

Bone Structure Description Lab

You must have teacher initials on pages 6, 9, 10, 18, and 19 to earn full credit

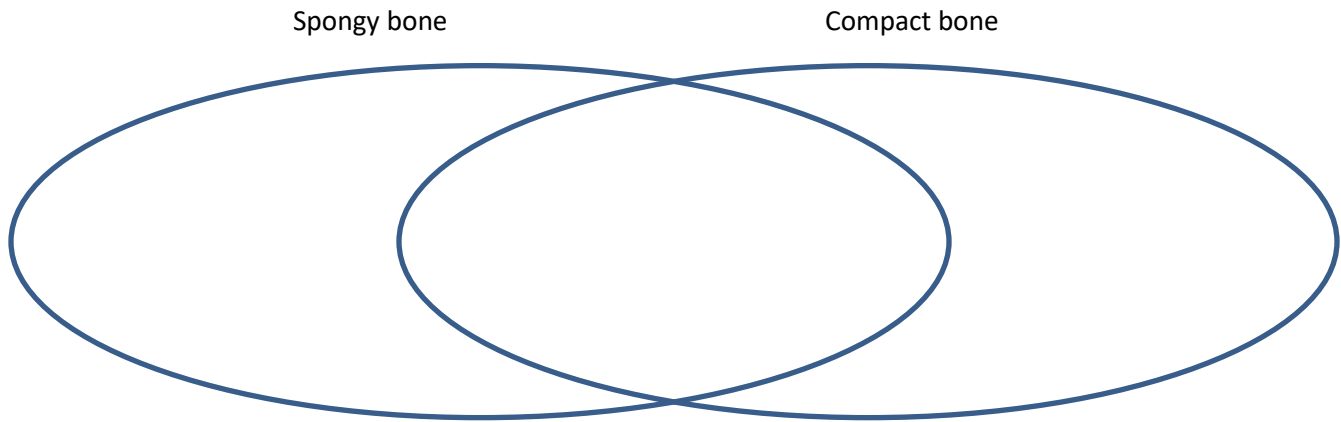
Prelab answer question 1-9 (Lecture Questions 20-22)

A bone represents an organ of the skeletal system. As such, it is composed of a variety of tissues including bone tissue, cartilage, dense connective tissue, blood, and nervous tissue. Bones are not only very much alive, but also multifunctional. They support and protect softer tissues, provide points of attachment for muscles, house blood-production cells, and store inorganic salts.

Although bones of the skeleton vary greatly in size and shape, they have much in common structurally and functionally.

- 1) What are the functions of bone?
 - I.
 - II.
 - III.
 - IV.
- 2) Define hematopoiesis
- 3) Where does hematopoiesis occur in adults?
- 4) What is red marrow and what does it do?
- 5) Describe the microscopic structure of compact bone.

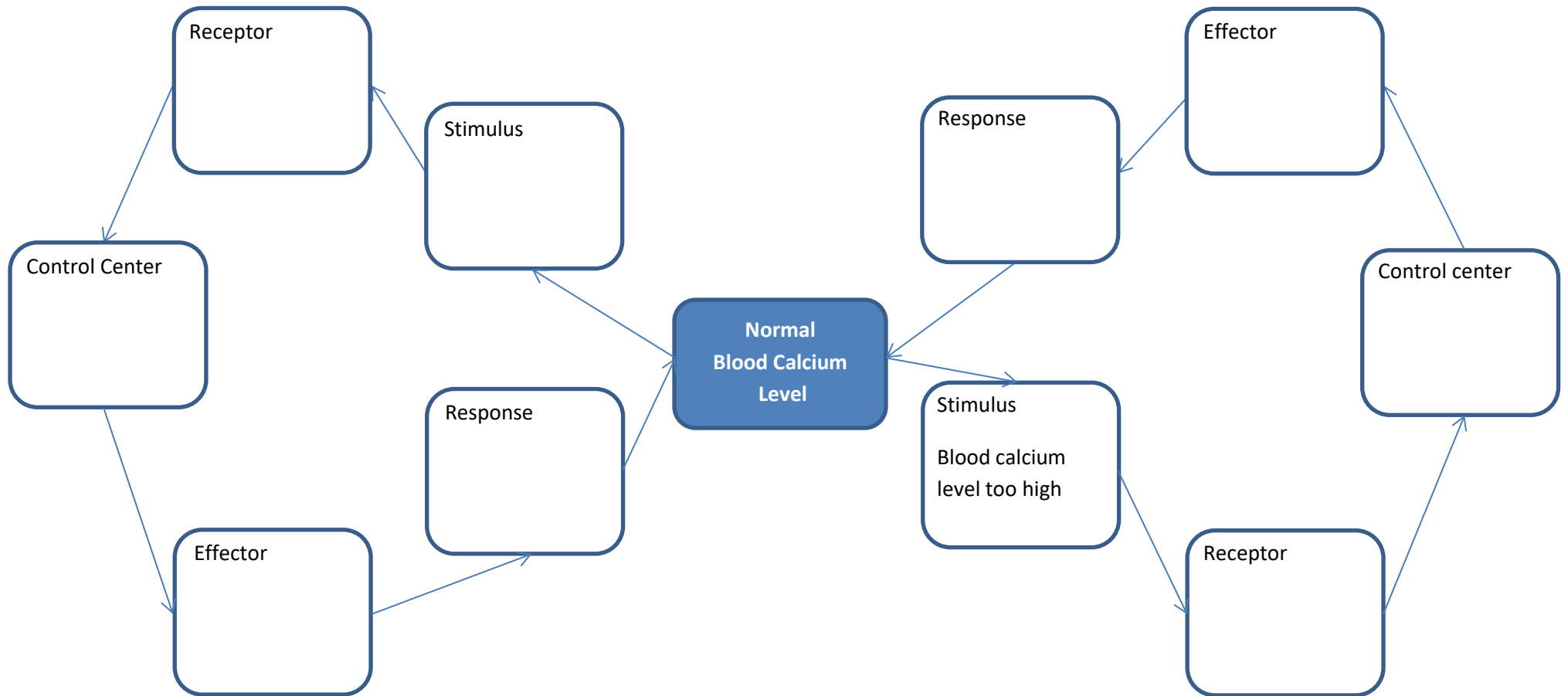
- 6) Complete the Venn diagram below with the following words and phrases: Extracellular material mostly collagen and inorganic salts, osteon, trabeculae, central (Haversian) canals, osteocytes, nourished via diffusion, nourished via blood vessels, perforating (Volkmann's) canals



