LABORATORY EXERCISE 11
STRUCTURE AND CLASSIFICATION OF BONE

Figure Labels

FIG. 11.1

1. Articular cartilage (hyaline cartilage)
2. Spongy bone (red marrow)
3. Compact bone
4. Medullary cavity
5. Yellow marrow
6. Periosteum
7. Proximal epiphysis
8. Diaphysis
9. Distal epiphysis

FIG. 11.2

1. Spongy bone
2. Compact bone
3. Osteon
4. Periosteum
5. Osteonic canal
6. Perforating canal
7. Blood vessels
8. Nerve
9. Canaliculus
10. Osteocyte

Critical Thinking Application Answer

The closest blood supply to an osteocyte is located in the osteonic canal of an osteon unit. Nutrients and wastes can move from one cell to another via small cellular processes located in minute tubes in the matrix called canaliculi. In this way, all of the osteocytes of one osteon are tied together to a blood source.

Laboratory Report Answers

PART A

1. flat
2. short
3. long
4. irregular
5. round or sesamoid
6. flat
7. Epiphysis refers to the expanded end of a long bone; diaphysis refers to the shaft between the ends of such a bone.
8. Hyaline cartilage covers the articular ends of a long bone.
9. Dense connective tissue comprises the periosteum that encloses the bone except for its articular ends.
10. Periosteum forms the outer covering of a bone, whereas endosteum lines its hollow, internal chambers.

PART B

1. Compact bone has osteons closely packed together, and spongy bone has large spaces between thin bony plates called trabeculae.
2. Compact bone provides strength in the shaft and along the borders of the bone. Spongy bone reduces the weight of the bone and provides spaces occupied by red marrow.
3. The marrow in the medullary cavity of an adult is yellow, but marrow in the spaces of spongy bone is red.

PART C (figure 11.3*a* and *b*)

1. Epiphysis (distal)
2. Diaphysis
3. Epiphysis (proximal)
4. Medullary cavity (occupied by yellow marrow)
5. Compact bone
6. Spongy bone (occupied by red marrow)

LABORATORY EXERCISE 12
ORGANIZATION OF THE SKELETON

Figure Labels

FIG. 12.1*a*

1.	Cranial bones (cranium)	5.	Sternum	9.	Carpals	14.	Metatarsal
2.	Facial bones (face)	6.	Rib	10.	Metacarpal	15.	Phalanx
3.	Skull	7.	Vertebral column (vertebra)	11.	Phalanx		
4.	Clavicle	8.	Coxal bone	12.	Patella		
				13.	Tarsals		

FIG. 12.1*b*

16.	Scapula	19.	Radius	22.	Fibula	24.	Sacrum
17.	Humerus	20.	Femur	23.	Vertebral column (vertebra)	25.	Coccyx
18.	Ulna	21.	Tibia				

Critical Thinking Application Answer

The largest foramen in the skull is the foramen magnum in the occipital bone. The largest foramen in the human body is the obturator foramen in the coxal bone.

Laboratory Report Answers

PART A

1.	sutural bones (wormian bones)	9.	ulna
2.	reduce friction where tendons pass over bony prominences	10.	carpals
3.	skull	11.	sacrum
4.	hyoid	12.	pelvis
5.	coccyx	13.	patella
6.	sternum	14.	tarsals
7.	twelve	15.	phalanges
8.	pectoral girdle		

PART B

1.	c	3.	a	5.	g	7.	d
2.	f	4.	e	6.	b		

PART C

1.	c	5.	b
2.	a	6.	d
3.	g	7.	f
4.	e		

LABORATORY EXERCISE 13
THE SKULL

Instructional Suggestion

You might want to have the students use colored pencils to color the bones in figures 13.1 through 13.5. They should use a different color for each of the individual bones in the series. This activity should cause the students to observe the figures more carefully and help them to locate the various bones that are shown from different views in the figures. The students can check their work by referring to the corresponding full-color figures in the textbook.

