

Objectives

1. List the two division of the human skeleton
2. Distinguish between the axial skeleton and appendicular skeleton.
3. Name and list the number of bones in the axial and appendicular skeleton
4. Define the terms used to describe bone markings.

INTRODUCTION

The adult skeletal system consists of 206 bones and it is divided into *axial* and *appendicular skeleton*. Besides supporting and protecting organs of the body, the skeletal system provides sites for skeletal muscle attachments, stores lipids, calcium, and phosphorus, and blood cell formation goes on within the red marrow cavities.

The ***axial skeleton*** consists of bones that protect the head, neck, and trunk. Specifically, the bones that make up the *axial skeleton* are:

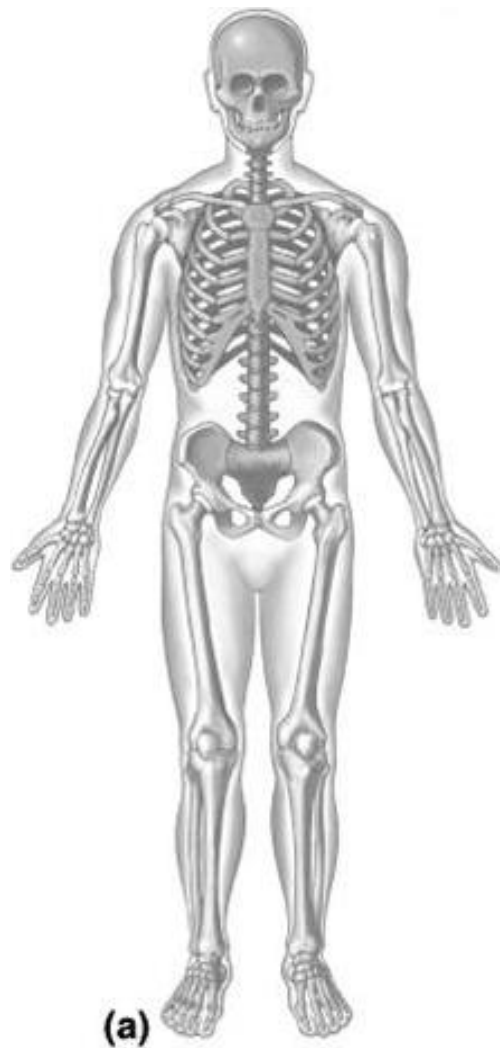
1. ***Skull***: made of the *cranium* (encases the brain) and *facial* bones.
2. ***Auditory ossicles***: located in the middle ear region.
3. ***Hyoid bone***: located in the neck region; it supports the tongue and muscles that move the tongue.
4. ***Vertebral Column***: consists of several vertebrae protecting the spinal cord.
5. ***Thoracic Cage***: protects the organs of the thoracic cavity; made of ribs and sternum.

The ***appendicular skeleton*** consists of bones of the arms, legs, and the bones that anchor the arms and legs to the *axial skeleton*. Specifically, the *appendicular skeleton* is composed of the following bones:

1. ***Upper limbs***: bones in the arms and hands.
2. ***Pectoral girdle***: formed by the scapula and the clavicle.
3. ***Lower limbs***: bones in the legs and feet.
4. ***Pelvic girdle***: formed by 2 coxae. **NOTE:** the sacrum, coccyx, and coxae together make up what is called the *pelvis*.

PART A

Color the bones that belong to the axial skeleton in **blue** and the bones that belong to the appendicular skeleton in **red**.



- Axial (blue)

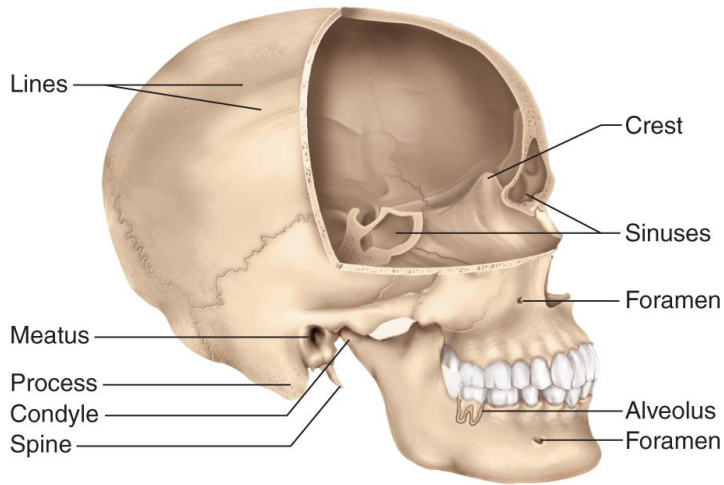


- Appendicular (red)

(a)

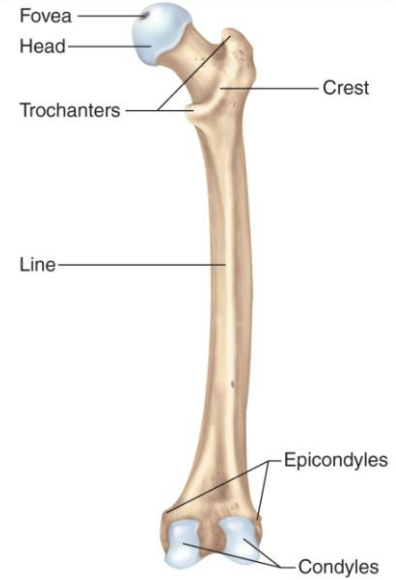
Anatomical Features of Bones: know the definitions of the different anatomical features (markings) of bones.

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

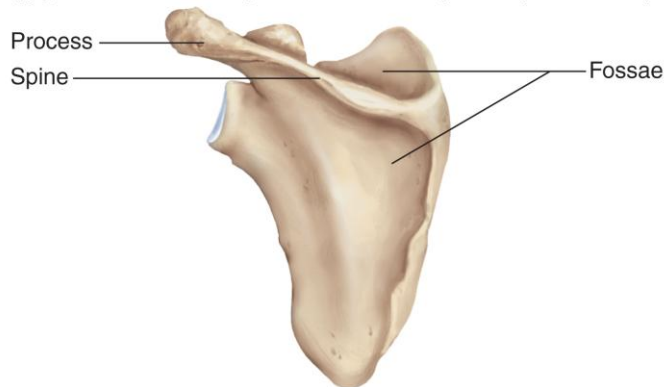


(a) Skull (lateral view)

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

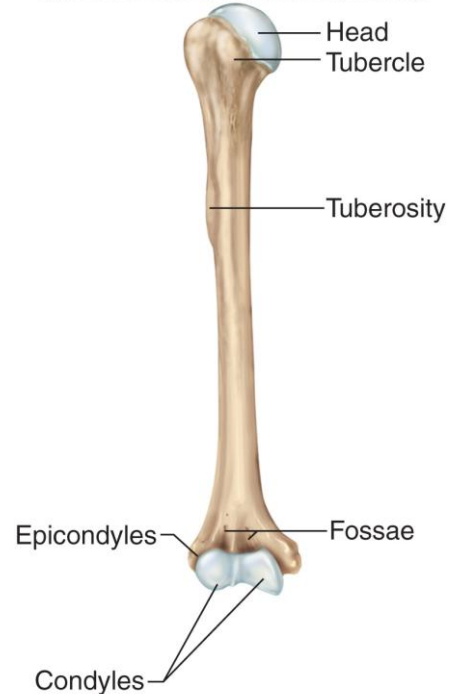


Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



(b) Scapula (posterior view)

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



(d) Humerus (anterior view)

For definitions of the different bone markings, see Table 6-1 (Ch 6) in your A&P textbook.