- 7) Describe the role of the epiphyseal plate in bone growth using the following words and phrases: diaphysis, epiphysis, epiphyseal plate, cartilaginous cells, osteoblasts, calcification, and osteocytes
- 8) Describe how bone growth stops using the following words and phrases: epiphyseal plate, ossify, epiphysis, diaphysis, and ossification centers. Hint: This is not explicitly described in the lecture. Think about what kind of tissue the epiphyseal plate is composed of and its role in bone growth.

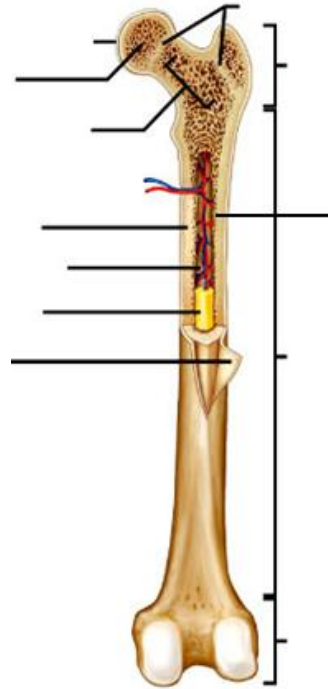
9) Review question #22: How does bone form and how is bone formation regulated? Fill in the Diagram below with the following phrases: parathyroid secretes parathyroid hormone, thyroid secretes calcitonin, osteoblasts absorb calcium from blood, osteoclasts break down bone releasing calcium into blood, parathyroid senses decrease in blood calcium level, thyroid senses increase in blood calcium, blood calcium level decreases, blood calcium level increases, blood calcium level returned to normal (use twice), blood calcium level too low

Calcium Homeostasis



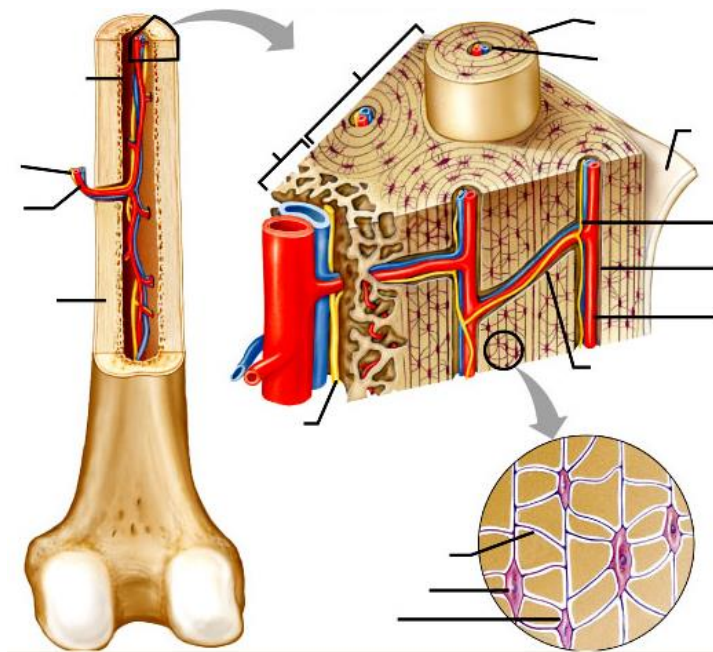
Procedure (this page is what will be on the practical)

- Label the femur (an example of a long bone) below with the following:



- 1) Articular cartilage
- 2) Compact bone
- 3) Diaphysis
- 4) Distal epiphysis
- 5) Endosteum
- 6) Epiphyseal plates
- 7) Medullary cavity
- 8) Periosteum
- 9) Proximal epiphysis
- 10) Red marrow is found here
- 11) Spongy bone
- 12) Yellow marrow is found here

- Memorize the structures by quizzing each other in pairs
- Label the following features associated with the microscopic structure of bone:



- 1) Blood vessels (use twice)
- 2) Canaliculi
- 3) Compact bone (use twice)
- 4) Endosteum
- 5) Haversian canal (use twice)
- 6) Lacuna
- 7) Nerve (use twice)
- 8) Osteocyte
- 9) Osteon
- 10) Spongy bone
- 11) Volkmann's canal

- Put on goggles and apron
- Acids dissolve minerals like calcium. Observe the chicken bone that was soaked in acetic acid. Attempt to bend it and then hit it with a hammer. Record your observations below.
- Baking removes the proteins and other organic substances from the extra cellular matrix of bone. Observe the chicken bone that was baked in the oven. Attempt to bend it and then hit with a hammer. Record your observations below. Make sure you shatter the epiphyses for use in the next lab activity.
- Remove gloves and goggles and wash your hands after handling the chicken bones

Bone soaked in acetic acid	Bone baked

- Identify the following structures on the prepared slide of compact bone using a compound light microscope and record observations below
 - Osteon
 - Lamella
 - Haversian canal
 - Osteocyte in lacuna
 - Bone extracellular matrix
 - Canaliculi
- Memorize the structures by quizzing each other in pairs
- Put on gloves
- Observe spongy bone with the dissecting microscope and record below

Compact bone (from prepared slide)	Spongy bone (from broken epiphyses of baked bone)

Analysis

- 10) Describe where dense connective tissue is found in/on long bone.

- 11) Distinguish between periosteum and endosteum.

- 12) How are the structural differences of compact and spongy bone related to their locations and functions?

- 13) What components of bones give them their rigidity?

- 14) What components of bone give them their flexibility?

- 15) Justify your answers to the last 2 questions above. A justification has 3 parts: 1) Scientific knowledge or theory, 2) data from analysis related to the knowledge, and 3) an explanation of HOW the data supports the knowledge. Highlight knowledge in pink, data from analysis in yellow, and explanation in green.

Teacher initials_____

Joints and Their Movements Lab

Prelab answer question 16-31 (Lecture Question 23)

Joints are junctions between bones. Although they vary considerably in structure, they can be classified according to the type of tissue that binds the bones together. The three groups of joints can be identified as 1) fibrous joints, 2) cartilaginous joints, and 3) synovial joints.

Movements occurring at freely movable synovial joints are due to the contractions of skeletal muscles. In each case, the type of movement depends on the kind of joint involved and the way in which the muscles are attached to the bones on either side of the joint.

16) What are the 3 types of joints?

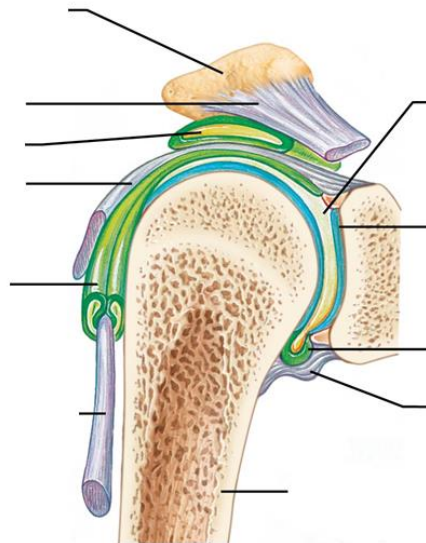
- I.
- II.
- III.

17) What is a joint?

18) What is the function of an intervertebral disc?

19) What is the function of the synovial fluid?

20) Label the synovial joint with the following: 1) bursa, 2) Joint cavity containing synovial fluid, 3) Humerus, 4) Tendon sheath, 5) tendon, 6) Synovial membrane, 7) Articular cartilage composed of hyaline cartilage, 8) fibrous layer of the articular capsule



This page will be on the practical

Review question #23: How does the skeleton move?

<u>Type</u>	<u>Mobility description</u> (synarthrotic, amphiarthrotic, diarthrotic)	<u>Example</u>
Fibrous		
21) Syndesmosis		
22) Suture		
23) Gomphosis		
Cartilaginous		
24) Syncondrosis		
25) Symphysis		
Synovial		
26) Ball-and-socket		
27) Condylloid (Condylar)		
28) Plane (Gliding)		
29) Hinge		
30) Pivot		
31) Saddle		

Procedures:

- ✚ Examine the human skull and articulated skeleton to locate examples of the following types of joints
 - Fibrous joints
 - Syndesmosis
 - Suture
 - Gomphosis
 - Cartiliginous joints
 - Syncondrosis
 - Symphysis
 - Synovial joints
- ✚ Locate examples of the following types of synovial joints in the skeleton
 - Ball-and-socket joint
 - Condylloid joint
 - Plane (Gliding) joint
 - Hinge joint
 - Pivot joint
 - Saddle joint
- ✚ Palpate the joints above on your own body
- ✚ Memorize the joints above by quizzing in pairs. Quiz each other by palpating each of the joints above on your body

Analysis

When the body is in anatomical position as shown below, most joints are extended and/or **adducted**. Skeletal muscle action involves the movable end (**insertion**) being pulled toward the stationary end (**origin**). In the limbs, the origin is usually **proximal** to the insertion; in the **trunk**, the origin is usually **medial** to the insertion. Translate the previous three sentences into language a normal person could understand and use the image below to illustrate the three sentences as well (*the bolded words must be translated and illustrated*).

