_ Dens
- \_\_\_ Facet that articulates with occipital condyle
- \_\_\_ Spinous process
- \_\_\_ Superior articular facet
- \_\_\_ Transverse foramen
- \_\_\_ Transverse process
- \_\_\_ Vertebral foramen

(a) Atlas (C1)

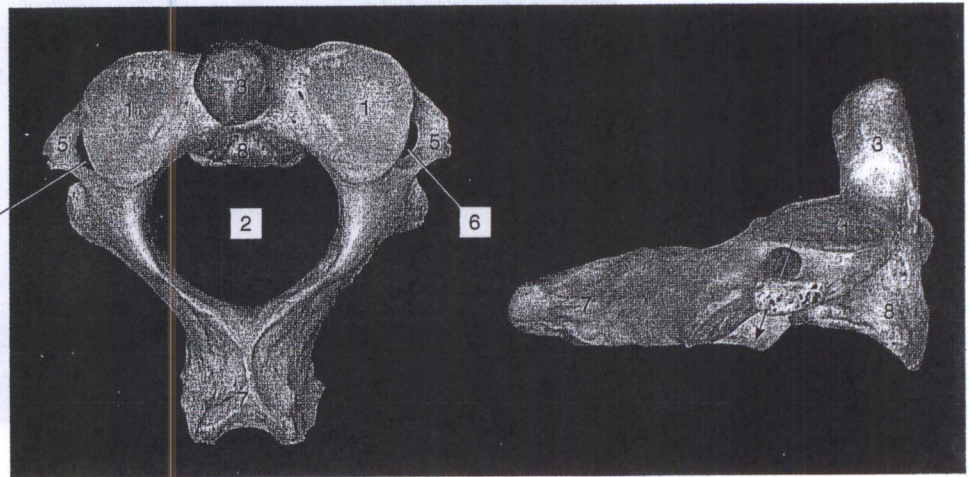
Anterior  
 ↑  
 ↓  
 Posterior



Superior view

(b) Axis (C2)

Anterior  
 ↑  
 ↓  
 Posterior



Superior view

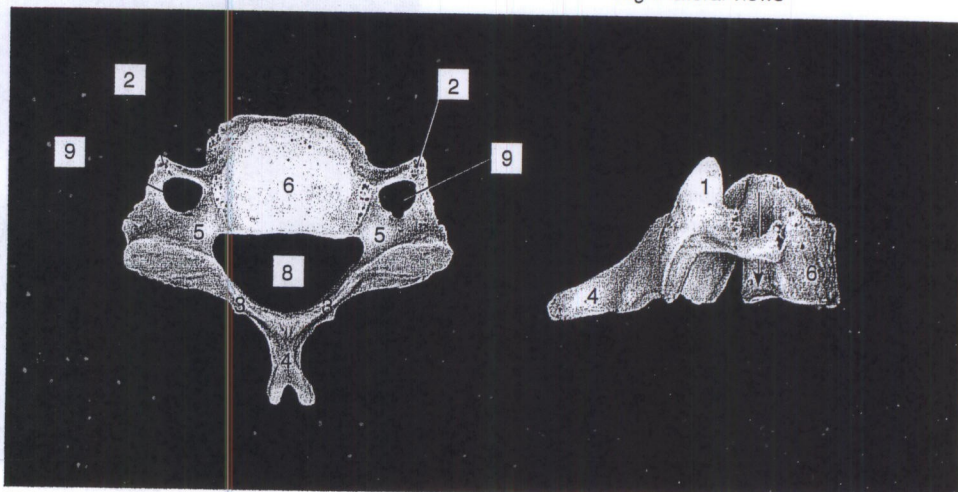
Right lateral view  
 Posterior ← → Anterior

**Figure 15.3** Label the superior and right lateral features of the (a) cervical, (b) thoracic, and (c) lumbar vertebrae by placing the correct numbers in the spaces provided. (The broken arrow indicates a transverse foramen.)