Axial Skeleton

Objectives

1. Locate, name, and identify the bones & markings of the axial skeleton.
2. List the number of bones in the axial skeleton.

INTRODUCTION

The axial skeleton is made up of 80 bones that form the central axis of the skeleton. These 80 bones include:

- 1. Skull:** made of the *cranium* (encases the brain) and *facial* bones. There are 22 bones in the skull.
- 2. Auditory ossicles:** located in the middle ear region. There are 6 auditory ossicles (3 bones in each ear).
- 3. Hyoid bone:** located in the neck region; it supports the tongue and muscles that move the tongue. There is only 1 hyoid bone in the human body.
- 4. Vertebral Column:** consists of several vertebrae protecting the spinal cord. There are 26 vertebrae.
- 5. Thoracic Cage:** protects the organs of the thoracic cavity; made of ribs and sternum. There are 25 bones in the thoracic cage: 24 ribs and 1 sternum.

See Chapter 7 in your A&P textbook for a list & number of bones in the axial skeleton.

The Skull

The human skull has twenty-two bones and consists of bones from the *cranium* (encases the brain), and *facial* bones. There are eight cranial bones and fourteen facial bones (Thirteen facial bones are immovable and only one is movable.)

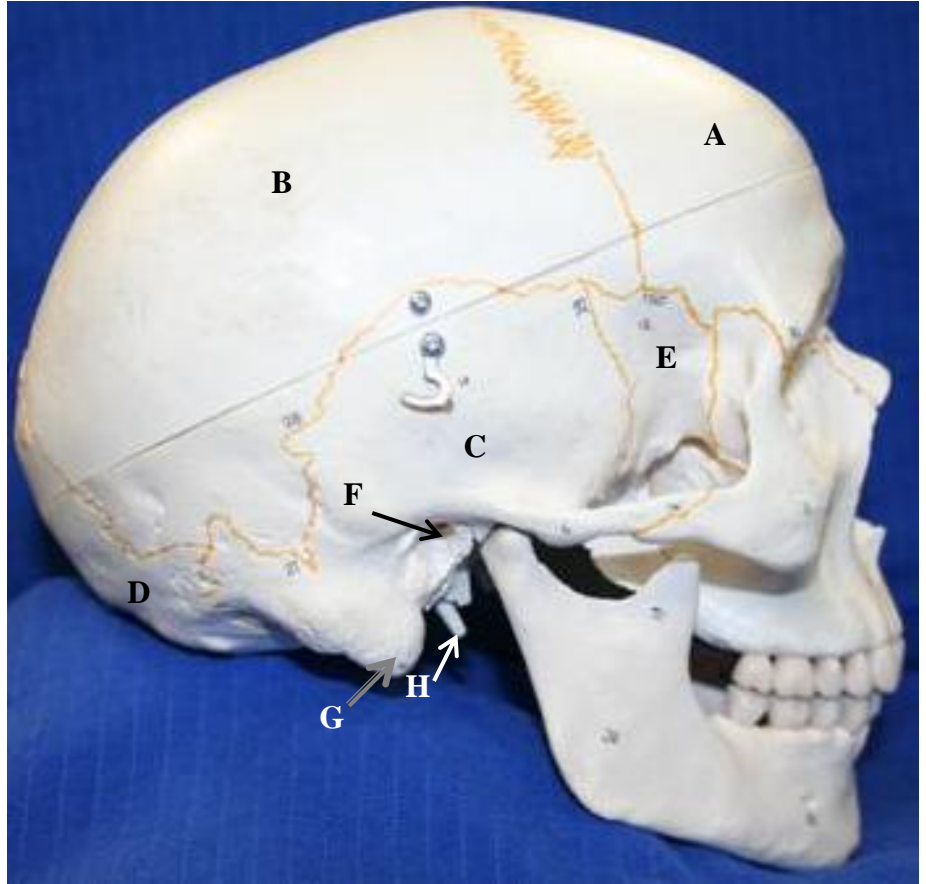
PART A Cranial Bones

Figure 9.1

Right lateral view of the skull.

Name the labeled bones and structures in the cranium.

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____



?

1. External Acoustic Meatus

- a) In which bone of the skull is the external acoustic meatus found? _____
- b) The external acoustic meatus leads inward to _____

2. Mastoid Process

- a) In which bone of the skull is the mastoid process located? _____
- b) The mastoid process provides attachment for _____

3. Styloid Process

- a) In which bone of the skull is the styloid process located? _____
- b) The styloid process anchors _____

Figure 9.2 Anterior view of the skull.
Name the labeled bones in the cranium.

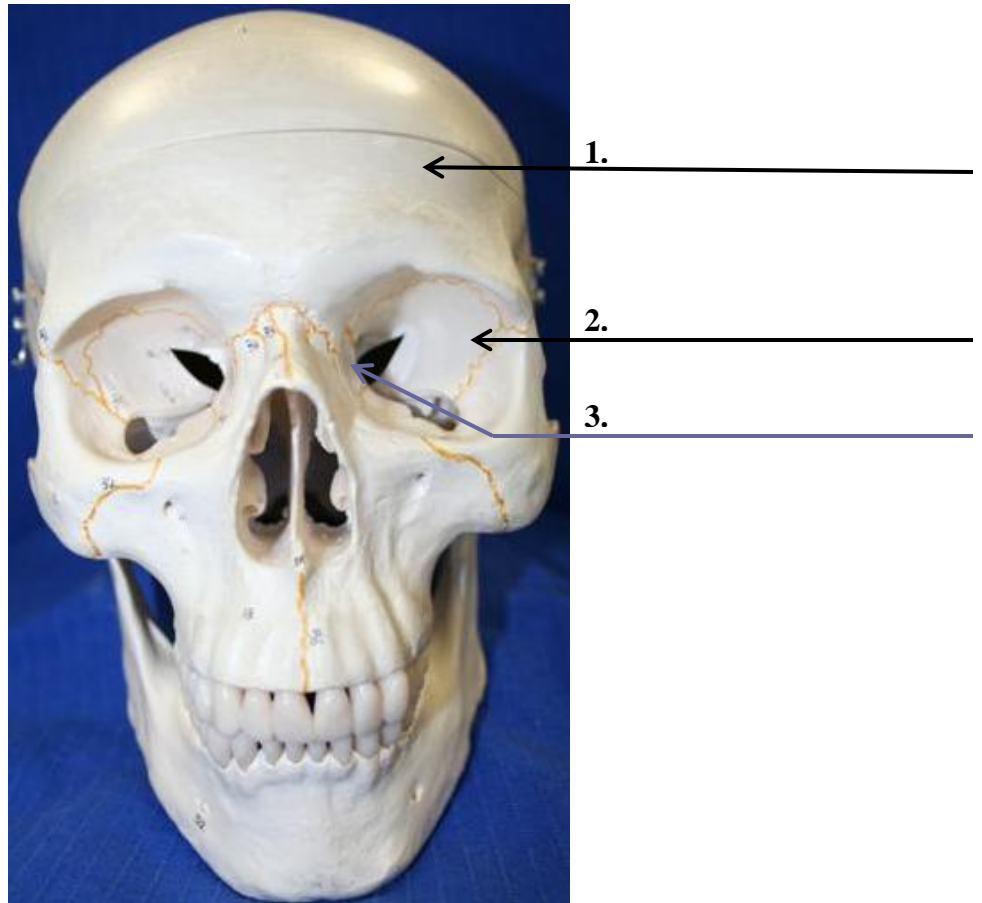
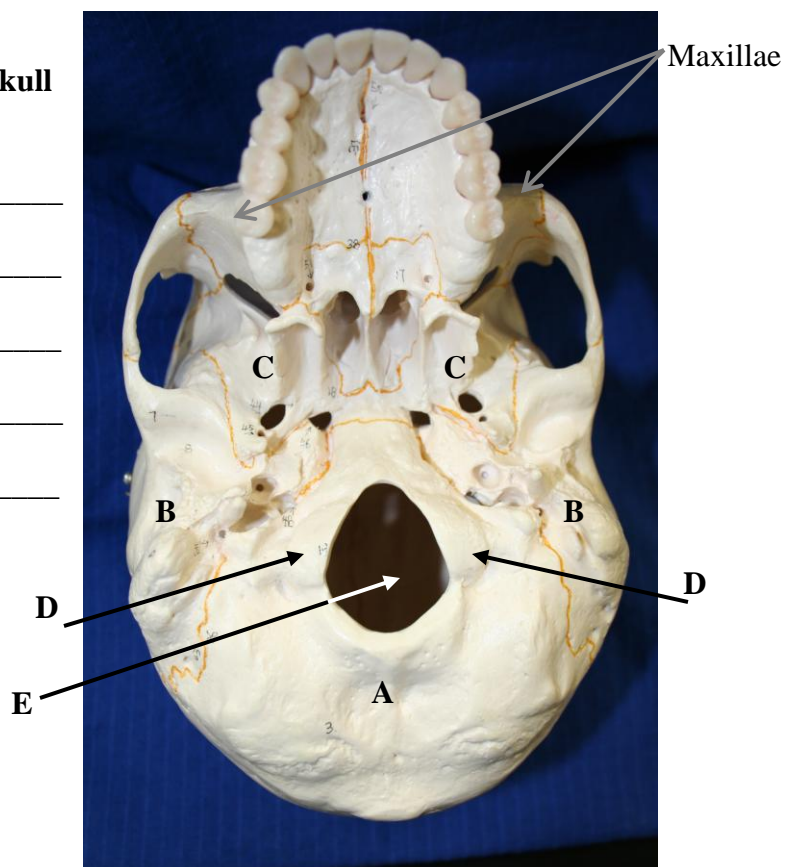