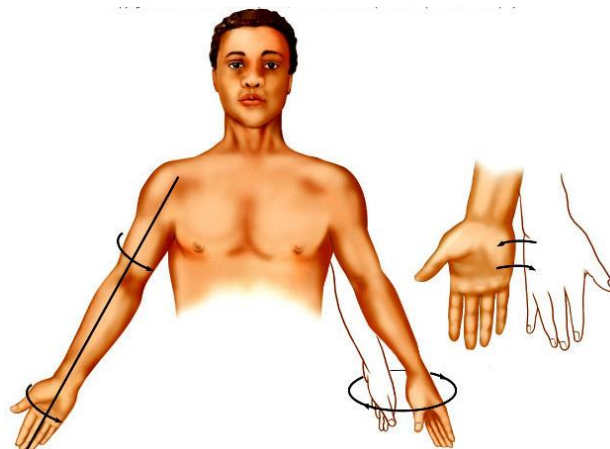


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🚦 Review question #23: How does the skeleton move?

🚦 Label the following joint movements on the illustrations below **(this page will be on the practical)**

- Extension (twice)
- hyperextension
- Flexion (twice)
- Dorsiflexion
- Plantar flexion
- Adduction
- Abduction
- Eversion
- Inversion
- Elevation
- Depression
- Supination
- Pronation
- Protraction
- Retraction
- Rotation
- Circumduction



🚦 Memorize the joint movements above by quizzing in pairs. Quiz each other by demonstrating the different movements

🚦 Demonstrate you know the joint movements to your teacher

Teacher initials_____

The Skull Lab

Prelab: all tables and illustrations must be completed or labeled (Lecture Question #24)

The human skull consists of twenty-two bones that, except for the lower jaw, are firmly interlocked along sutures. Eight of these immovable bones make up the brain case, or cranium, and thirteen more immovable bones and the mandible form the facial skeleton.

The structures below will be on the practical

Cranial Bones

Name of bone	Number bones of this type	Description
Frontal		
Parietal		
Occipital		
Temporal		
Sphenoid		
Ethmoid		

Sinuses of the Cranial and Facial Bones

Name of sinus	Location
Frontal sinus	
Sphenoidal sinus	
Ethmoidal sinus	
Maxillary sinus	