Figure Labels

FIG. 13.1

1. Parietal bone
2. Frontal bone
3. Coronal suture
4. Temporal bone
5. Perpendicular plate (of ethmoid bone)
6. Infraorbital foramen
7. Vomer bone
8. Mandible
9. Supraorbital foramen
10. Nasal bone
11. Sphenoid bone
12. Zygomatic bone
13. Middle nasal concha (of ethmoid bone)
14. Inferior nasal concha
15. Maxillary bone
16. Mental foramen

FIG. 13.2

1. Parietal bone
2. Squamosal suture
3. Lambdoidal suture
4. Temporal bone
5. Occipital bone
6. Temporal process (of zygomatic bone)
7. External auditory meatus
8. Mastoid process
9. Styloid process
10. Mandibular condyle
11. Zygomatic process (of temporal bone)
12. Coronal suture
13. Frontal bone
14. Sphenoid bone
15. Lacrimal bone
16. Nasal bone
17. Zygomatic bone
18. Maxillary bone
19. Mental foramen
20. Mandible
21. Coronoid process

FIG. 13.3

1. Maxillary bone
2. Zygomatic bone
3. Sphenoid bone
4. Vomer bone
5. Zygomatic arch
6. Styloid process
7. Mastoid process
8. Occipital condyle
9. Temporal bone
10. Palatine process (of maxillary bone)
11. Palatine bone
12. Foramen magnum
13. Lambdoidal suture
14. Occipital bone

FIG. 13.4

1. Ethmoid bone
2. Foramen magnum
3. Crista galli
4. Cribriform plate (olfactory foramina)
5. Frontal bone
6. Sphenoid bone
7. Temporal bone
8. Sella turcica
9. Parietal bone
10. Occipital bone

FIG. 13.5

1. Coronal suture
2. Frontal bone
3. Frontal sinus
4. Crista galli
5. Nasal bone
6. Perpendicular plate (of ethmoid bone)
7. Maxillary bone
8. Mandible
9. Temporal bone
10. Parietal bone
11. Squamosal suture
12. Lambdoidal suture
13. Occipital bone
14. Sella turcica
15. Styloid process
16. Sphenoidal sinus
17. Vomer bone

Critical Thinking Application Answer

The cribiform plate of the ethmoid bone with numerous olfactory foramina is a weak location of the cranium. Excessive pressure on the cribiform plate could result in a skull fracture.

Laboratory Report Answers

PART A

1.	d	4.	f	7.	f	10.	e
2.	a	5.	c	8.	a	11.	f
3.	a	6.	f	9.	c	12.	b

PART B

1. coronal
2. sagittal
3. lambdoidal
4. squamosal
5. frontal, ethmoid, sphenoid
6. maxillary bone

PART C

1.	e	4.	h	7.	h	10.	c
2.	c	5.	d	8.	a	11.	f
3.	c	6.	g	9.	d	12.	b

PART D

1.	c	3.	g	5.	d	7.	e
2.	a	4.	f	6.	b		

PART E (figures 13.7–13.11)

FIG. 13.7

1. Frontal
2. Nasal
3. Zygomatic
4. Infraorbital foramen
5. Maxilla
6. Mandible
7. Middle nasal concha (of ethmoid bone)
8. Inferior nasal concha
9. Mental foramen

FIG. 13.8

1. Parietal
2. Squamosal suture
3. Temporal
4. Lambdoidal suture
5. Occipital
6. External auditory meatus
7. Mastoid process
8. Mandibular condyle
9. Coronal suture
10. Frontal
11. Zygomatic process (of temporal bone)
12. Zygomatic
13. Maxilla
14. Mandible

FIG. 13.9

1. Maxilla
2. Zygomatic bone
3. Sphenoid bone
4. Temporal bone
5. Occipital bone
6. Incisive foramen
7. Palatine process of maxilla
8. Palatine bone
9. Vomer bone
10. Occipital condyle
11. Foramen magnum