Figure 9.3 Inferior view of the skull
Name the labeled bones and markings in the cranium.

- A. _____
B. _____
C. _____
D. _____
E. _____



?

1. Foramen Magnum

- In which bone of the skull is the foramen magnum found? _____
- What passes through the foramen magnum? _____

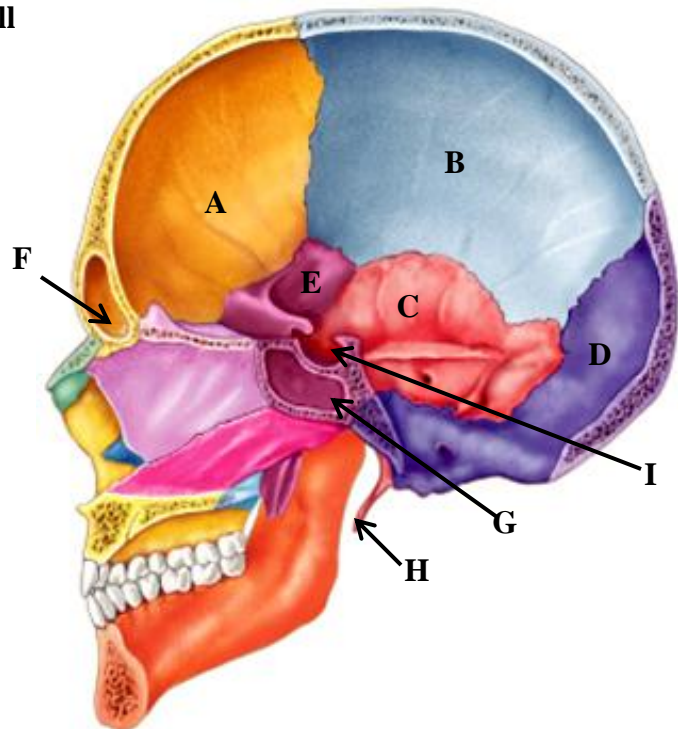
2. Occipital Chondyle

- In which bone of the skull are the occipital chondyles found? _____
- Occipital chondyles are on each side of the _____
- Occipital chondyles articulate with _____

Figure 9.4 Sagittal Section of the skull

Name the labeled bones and markings in the cranium.

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____



?

1. Sella Turcica

- What lies inside the sella turcica? _____
- Which bone in the skull indents to form the sella turcica? _____
- How many sphenoidal sinuses are in the sphenoid bone? _____
- How many frontal sinuses are in the frontal bone? _____

PART B Sutures Between Cranial Bones

Figure 9.5 Posterior view of the skull.

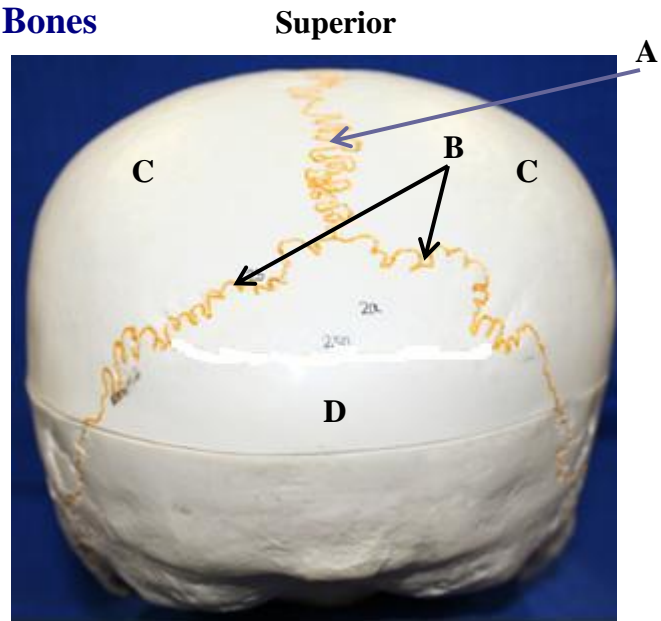
Name the labeled sutures and bones of the cranium.

A. (suture) _____

B. (suture) _____

C. _____

D. _____



Inferior

Figure 9.6 Superior view of the skull.