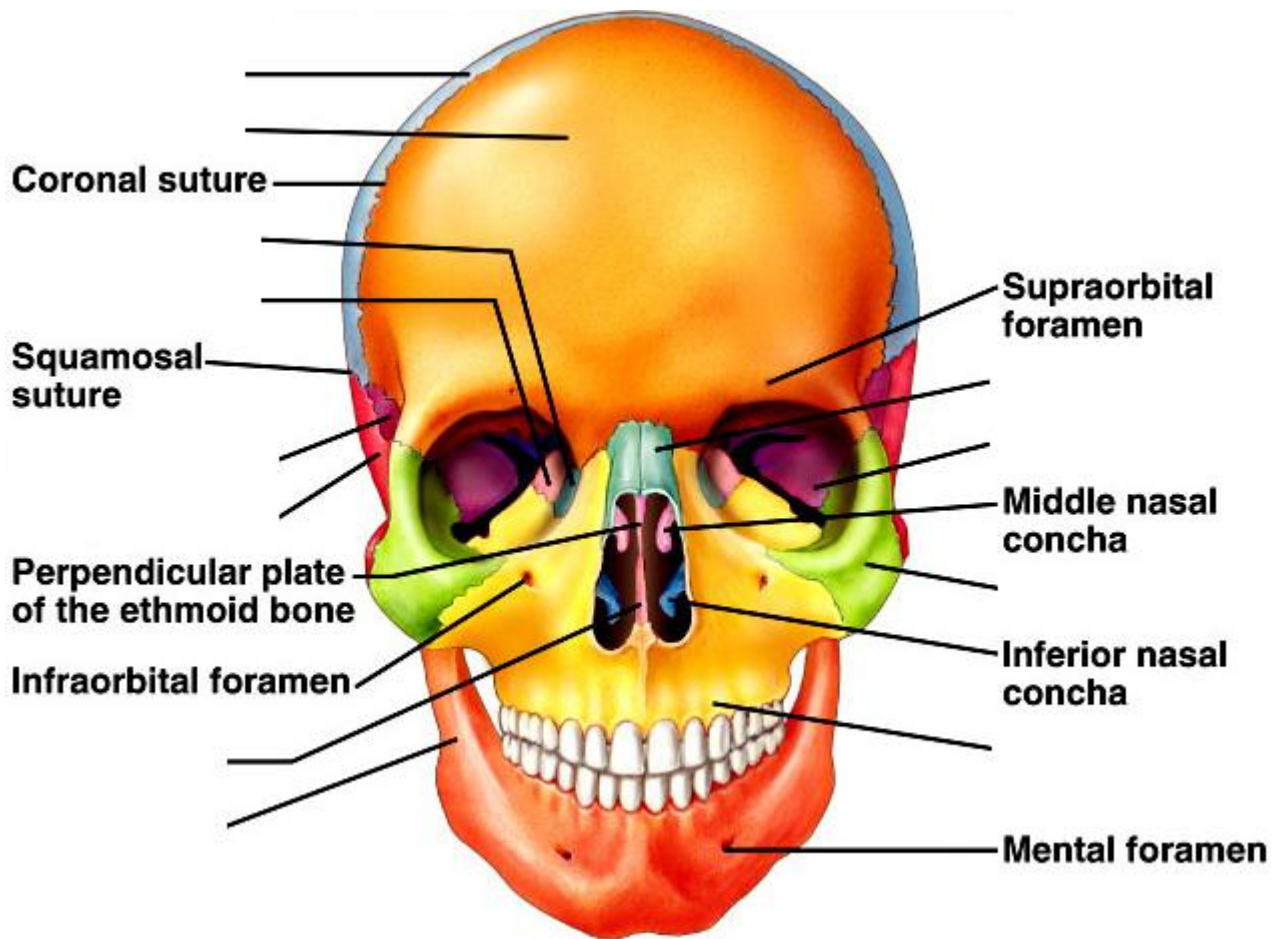
Facial Bones

Name of bone	Number bones of this type	Description
Maxillary		
Palatine		
Zygomatic		
Lacrimal		
Nasal		
Vomer		
Mandible		

✚ Label the following structures in the figure below (the labeled structures will not be on the practical)

The structures below will be on the practical

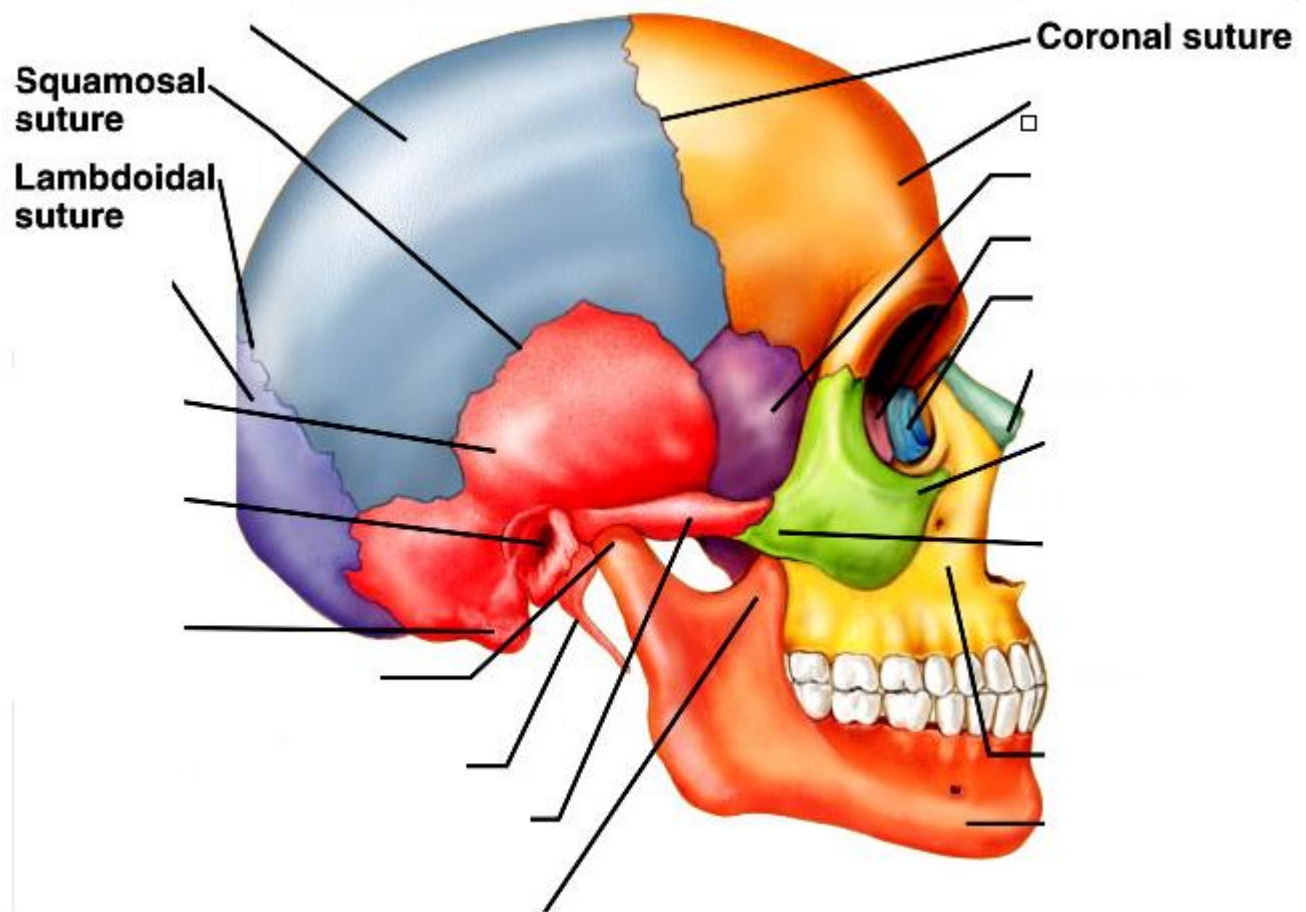
- | | | |
|------------------|--------------------------|--------------------|
| 1) Ethmoid bone | 5) Maxilla | 9) Temporal bone |
| 2) Frontal bone | 6) Nasal bone | 10) Vomer bone |
| 3) Lacrimal bone | 7) Parietal bone | 11) Zygomatic bone |
| 4) Mandible | 8) Sphenoid bone (twice) | |