FIG. 13.10

1. Frontal bone
2. Temporal bone
3. Parietal bone
4. Occipital bone
5. Ethmoid bone
6. Sphenoid bone
7. Sella turcica
8. Foramen magnum

FIG. 13.11

1. Parietal bone
2. Sphenoid bone
3. Temporal bone
4. Zygomatic bone
5. Maxilla
6. Frontal bone
7. Mandible

LABORATORY EXERCISE 14
VERTEBRAL COLUMN AND THORACIC CAGE

Figure Labels

FIG. 14.1

1. Cervical vertebrae
2. Thoracic vertebrae
3. Lumbar vertebrae
4. Intervertebral disks
5. Intervertebral foramina
6. Sacrum
7. Coccyx

FIG. 14.2

1. Fovea dentis (facet for dens)
2. Facet that articulates with occipital condyle
3. Transverse foramen
4. Transverse process
5. Dens (odontoid process)
6. Superior articular facet
7. Transverse foramen
8. Body
9. Spinous process

FIG. 14.3

1. Lamina
2. Body
3. Lamina
4. Pedicle
5. Body
6. Lamina
7. Superior articular facet
8. Spinous process (bifid)
9. Transverse foramen
10. Transverse process
11. Spinous process
12. Transverse process
13. Facet for rib tubercle
14. Superior articular facet
15. Facet for rib head
16. Vertebral foramen
17. Transverse process
18. Pedicle
19. Body

FIG. 14.4

1. Sacral promontory
2. Pelvic (ventral) sacral foramen
3. Superior articular process
4. Sacral canal
5. Tubercle of medial sacral crest
6. Dorsal sacral foramen
7. Sacral hiatus

Critical Thinking Application Answer

The four curvatures allow more resiliency and flexibility, which will enable the vertebral column to function more like a spring instead of a rigid rod.

FIG. 14.5

1. Sternal notch
2. Sternal angle
3. True ribs
4. False ribs
5. Floating ribs
6. Thoracic vertebrae
7. Clavicular notch
8. Manubrium
9. Body
10. Xiphoid process
11. Sternum
12. Costal cartilage

FIG. 14.6

1. Neck
2. Head
3. Tubercle
4. Shaft
5. Anterior (sternal) end
6. Tubercle
7. Anterior (sternal) end

Laboratory Report Answers

PART A

1. spinal cord
2. 33
3. 26
4. primary
5. bodies
6. intervertebral disks
7. vertebral arch
8. spinal nerves
9. vertebral arteries
10. atlas
11. axis
12. dens
13. lumbar
14. five
15. sacroiliac
16. sacral promontory
17. sacral hiatus

PART B

Vertebra	*Number*	*Size*	*Body*	*Spinous Process*	*Transverse Foramina*
Cervical	7	Smallest	Smallest	C2 through C5 are forked	Present
Thoracic	12	Intermediate	Intermediate	Pointed and angle downward	Absent
Lumbar	5	Largest	Largest	Short, blunt, and nearly horizontal	Absent

PART C

1. 206
2. floating
3. transverse
4. hyaline cartilage
5. clavicles
6. a. supports shoulder girdle and upper limbs
   b. protects visceral organs
   c. functions in breathing

PART D (figure 14.7)

1. Spinous process
2. Atlas
3. Axis
4. Transverse process
5. Intervertebral disk
6. Body of sixth cervical vertebra

LABORATORY EXERCISE 15
PECTORAL GIRDLE AND UPPER LIMB

Figure Labels

FIG. 15.1

1. Acromion process
2. Head of humerus
3. Coracoid process
4. Clavicle
5. Rib
6. Sternum
7. Costal cartilage
8. Scapula
9. Humerus
10. Ulna
11. Radius

FIG. 15.2

1. Acromion process
2. Coracoid process
3. Superior border
4. Supraspinous fossa
5. Spine
6. Infraspinous fossa
7. Medial (vertebral) border
8. Glenoid cavity
9. Lateral (axillary) border
10. Coracoid process
11. Glenoid cavity
12. Acromion process

Critical Thinking Application Answer

The clavicles brace the freely movable scapulae, helping to hold the shoulders in place. If an excessive lengthwise force occurs on this structurally weak bone, as when a person breaks a fall with an outstretched rigid upper limb, it is likely to fracture.

