The Skeletal System
DO NOW

Name 3 symptoms and causes of inflammation on small piece of paper.

10 minutes
## Do Now

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redness</td>
<td>Vasodilation, more blood in area.</td>
</tr>
<tr>
<td>Heat</td>
<td>Large amount of blood accumulating in area and as a by-product of increased metabolic activity in tissue.</td>
</tr>
<tr>
<td>Swelling</td>
<td>Increased permeability of blood vessels, fluids leaving blood go into tissue spaces (edema).</td>
</tr>
<tr>
<td>Pain</td>
<td>Injury to neurons and increased pressure from edema.</td>
</tr>
</tbody>
</table>
KWL

- Work in groups of 4 to 5.
- Do not use your books or any other help outside your group.
- Make your list on the plain paper at the “daily work table”.
- Name as many proper bone names as you can.
On a left side of notebook

- Use pages 140-141 to gather information on the appendicular and axial skeleton.

- Notes should include location, classification, and function.
DO NOW

Summarize the connections between the skeletal system and the other human body systems in a short paragraph. Use Page 168 as a reference.
Group Activity

• Bring in newspapers to create a skeleton out of paper Mache.
objectives

Describe the macroscopic and microscopic structure of a long bone.

Identify the anatomy of a long bone, and explain the function of each structure.
Essential Question

How does the anatomy of the long bone determine the function of these bones?
Epiphysis  The ends of the bone.

Diaphysis  The shaft of the bone.

Marrow  Specialized type of soft connective tissue.

Medullary Cavity  A space within the diaphysis.

Endosteum  The membrane lining the medullary cavity.

Articular Cartilage  A thin layer of hyaline cartilage.

Periosteum  A dense, white, fibrous membrane that covers bone.
Compact bone- Tightly packed tissue of diaphysis wall.

Spongy bone- Numerous branching bony plates.
Osteoblast - Bone forming cells

Osteocyte - Mature bone cells
Pork long bone dissection video

https://www.youtube.com/watch?v=CHVzA169wH0
Essential Question

How does the anatomy of the long bone determine the function of these bones?
Complete both assignments on the same paper and turn into “IN BOX”.

- Work independently to answer Check Your Recall Questions 1-4, page 132.
- Use computers for independent research of an osteological disorder and identify which portion of the bone is being affected, given the researched symptoms.
1. Which major structure of the long bone is responsible for the creation of blood?
2. Which structures are primarily associated with growth?
3. How could damage to these areas impact bone growth?
objectives

Distinguish between intramembranous and endochondral bones, and explain how these bones grow and develop.

Explain what happens when a bone breaks, and how it heals.
Essential Question

How do bones develop and grow?
How does your body respond to, and repair, osteological trauma?
Distinguish between intramembranous and endochondral bones, and explain how these bones grow and develop.

- Intramembranous—originate between sheet like layers of connective tissues.
Distinguish between intramembranous and endochondral bones, and explain how these bones grow and develop.

- **Endochondral** – begin as masses of cartilage that are later replaced by bone tissue.
<table>
<thead>
<tr>
<th>Site</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphysis center</td>
<td>Cartilage slowly breaks down and disappears</td>
</tr>
<tr>
<td>Diaphysis</td>
<td>A periosteum forms from connective tissue that encircles the developing diaphysis.</td>
</tr>
<tr>
<td>Periosteum</td>
<td>Blood vessels and osteoblast invade the disintegrating cartilage and spongy bone forms in it’s place.</td>
</tr>
<tr>
<td>Primary ossification center</td>
<td>Bone tissue develops from it towards the ends of the cartilaginous structure.</td>
</tr>
<tr>
<td>Primary ossification center</td>
<td>Osteoblast from the periosteum deposit a thin layer of compact bone around the primary ossification center.</td>
</tr>
</tbody>
</table>