Name the labeled sutures and bones of the cranium

A. (suture) _____

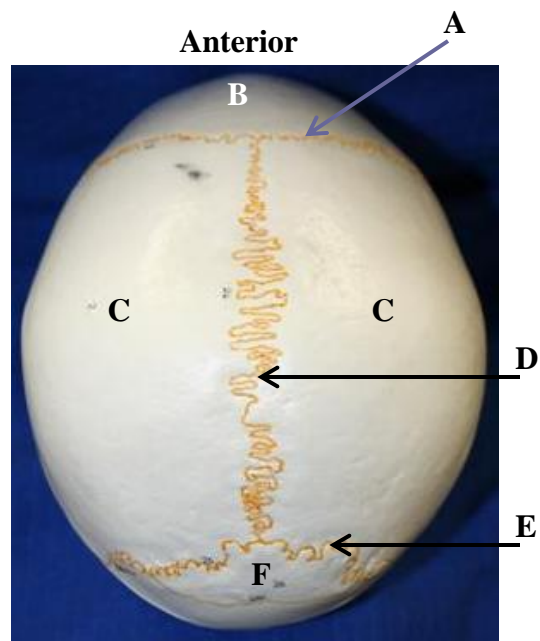
B. _____

C. _____

D. (suture) _____

E. (suture) _____

F. _____

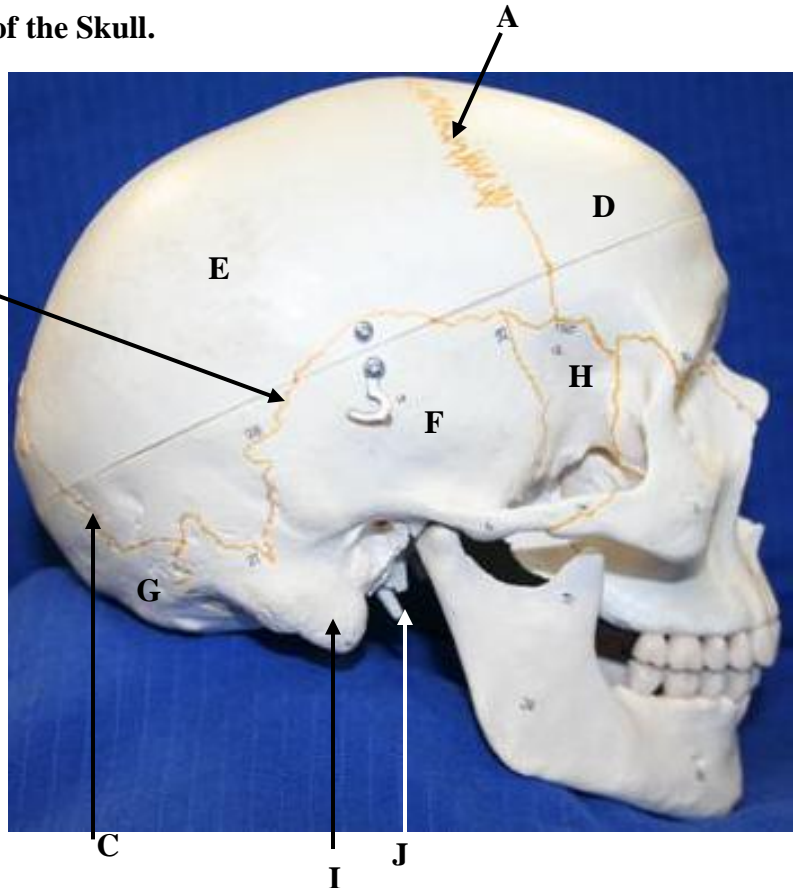


Posterior

Figure 9.7 Right Lateral View of the Skull.

Name the labeled sutures, bones, and structures in the cranium.

- A. (suture) _____
- B. (suture) _____
- C. (suture) _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____
- J. _____



Sutures and Cranial Bones

?

1. Name the suture that joins the frontal bone to the parietal bones: _____
2. The parietal bones are joined along the midline by the _____ suture.
3. Name the suture that joins the occipital bone to the parietal bones: _____
4. Name the suture that joins the temporal bones to the parietal bones: _____

5. Fill in the number of bones in the cranium:

Cranial Bones: _____

Frontal _____

Parietal _____

Temporal _____

Occipital _____

Sphenoid _____

Ethmoid _____

Total: _____ Cranial Bones

PART C Facial Bones

Figure 9.8 Anterior view of the skull.

Name the labeled bones of the face

- A. _____
 B. _____
 C. _____
 D. _____
 E. _____
 F. _____

Maxilla = singular
Maxillae = plural

Inferior nasal concha = singular
Inferior nasal conchae = plural

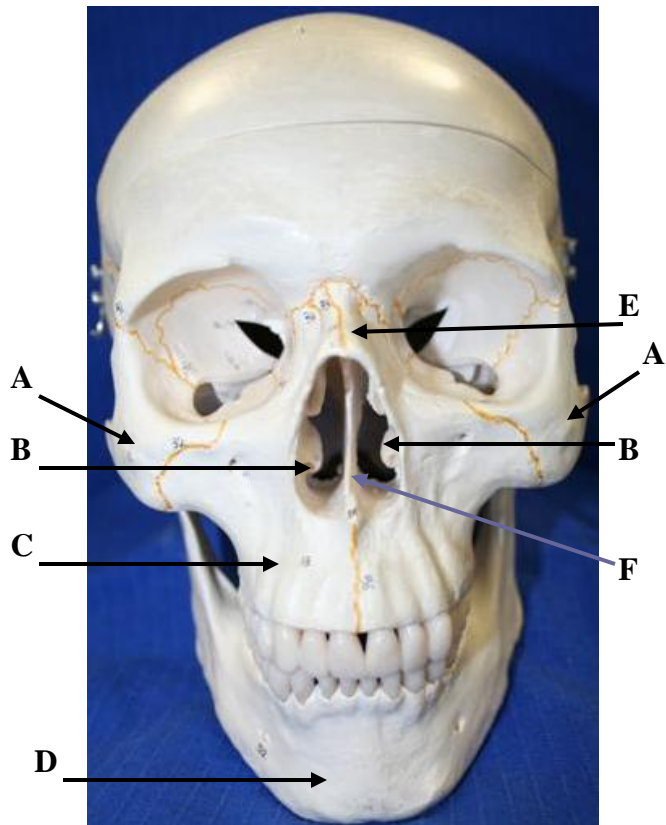


Figure 9.9 Lateral view of the skull.

Name the labeled bones of the face.

- A. _____
 B. _____
 C. _____
 D. _____

?

1. These bones are known as "cheek bones": _____

2. The bridge of the nose is formed by these two bones: _____

3. Name the only facial bone that moves: _____

4. Describe what sutures are: _____

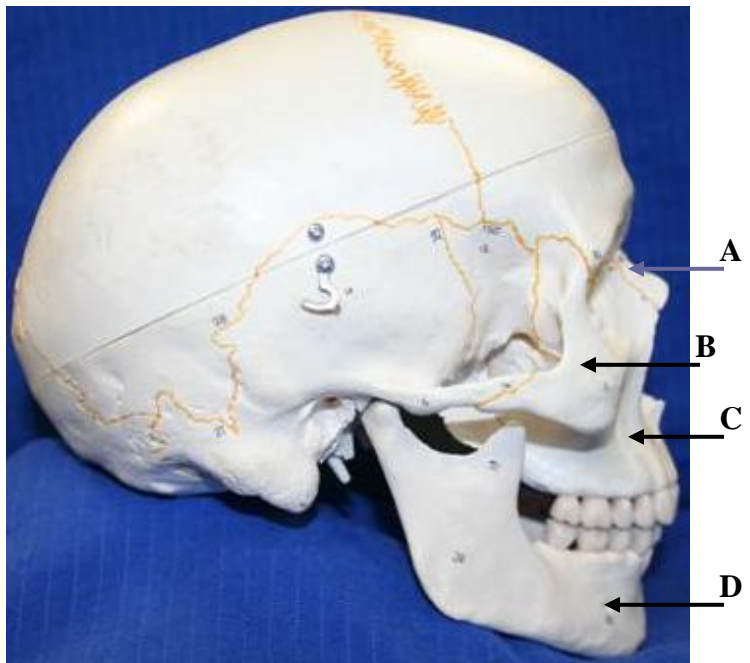
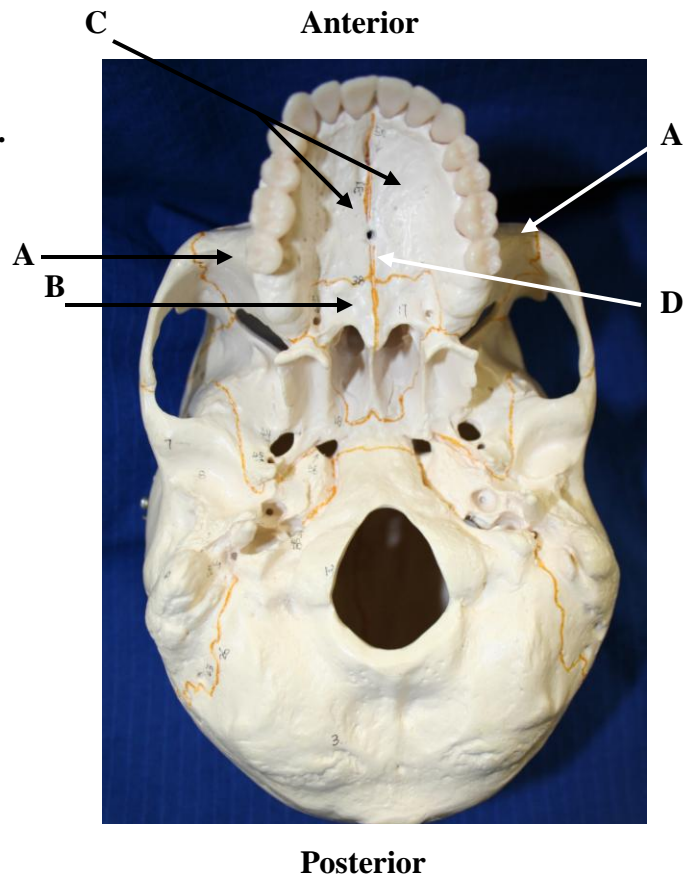