✚ Label the following structures in the figure below (the labeled structures will not be on the practical)

The numbered structures below will be on the practical

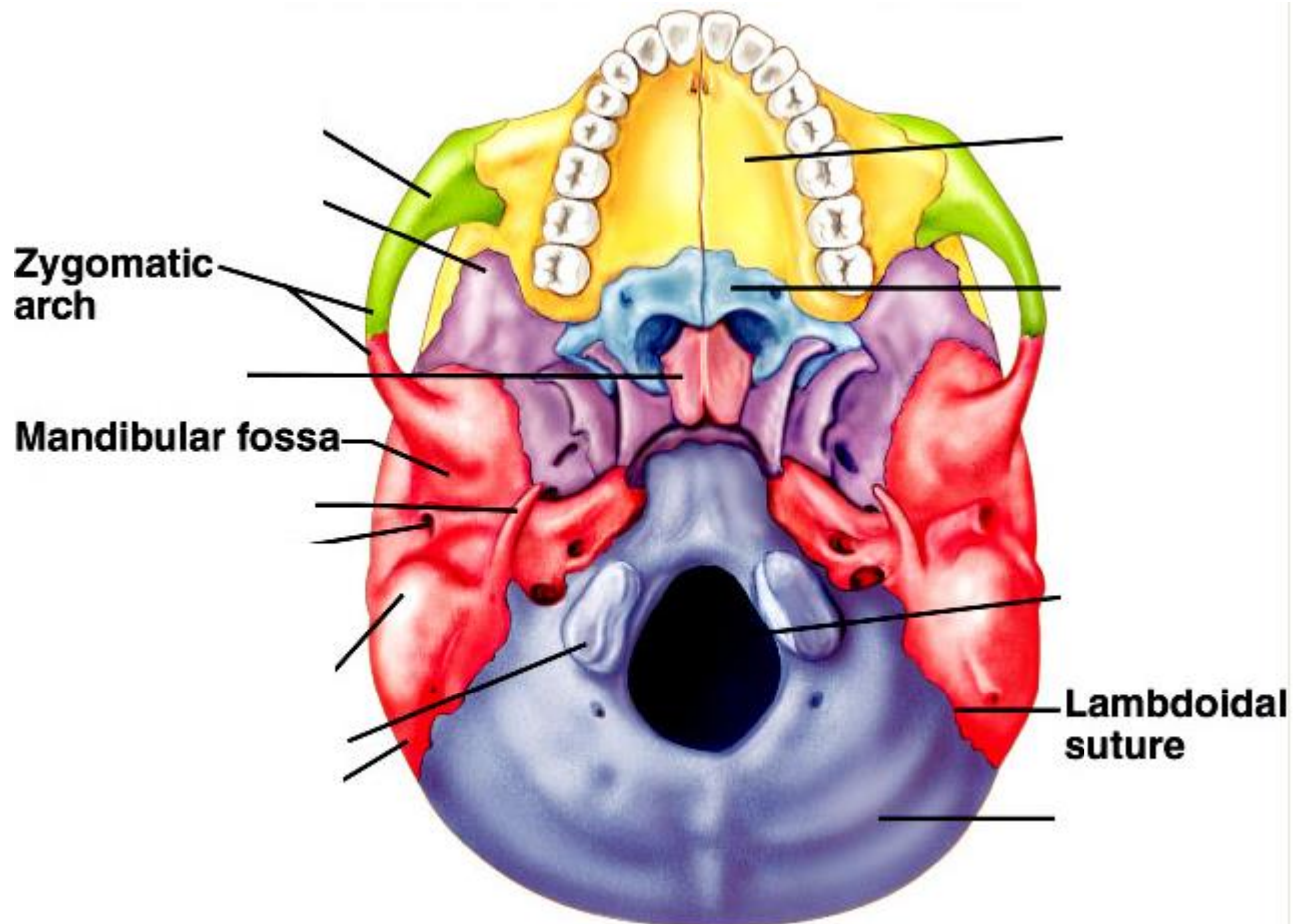
- | | | |
|-----------------------------|-------------------|----------------------|
| 1) Ethmoid bone | 7) Maxilla | 13) Zygomatic bone |
| 2) External acoustic meatus | 8) Nasal bone | 14) Mandibular ramus |
| 3) Frontal bone | 9) Occipital bone | 15) Condylar process |
| 4) Lacrimal bone | 10) Parietal bone | 16) Coronoid process |
| 5) Mandible | 11) Sphenoid bone | |
| 6) Mastoid process | 12) Temporal bone | |



✚ Label the following structures in the figure below (the labeled structures will not be on the practical)

The numbered structures below will be on the practical

- | | | |
|-----------------------------|--------------------------------|--------------------|
| 1) External acoustic meatus | 5) Occipital condyle | 8) Temporal bone |
| 2) Foramen magnum | 6) Palatine process of maxilla | 9) Vomer bone |
| 3) Mastoid process | 7) Sphenoid bone | 10) Zygomatic bone |
| 4) Occipital bone | | |