- Body
- Intervertebral (inferior) notch
- Lamina
- Pedicle
- Spinous process
- Superior articular process
- Transverse foramen
- Transverse process
- Vertebral foramen

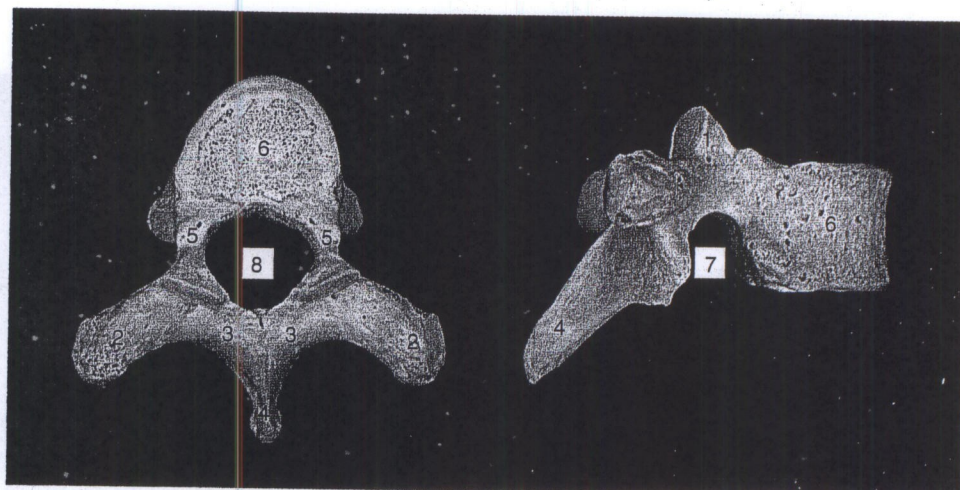
Superior views

Right lateral views

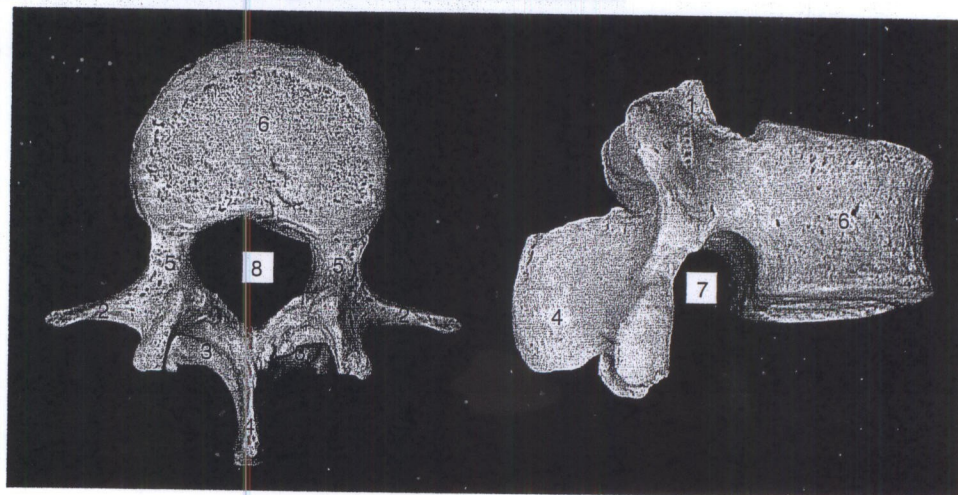


(a) Cervical vertebra

Anterior  
↑  
↓  
Posterior



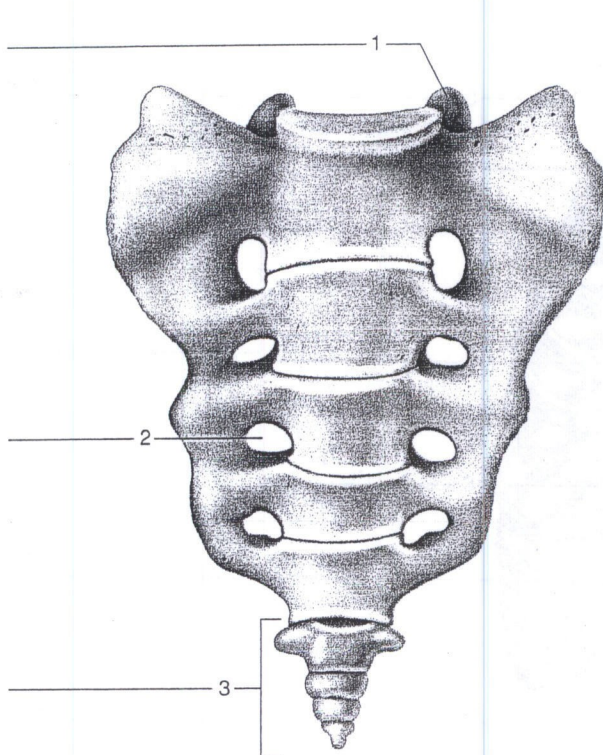
(b) Thoracic vertebra



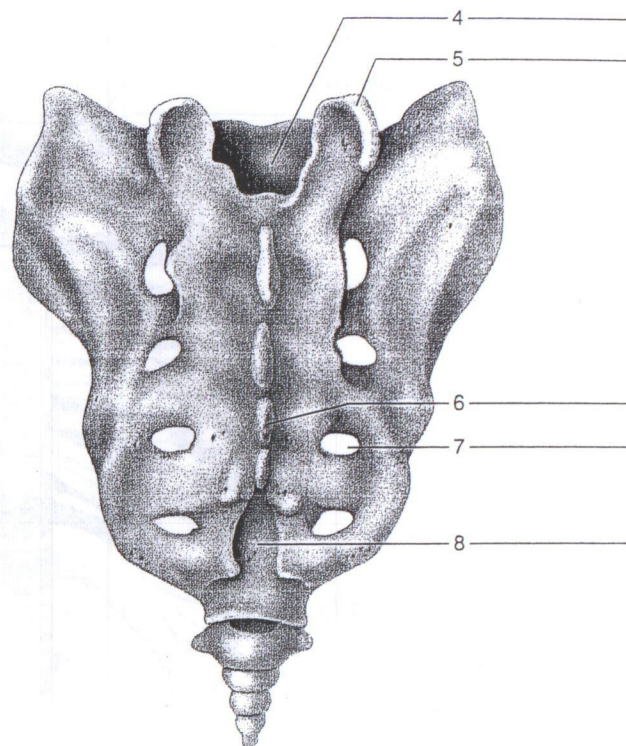
(c) Lumbar vertebra

Posterior ← → Anterior

Figure 15.4 Label the coccyx and the features of the sacrum: (a) anterior view; (b) posterior view.



(a)



(b)

- Examine the sacrum and coccyx. Locate the following features:

**sacrum**

- superior articular process
- posterior sacral foramen
- anterior sacral foramen
- sacral canal
- tubercles
- sacral hiatus

**coccyx**

- Complete Parts A and B of Laboratory Report 15.

**PROCEDURE B—THE THORACIC CAGE**

- Review the section entitled “Thoracic Cage” in chapter 7 of the textbook.
- As a review activity, label figure 15.5.

- Examine the thoracic cage of the human skeleton and locate the following bones and features:

**rib**

- head
- tubercle
- facets
- true ribs
- false ribs
- floating ribs

**costal cartilages**

**sternum**

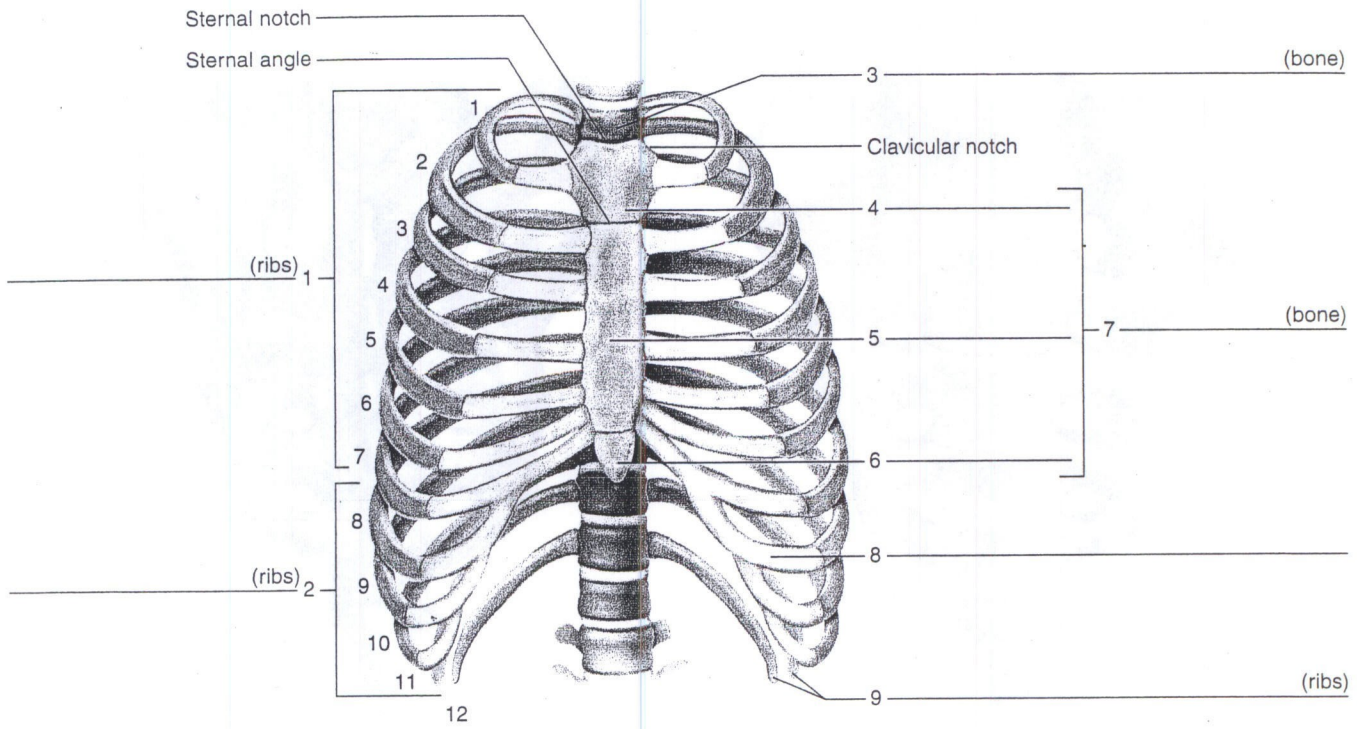
- manubrium
- body
- xiphoid process

- Complete Parts C and D of the laboratory report.

**Web Quest**

What are the functions of individual bones and features? Search these and review the anatomy of the skeleton at [www.mhhe.com/shieress9](http://www.mhhe.com/shieress9)

Figure 15.5 Label the bones and features of the thoracic cage.



# VERTEBRAL COLUMN AND THORACIC CAGE

## PART A

Complete the following statements:

1. The vertebral column encloses and protects the \_\_\_\_\_.
2. The \_\_\_\_\_ of the vertebrae support the weight of the head and trunk.
3. The \_\_\_\_\_ separate adjacent vertebrae.
4. The pedicles, laminae, and spinous process of a vertebra form the \_\_\_\_\_.
5. The intervertebral foramina provide passageways for \_\_\_\_\_.
6. Transverse foramina of cervical vertebrae serve as passageways for \_\_\_\_\_ leading to the brain.
7. The first vertebra is also called the \_\_\_\_\_.
8. When the head is moved from side to side, the first vertebra pivots around the \_\_\_\_\_ of the second vertebra.
9. The \_\_\_\_\_ vertebrae have the largest and strongest bodies.
10. The number of vertebrae that fuse to form the sacrum is \_\_\_\_\_.
11. An opening called the \_\_\_\_\_ exists at the tip of the sacral canal.

## PART B

Based on your observations, compare typical cervical, thoracic, and lumbar vertebrae in relation to the characteristics indicated in the table. Consider characteristics such as size, shape, presence or absence, and unique features for your responses.

Vertebra	Number	Size	Body	Spinous Process	Transverse Foramina
Cervical					
Thoracic					
Lumbar					

## PART C

Complete the following statements:

1. The adult skeleton of most men and women contains a total of \_\_\_\_\_ (number) bones.
2. The last two pairs of ribs that have no cartilaginous attachments to the sternum are sometimes called \_\_\_\_\_ ribs.
3. The tubercles of the ribs articulate with facets on the \_\_\_\_\_ processes of the thoracic vertebrae.
4. The manubrium articulates with the \_\_\_\_\_ on its superior border.
5. List three general functions of the thoracic cage.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

## PART D

Identify the bones and features indicated in the radiograph of the neck in figure 15.6.

**Figure 15.6** Identify the bones and features indicated in this radiograph (X ray) of the neck (lateral view), using the terms provided.

**Terms:**

Atlas  
Axis  
Body  
Intervertebral disc  
Spinous process  
Transverse process