Figure 9.10 Inferior view of the skull.
Name the labeled face bones.

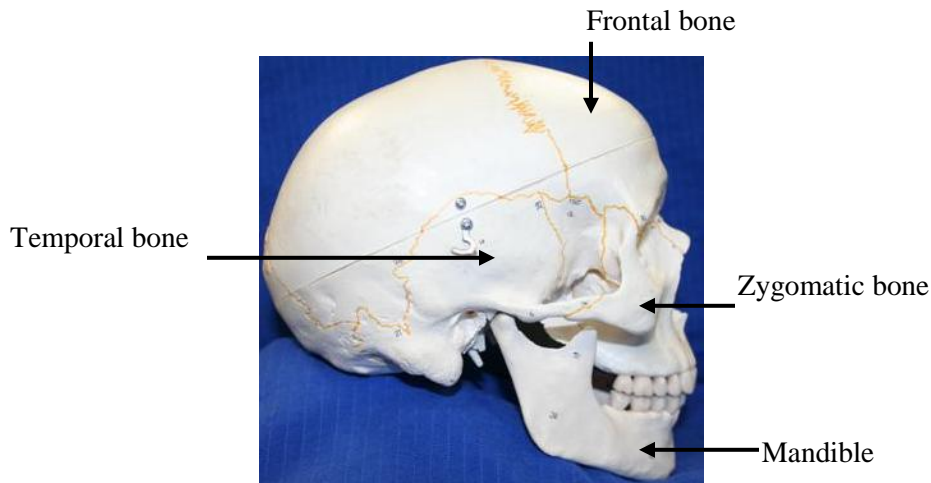
- A. _____
- B. _____
- C. _____
- D. _____



PART D: Explore on Your Own

When it comes to the skeleton, your body can be a great learning tool!
Using the diagram below as a guide, see if you can locate the following:

1. The ridges of your frontal bone above your eyebrows;
2. the arching part of your zygomatic bone, which forms your “cheekbones”; and the joint where your mandible articulates with the temporal bone (open and close your mandible to palpate this joint).



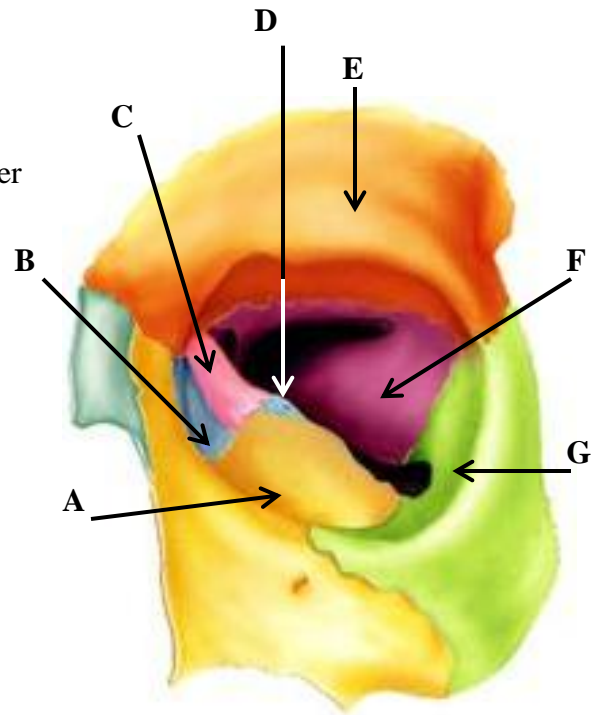
PART E Orbit of the Eye

Some facial bones and cranial bones together form the orbit of the eye.

Figure 9.11 Orbit of the Eye

Name the labeled bones of the cranium and face making up the orbit of the eye.

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____



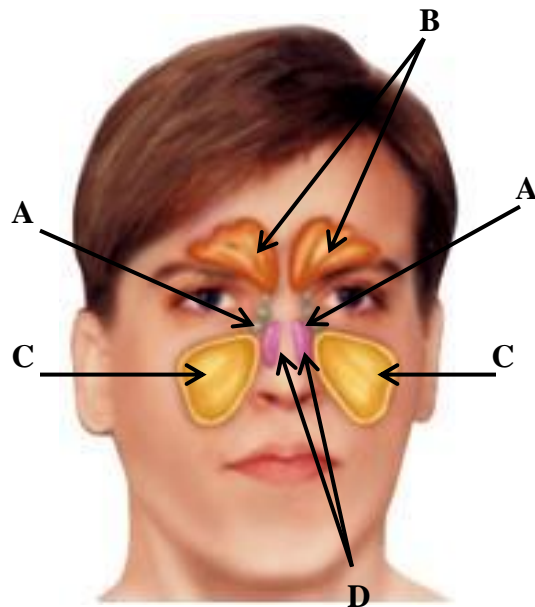
PART F Sinuses

Sinuses are air-filled cavities found in some cranial and facial bones

Figure 9.12

Name the sinuses found in some cranial and facial bones.

- A. _____
- B. _____
- C. _____
- D. _____



?

For the following questions see Figure 9.12, above:

1. The facial bone that contains sinuses is: _____
2. The three cranial bones that contain sinuses are: _____

?

Fill in the correct number of bones found in the face:

Facial Bones: 14

Mandible _____

Nasal _____

Lacrimal _____

Vomer _____

Inferior Nasal Conchae _____

Zygomatic _____

Palatine _____

Maxilla _____

TOTAL: _____ **Facial Bones**

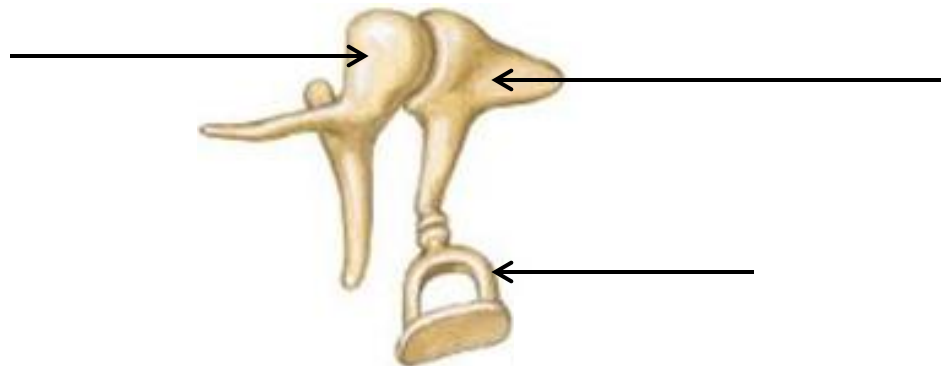
Auditory Ossicles

The ear, organ of hearing, has three sections: external, middle, and inner sections. The middle section hollows out from the temporal bone. It is an air-filled cavity that contains three small bones: the *auditory ossicles*. The auditory ossicles: *malleus*, *incus*, and *stapes*, transmit sound wave vibrations from the tympanic membrane to the inner ear section.