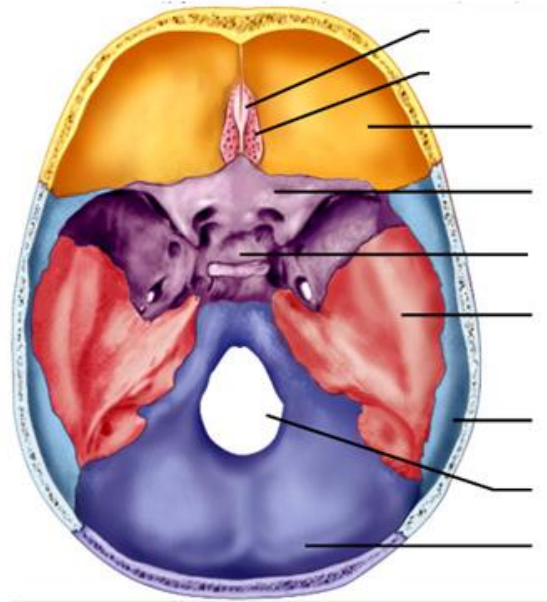
You also need to be able to identify the following:

- 1) Inferior nuchal line
- 2) Superior nuchal line
- 3) Pterygoid process

✚ Label the following structures in the figure below (the labeled structures will not be on the practical)

The numbered structures below will be on the practical

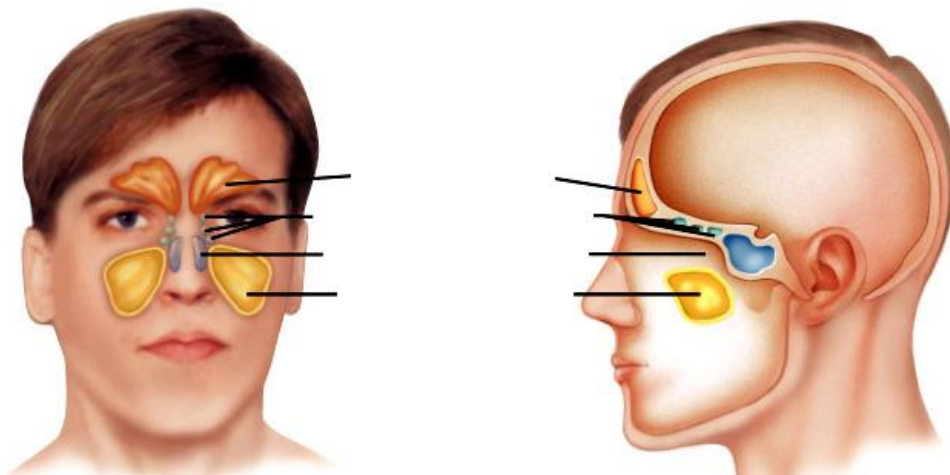
- | | | |
|-------------------|------------------|----------------------|
| 1) Ethmoid bone | 5) Optic canal | 9) Foramen magnum |
| 2) Foramen magnum | 6) Parietal bone | 10) Cribriform plate |
| 3) Frontal bone | 7) Sphenoid bone | 11) Sella turcica |
| 4) Occipital bone | 8) Temporal bone | |



✚ Label the following structures in the figure below

The numbered structures below will be on the practical

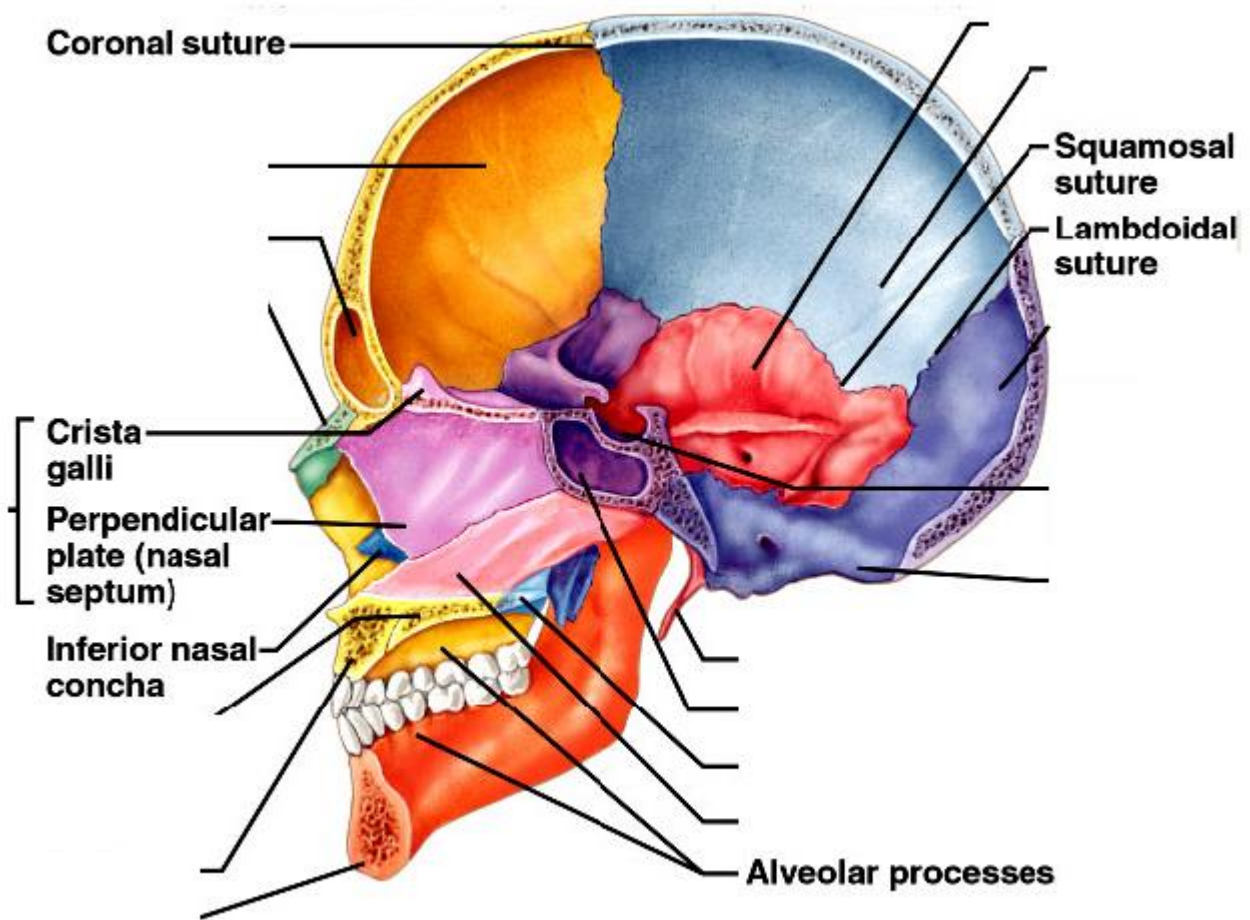
- | | |
|----------------------|--------------------|
| 1) Ethmoidal sinuses | 3) Maxillary sinus |
| 2) Frontal sinus | 4) Sphenoid sinus |



