Axial / Appendicular lab

Centra shapes:
acoelous
amphicoelous
prococelous
opisthocoelous
heterocoelous

Human vertebrae:
axis
atlas
odontoid process (on axis)
diapophysis (thoracic)
parapophysis (thoracic)
pre and postzygapophysis
centrum
neural spine
transverse process
transverse foramen (cervical)
lamina
capitulum of rib
tuberculum of rib
sternum (body)
manubrium (of sternum)
xiphoid process (of sternum)

Human scapula:
acromion
supraspinous fossa
infraspinous fossa
scapular spine
coracoid process
glenoid fossa

Human pelvis:
ilium
ischium
pubis
pubic symphysis
acetabulum

Vertebral regions: Identify on mammals, including human disarticulated vertebrae:
cervical
thoracic
lumbar
sacral
caudal

Disarticulated human bones:
radius ulna
humerus femur
tibia fibula

Specialized axial structures on other creatures:
synsacrum (bird – fused lumbar, sacral, one caudal)
urostyle (frog caudal vertebra)
Axial Lab

Quote of the day: “To me, clowns aren’t funny. In fact, they’re kinda scary. I’ve wondered where this started and I think it goes back to the time I went to the circus and a clown killed my dad.”

-Jack Handey

Vertebral Types (based on shape of centrum)
acoelous—the word means “no hollow.” Thus, the centrum is flat on both ends. This type is found in humans and most mammals.

amphicoelous—the word means “double hollow.” The centrum is hollow on the anterior and posterior ends. Found in fish. It only allows for limited motion, and it withstands compression and absorbs shock.

procoelous—the anterior end is hollow and the posterior is either flat or ball-shaped. Like ball and socket joints, this type allows for more extensive range of motion.

opisthocoeulous—the anterior end is flat and the posterior is hollow. Like procoelous vertebrae, this type allows for more extensive range of motion.

heterocoelous—means “different hollow.” Both ends are saddle shaped. These are found in the necks of birds and turtles, where great flexibility is needed.

Human Vertebrae

Vertebrae can be divided into two main parts, the centrum and the neural arch.
Locate the neural arch (everything above the neural canal) first. Notice the supports (pedicles) of the arch rising from the centrum. The arch also consists of pre- and post-zygopophyses that serve as articulation points with the pre’s and post’s of other vertebrae. The pre’s point dorsally and anterior, and the post’s point ventrally and posterior. Find the neural spine (most often a posterior projection off the lamina of the neural arch). Notice the transverse processes, points of bone arising out of the neural arch on each side of the vertebrae.

The transverse processes of thoracic vertebrae have a flat area of bone at their tips called the diapophysis— the articulation point with the tuberculum of the rib. Flat areas called demifaucets exist both anteriorly and posteriorly near the centrum, and when combined, they form a parapophysis that serves as the articulation point with the capitulum of the rib.

Note the atlas is the first cervical vertebrae that articulates with the occipital condyles of the skull and serves to hold the head. The atlas has no centrum. The second cervical vertebrae, the axis, has an odontoid process that goes through the opening of the atlas and articulates with it to move the head from side to side. The axis has a centrum. Note that all cervical vertebrae have two other holes called transverse foramen that house the vertebral arteries.

Identification Hints
Cervical (7)—have transverse foremen.
Thoracic (12)—articulate with ribs, have large transverse processes, pre- and postzygopophyses are flat.
Lumbar (5)—centrum is thicker to support more weight, smaller transverse processes, Pre (further apart) and post-zygopophyses (closer together) are curled inward.
Sacral (5)—transverse processes are fused together and the entire sacrum is fused with the pelvis.
Caudal (4)—vestigial, called the coccyx.
Amniotes: reptiles, birds, mammals

Thoracic vertebrae

- Neural arch
- Transverse process
- Diaphysis (rib articulation)
- Prezygapophysis
- Postzygapophysis (underside)
- Neural spine

Thoracic ribs

- Postzygapophysis
- Diaphysis
- Tuberculum
- Parapophysis
- Capitulum
- Pleurocentrum
- Intercentrum
- Sternum
- Costal segment
- Sternal segment
Figure 8.11 The atlas articulating with the axis forms a pivot joint that permits a rotational movement in one axis. (Note the diagrammatic representation showing the direction of possible movement.) Refer to figure...

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of bones</th>
<th>Diagnostic features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>7</td>
<td>Transverse foramina; superior facets of atlas articulate with occipital condyle; odontoid process of axis; spinous processes of second through sixth vertebrae are bifid</td>
</tr>
<tr>
<td>Thoracic</td>
<td>12</td>
<td>Long spinous processes that slope obliquely inferiorly; facets and demifacets for articulation with ribs</td>
</tr>
<tr>
<td>Lumbar</td>
<td>5</td>
<td>Large bodies; prominent transverse processes; short, thick spinous processes; neural spine</td>
</tr>
<tr>
<td>Sacrum</td>
<td>4 or 5 fused vertebrae</td>
<td>Extensive auricular surface; median sacral crest; dorsal sacral foramina; sacral promontory; sacral canal</td>
</tr>
<tr>
<td>Coccyx</td>
<td>4 or 5 fused vertebrae</td>
<td>Small, triangular; coccygeal cornua</td>
</tr>
</tbody>
</table>
**Figure 3.21** Articulation of a thoracic vertebra with a rib
Figure 5.12
Skeleton of a painted turtle, ventral view. The plastron has been cut away to reveal the internal skeletal detail.
Figure 5.13
Skeleton of a pigeon. (a) Articulated skeleton with the left member of paired structures not included for clarity. (b) Cervical vertebrae, lateral view. (c) Synsacrum, ventral view; cranial is up.
Appendicular Skeleton

Superior border

Superior angle

Supraspinous fossa or process

Infraspinous fossa or process

Medial (vertebral) border

Acromion

Coracoid process

Glenoid cavity

Body

Lateral (axillary) border

Superior angle

Subscapular fossa

Lateral border

Posterior border

Superior border

Superior angle

Supraspinous fossa or process

Infraspinous fossa or process

Medial (vertebral) border

Acromion

Coracoid process

Spine

Glenoid cavity

Body

Lateral (axillary) border

Superior angle

Subscapular fossa

Body

Lateral border

Posterior border

Superior border

Superior angle

Supraspinous fossa or process

Infraspinous fossa or process

Medial (vertebral) border

Acromion

Coracoid process

Spine

Glenoid cavity

Body

Lateral (axillary) border

Superior angle

Subscapular fossa

Body

Lateral border

Posterior border
FIGURE 3.27 | Pelvis

(a) Superior view of female pelvis

(b) Superior view of male pelvis