Figure 9.13 Auditory Ossicles.

Name the labeled auditory ossicles:

Use Fig. 17-22 in Chapter 17 of your textbook as a guide to label Figure 9.13



How many (total)?

Auditory Ossicles (middle ear bones): _____

Malleus _____

Incus _____

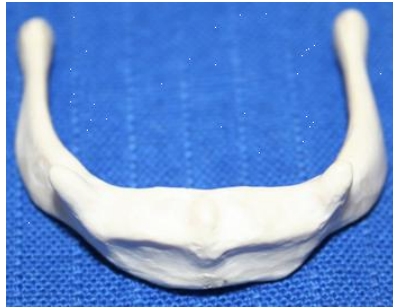
Stapes _____

Hyoid Bone

The *hyoid* (*hi'oid*) bone is found in the anterior neck region, between the mandible and the larynx. This bone is unique in that it does not articulate with any other bones. The hyoid bone is held in position by ligaments and muscles. It supports the tongue and provides attachment sites for muscles that help move the tongue during swallowing.

Figure 9.14 Hyoid Bone.

Name this bone:



See Fig. 7-12 (Ch 7) in
your textbook.

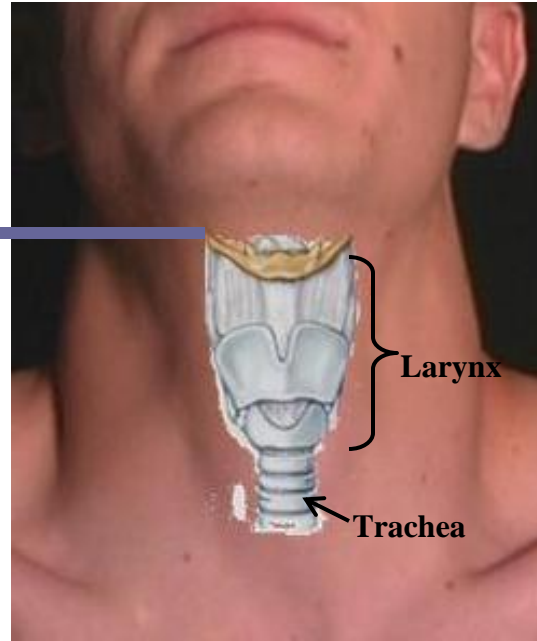


Figure 9.15 Left lateral view of the skeleton.

Label the hyoid bone
in this picture of the
skeleton.



NOTE: when a person is killed by strangulation, the hyoid bone and cartilages of the larynx are usually fractured!

Vertebral Column

The vertebral column, also called the spinal column or backbone, is made up of twenty-six bones called vertebrae (singular is *vertebra*) in adults. During early development, the total number of vertebrae is thirty-three. Between ages 21 to 25 years, several vertebrae in the sacral and coccygeal region fuse together, therefore, decreasing the number of vertebrae in the adult's vertebral column. Vertebrae are separated from each other by fibrocartilage called intervertebral discs. The vertebral column functions to protect the spinal cord, to support the head and to provide attachment sites for ribs, the pelvic girdle, and muscles of the back.

The twenty-six vertebrae in the adult's vertebral column are distributed as follows:

- 7 **cervical vertebrae**
- 12 **thoracic vertebrae**
- 5 **lumbar vertebrae**
- 1 **sacrum** (consists of five fused sacral vertebrae)
- 1 **coccyx** (consists of four fused coccygeal vertebrae)

Vertebra = singular
Vertebrae = plural

PART F Types of Vertebrae

Figure 9.16 Right lateral view of the vertebral column.

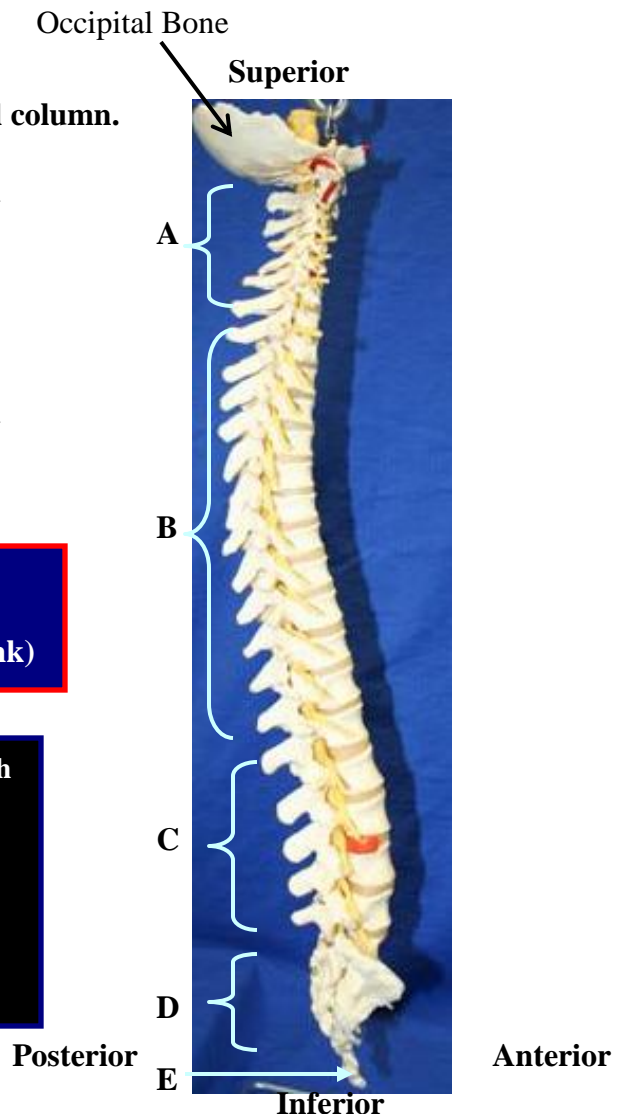
Name the type of vertebrae:

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____

Use color pencils to color each vertebrae:
 cervical (yellow), thoracic (blue), lumbar (orange), sacrum (green), and coccyx (pink)

Hint: to remember the total number of each type of vertebra, think about meal times:
 Cervical (7) – breakfast at 7:00 a.m.
 Thoracic (12) – lunch at 12:00 p.m.
 Lumbar (5) – dinner at 5:00 p.m.

Sacral & Coccyx vertebra each have 1 vertebra: 1 snack between meals!



PART G Vertebral Curvatures

When seen from the side, the vertebral column has four slight *curvatures*. The names of these curvatures correspond to the area in which they occur in the vertebral column.

Figure 9.17 Curvatures of the Vertebral Column – Right lateral view

Label the four curvatures of the vertebral column.