FIG. 15.3

1. Head
2. Greater tubercle
3. Anatomical neck
4. Surgical neck
5. Olecranon fossa
6. Lateral epicondyle
7. Capitulum
8. Greater tubercle
9. Lesser tubercle
10. Intertubercular groove
11. Deltoid tuberosity
12. Coronoid fossa
13. Capitulum
14. Trochlea
15. Medial epicondyle
16. Trochlea

FIG. 15.4

1. Trochlear notch
2. Coronoid process
3. Head of radius
4. Radial tuberosity
5. Styloid process
6. Olecranon process
7. Head of ulna
8. Styloid process

FIG. 15.5

1. Olecranon process
2. Humerus
3. Olecranon fossa
4. Head of radius
5. Radius
6. Ulna

FIG. 15.6

1. Distal phalanx
2. Middle phalanx
3. Proximal phalanx
4. Metacarpals
5. Carpals
6. Pisiform
7. Triquetrum
8. Hamate
9. Phalanges
10. Trapezium
11. Trapezoid
12. Scaphoid
13. Capitate
14. Lunate

Laboratory Report Answers

PART A

1. scapulae
2. manubrium (clavicular notch)
3. acromion processes
4. clavicle
5. spine
6 acromion process
7. coracoid process
8. head

PART B

1.	a	5.	d	9.	f	13.	b
2.	b	6.	b	10.	e	14.	f
3.	b	7.	a	11.	a	15.	e
4.	c	8.	b	12.	a		

PART C (figures 15.7, 15.8, and 15.9)

1. Ulna
2. Humerus
3. Olecranon process
4. Head of radius
5. Radius
6. Acromion process
7. Head of humerus
8. Humerus
9. Clavicle
10. Scapula
11. Rib
12. Phalanges
13. Metacarpals
14. Carpals
15. Distal phalanx
16. Proximal phalanx

LABORATORY EXERCISE 16
PELVIC GIRDLE AND LOWER LIMB

Figure Labels

FIG. 16.1

1. Coxal bone
2. Sacrum
3. Coccyx

FIG. 16.2*a*

1. Ilium
2. Posterior superior iliac spine
3. Greater sciatic notch
4. Ischial spine
5. Lesser sciatic notch
6. Ischium
7. Ischial tuberosity
8. Iliac crest
9. Anterior superior iliac spine
10. Acetabulum
11. Pubis
12. Obturator foramen

FIG. 16.2*b*

13. Anterior superior iliac spine
14. Ilium
15. Pubis
16. Iliac crest
17. Iliac fossa
18. Posterior superior iliac spine
19. Greater sciatic notch
20. Ischial spine
21. Lesser sciatic notch
22. Ischium

Critical Thinking Application Answer

All the features examined are wider in the female pelvis which will result in a larger pelvic cavity and must also serve as a birth canal for a vaginal delivery.

FIG. 16.3

1. Fovea capitis
2. Neck
3. Lesser trochanter
4. Medial epicondyle
5. Lateral epicondyle
6. Patellar surface
7. Greater trochanter
8. Head
9. Neck
10. Lesser trochanter
11. Linea aspera
12. Lateral condyle
13. Medial condyle

FIG. 16.4

1. Medial condyle
2. Tibial tuberosity
3. Anterior crest
4. Tibia
5. Medial malleolus
6. Lateral condyle
7. Head of fibula
8. Fibula
9. Lateral malleolus