✚ Label the following structures in the figure below (the labeled structures will note be on the practical)

The numbered structures below will be on the practical

- | | | |
|--------------------|---------------------------------|----------------------|
| 1) Ethmoid bone | 8) Occipital bone | 14) Temporal bone |
| 2) Frontal bone | 9) Palatine bone | 15) Vomer bone |
| 3) Frontal sinus | 10) Palatine process of maxilla | 16) Sella turcica |
| 4) Mandible | 11) Parietal bone | 17) Cribriform plate |
| 5) Mastoid process | 12) Sphenoid sinus | |
| 6) Maxilla | 13) Styloid process | |
| 7) Nasal bone | | |



Procedure

✚ Quiz each other in pairs until you have memorized all structures above

Organization of the Skeleton Lab

Lecture Questions 25-27

The skeleton can be divided into two major portions: the axial skeleton, which consists of the bones and cartilages of the head, neck, and trunk, and the appendicular skeleton, which consists of the bones of the limbs and those that anchor the limbs to the axial skeleton

- | | | |
|------------------------|-----------------------------------|----------------------------|
| 1) Carpals | 23) Lateral malleolus | 44) Sternum |
| 2) Scaphoid | 24) Humerus | 45) Manubrium |
| 3) Lunate | 25) Medial epicondyle | 46) Xiphoid process |
| 4) Triquetrum | 26) Lateral epicondyle | 47) Tarsals |
| 5) Pisiform | 27) Hyoid | 48) Talus |
| 6) Trapezium | 28) Metacarpals | 49) Calcaneus |
| 7) Trapezoid | 29) Metatarsals | 50) Navicular |
| 8) Capitate | 30) Patella | 51) Cuboid |
| 9) Hamate | 31) Phalanges | 52) Lateral cuneiform |
| 10) Metacarpals | 32) Phalanx (plural is phalanges) | 53) Intermediate cuneiform |
| 11) Clavicle | 33) Radius | 54) Medial cuneiform |
| 12) Coccyx | 34) Radial styloid process | 55) Metatarsals |
| 13) Coxa | 35) Ribs | 56) Phalanges |
| 14) Ilium | 36) Sacrum | 57) Tibia |
| 15) Iliac crest | 37) Scapula | 58) Medial malleolus |
| 16) Pubis | 38) Glenoid cavity | 59) Ulna |
| 17) Acetabulum | 39) Coracoid process | 60) olecranon |
| 18) Cranium | 40) Acromion | 61) Cervical vertebrae |
| 19) Femur | 41) Scapular spine | 62) Thoracic vertebrae |
| 20) Greater trochanter | 42) Subscapular fossa | 63) Lumbar vertebrae |
| 21) Lesser trochanter | 43) Infraspinous fossa | |
| 22) Fibula | | |

Procedure

- ✚ Locate the bones above on the articulated skeleton
- ✚ Memorize the bones above by quizzing each other in pairs
- ✚ Locate the bones above from the disarticulated skeleton

Review question #27: What are the bones and land marks of the pelvic girdle, leg, and foot?

- 8) The pelvis is composed of 2 hip bones called _____ that are composed of three bones called the _____, _____ and _____. The two bones of the pelvis are attached posteriorly to the _____, and anteriorly by the _____.
- 9) What covers the anterior surface of the knee?
- 10) What is the bone that articulates with the distal ends of the tibia and fibula called?
- 11) All finger and toe bones are called?

Teacher initials _____