A. Name this vertebra: _____

B. Name this vertebra: _____

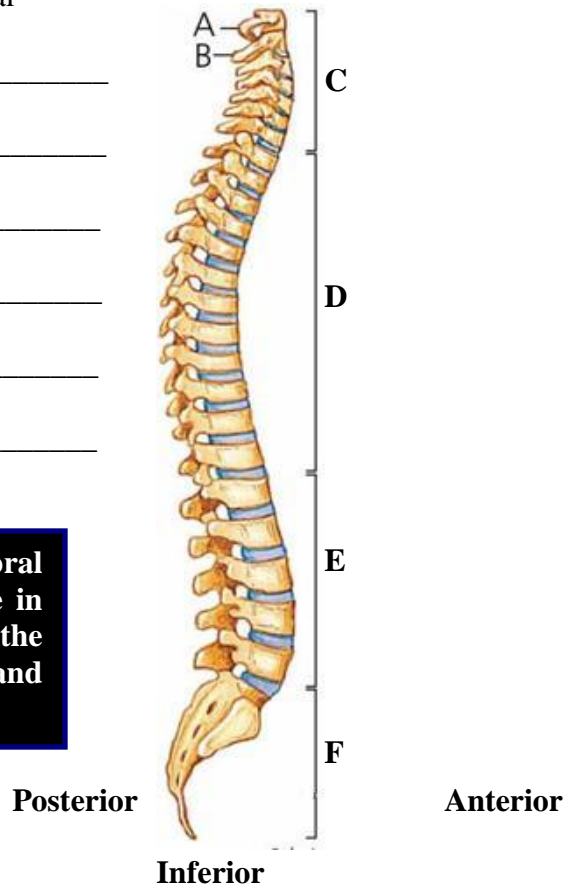
C. Curvature name: _____

D. Curvature name: _____

E. Curvature name: _____

F. Curvature name: _____

The curvatures of the vertebral column help to maintain balance in the upright position, protect the vertebral column from fractures and increase its strength.



?

How many? Fill in the blank:

1. There are _____ cervical vertebrae.
2. There are _____ thoracic vertebrae.
3. There are _____ lumbar vertebrae.
4. There are _____ sacral vertebrae in children, teenagers and young adults.
5. There is _____ sacral vertebra in adults.
6. There are _____ coccyx vertebrae in children, teenagers and young adults.
7. There is _____ coccyx vertebra in adults.

PART H Vertebrae

Vertebrae at different parts of the vertebral column have distinct characteristics as well as common characteristics. The first two cervical vertebrae at the top of the vertebral column are called *atlas* (cervical 1 or C1; supports the head) and *axis* (cervical 2 or C2). The atlas and the axis form a pivot joint, where the head can turn to the left or right (atlas moves on the more stationary axis).

Figure 9.18 Superior view of the (a) atlas and (b) axis. Label the features of the atlas and axis by using the terms provided.

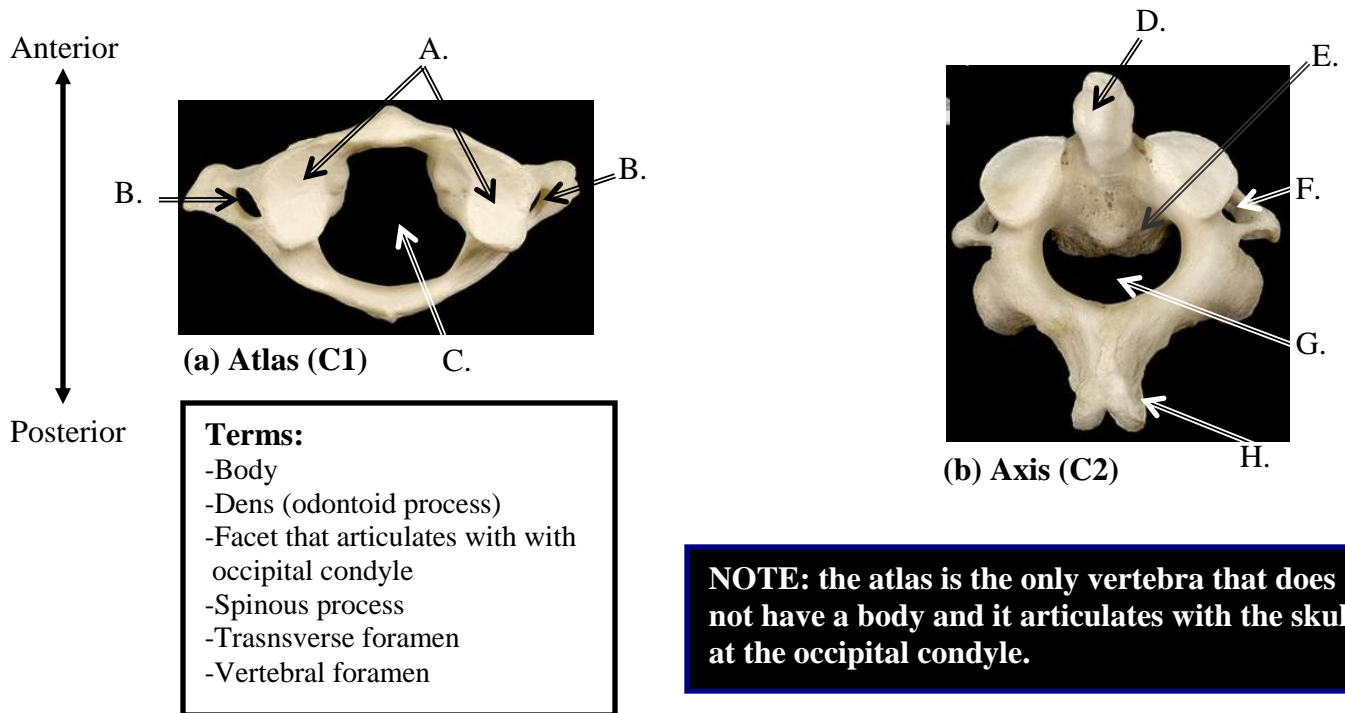
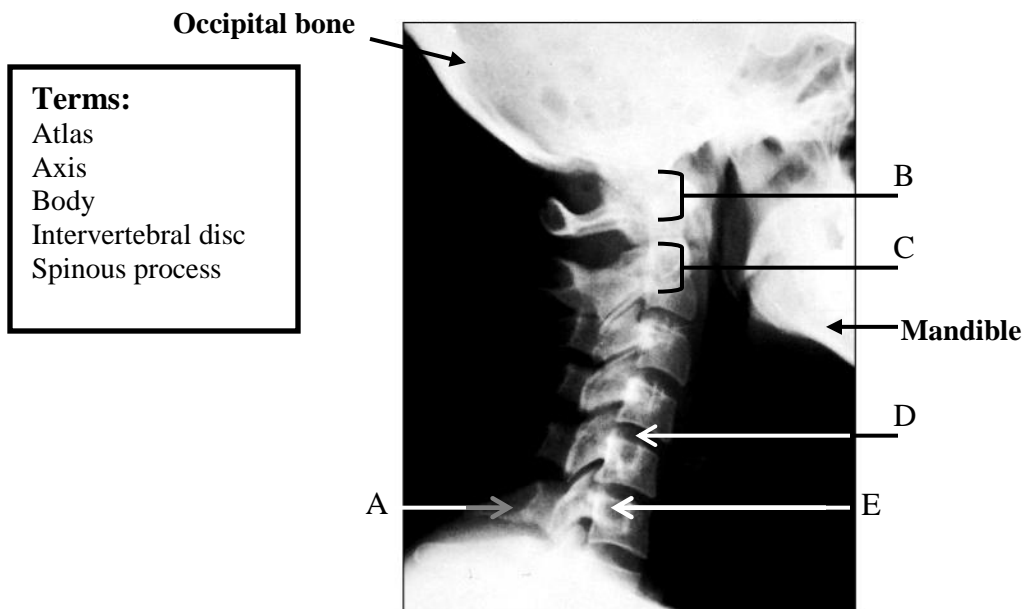


Figure 9.19 Lateral view of an X ray of the neck. Label the bones and features using the terms provided.



Explore on Your Own

Feel along the back of your neck beginning at your hairline. Can you feel any lumps made by the spinous processes of your cervical vertebrae? Try to locate the C7 vertebra, which in most people its spinous process is the most prominent. Can you feel it at the base of your neck?

Figure 9.20 Superior view of (a) cervical, (b) thoracic, and (c) lumbar vertebrae.

Label the features in each vertebra using the terms provided.

Terms:

- A. Spinous process
- B. Transverse foramen
- C. Vertebral foramen
- D. Body
- E. Bifid spinous process
- F. Transverse process
- G. Facet that articulates with rib

(a) Cervical Vertebra



(b) Thoracic Vertebra

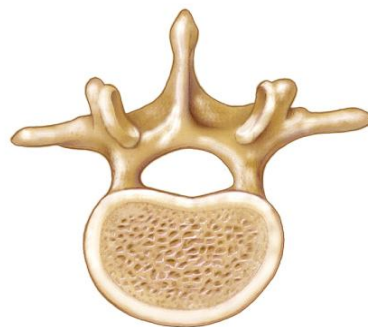


Posterior



Anterior

(c) Lumbar Vertebra



(c)



1. Do the spinous processes of the vertebrae face to the anterior or posterior of the body?
2. Does the body of the vertebra face to the anterior or posterior of the body?
3. Choose One: The vertebrae that have the largest and strongest bodies are the...
a) Cervical b) Thoracic c) Lumbar
4. Describe what passes through the transverse foramen. _____
5. Choose One: The only vertebrae that have transverse foramen are the...
a) Cervical b) Thoracic c) Lumbar
6. Describe what passes through the vertebral foramen. _____
7. What is the name of the fibrocartilage (connective tissue) pads sandwiched between vertebrae? _____
8. How many vertebrae make up the sacrum of an **adult**? _____
9. How many vertebrae make up the sacrum of a **child or teenager**? _____
10. How many TOTAL vertebrae are there in the adult skeleton? _____
11. Choose One: The vertebrae that articulate with ribs are...
a) Cervical b) Thoracic c) Lumbar

Table 9.3 Special Features of Vertebrae

<i>Vertebrae</i>	<i>Special Features</i>
Cervical Vertebrae (7)	The only vertebrae with transverse foramen; Atlas (C1) supports the skull and articulates with occipital chondyle; Atlas does not have a body and spinous process; dens of axis (C2) is located on the body and articulates with atlas; spinous processes from C2-C7 are bifid.
Thoracic Vertebrae (12)	Have pointed spinous processes that slope downward; thoracic vertebrae articulate with ribs.
Lumbar Vertebrae (5)	Have the largest, strongest bodies (to support weight of the trunk); Spinous processes project posteriorly, nearly horizontal.
Sacrum (1)	5 vertebrae fused into one bone in adults.
Coccyx (1)	4 vertebrae fused into one bone in adults; commonly known as the “tailbone”

Thoracic Cage

The thoracic cage is made up by the ribs (12 pairs or 24 total ribs), the thoracic vertebrae, the sternum, and the costal cartilages that attach the ribs to the sternum.

Figure 9.21 Bones and features of the thoracic cage.

Name the labeled bones and structures of the thoracic cage.

A. _____

B. _____

C. (bone) _____

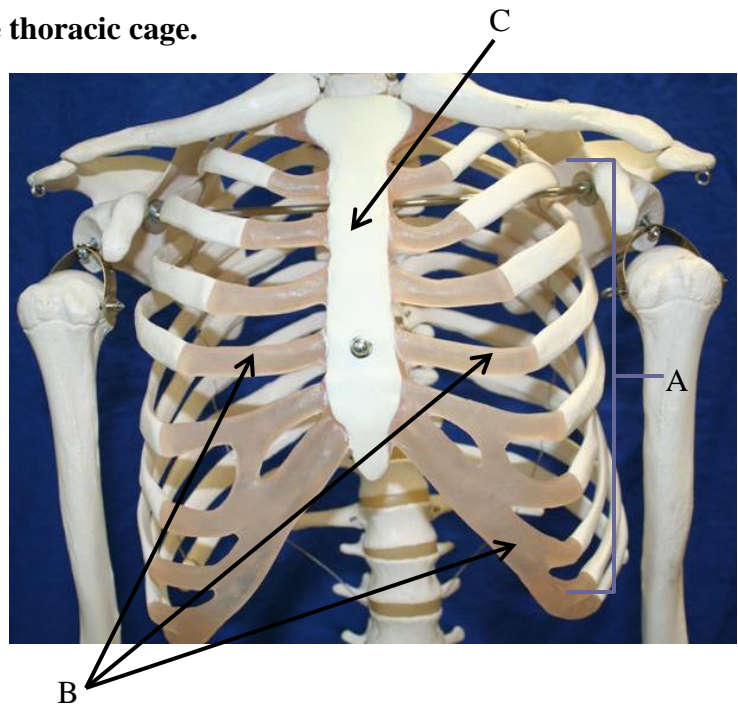
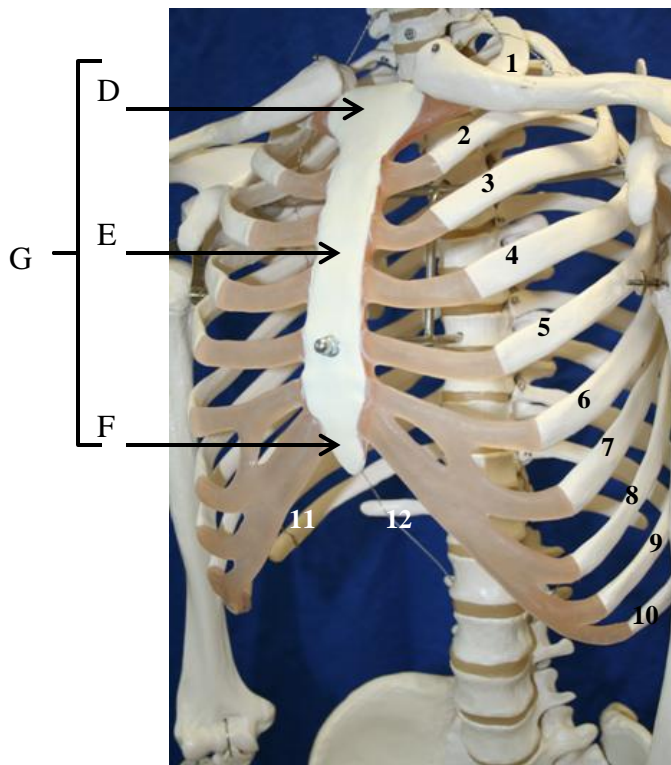


Figure 9.22 Type of ribs and parts of the sternum.

Name the type of ribs and labeled parts of the sternum.



A. Rib pairs 1-7 are called: _____

B. Rib pairs 8-12 are called: _____

C. Rib pairs 11-12 are also called _____

D. _____

E. _____

F. _____

G. (bone) _____

?

1. How many **PAIRS** of ribs are there in the human skeleton? _____
2. How many TOTAL ribs are there in the human skeleton? _____
3. What is the common name for the sternum? _____
4. Which vertebrae do the ribs attach to? _____
5. How many *true* ribs are there? _____
6. How many *false* ribs are there? _____
7. Why the *true ribs* are called “True”? _____

8. Why the *false ribs* are called “False”? _____

9. Why the last two pairs of ribs are called *floating ribs*? _____

10. Are the *floating ribs* true or false ribs? _____