The epiphysis of the developing bone remain cartilaginous and continue to grow
<table>
<thead>
<tr>
<th>Site</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epiphysis</td>
<td>Secondary ossification centers appear in the epiphysis and spongy bone forms in all directions from them.</td>
</tr>
<tr>
<td>Between Epiphysis and Diaphysis</td>
<td>Spongy bone is deposited in the diaphysis and the epiphysis and a band of cartilage remains to form epiphyseal plate.</td>
</tr>
<tr>
<td>Epiphyseal plate</td>
<td>Young cells that undergo mitosis and produce new cells.</td>
</tr>
<tr>
<td>Epiphyseal plate</td>
<td>As cells enlarge and extracellular matrix forms around them, the cartilaginous plate thickens, lengthening the bone.</td>
</tr>
<tr>
<td>Epiphyseal plate</td>
<td>Calcium salts accumulate in the extracellular matrix adjacent to the oldest cartilaginous cells.</td>
</tr>
<tr>
<td>Extracellular matrix</td>
<td>As the extracellular matrix calcifies, the cells begin to die.</td>
</tr>
<tr>
<td>extracellular matrix</td>
<td>Osteoclast break down the calcified extracellular matrix in time.</td>
</tr>
</tbody>
</table>
Endochondral bones
Explain what happens when a bone breaks, and how it heals.

A *greenstick* fracture is incomplete, and the break occurs on the convex surface of the bend in the bone.

A *fissured* fracture involves an incomplete longitudinal break.

A *comminuted* fracture is complete and fragments the bone.

A *transverse* fracture is complete, and the break occurs at a right angle to the axis of the bone.

An *oblique* fracture occurs at an angle other than a right angle to the axis of the bone.

A *spiral* fracture is caused by twisting a bone excessively.
When bones break:

<table>
<thead>
<tr>
<th>Site</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>At break</td>
<td>Blood vessels within bone rupture.</td>
</tr>
<tr>
<td>Blood vessels</td>
<td>Blood escapes into damaged area and form a clot (hematoma).</td>
</tr>
<tr>
<td>Surrounding tissue</td>
<td>Vessels dilate, swelling and inflaming the tissues.</td>
</tr>
<tr>
<td>Hematoma</td>
<td>Developing blood vessels and large numbers of osteoblasts from periosteum invade hematoma.</td>
</tr>
<tr>
<td>At developing vessels</td>
<td>Osteoblasts rapidly divide in the regions close to new vessels building spongy bone nearby.</td>
</tr>
<tr>
<td>At break</td>
<td>Granulation tissue develops, fibroblasts produce masses of fibrocartilage.</td>
</tr>
<tr>
<td>Blood clot</td>
<td>Phagocytic cells remove the blood clot, dead or damaged cells</td>
</tr>
<tr>
<td>Damaged area</td>
<td>Osteoclasts appear, resorb bone fragments to clean up debris.</td>
</tr>
</tbody>
</table>
Fracture and stages of repair.
Hybrid fixator used to align broken bone pieces to help the bone healing process.
In groups of 3: create a poster. 20 minutes

Diagram the stages of endochondral bone growth, summarizing the major events and developing structures.
Work independently:

To answer Check Your Recall Questions 9-11, page 139.
What would be a major implication of breaking your wrist at a young age?
DO NOW

What is the major function of osteoblasts and osteoclasts cells?

Next available left hand side

10 minutes
Joint Functions

- Bind parts of the skeletal system
- Make possible bone growth
- Permit parts of the skeleton to change shape during childbirth
- Enable the body to move in response to skeletal muscle contractions
- Joints vary considerably in structure and function.
Types of Joints

- There are 3 types of joints
  - Fixed / Immoveable joints
  - Slightly moveable joints
  - Freely moveable joints
Immovable  (synarthrotic)

- The fibrous joints between the bones of the skull are immovable and are called sutures.
Slightly moveable (amphiarthrotic)

Amphiarthrotic Joints

- Slightly movable joints.
- Examples: joints between tibia and fibula, joints between vertebrae.
Freely Movable (diarthrotic)

Diarthrotic Joints

1. Freely moveable joints permitting a wide range of motion.
2. Ends of the bones are covered by cartilage and held together by synovial capsules filled with synovial fluid. This fluid helps to lubricate the joint and permits smooth movement.
Joints can also be grouped according to the type of tissue.

- **Fibrous** – a thin layer of dense connective tissue that joins a pair of bones (suture), like the flat bones of the skull.
- **Cartilaginous** – Hyaline or fibrocartilage connect the bones of cartilaginous joints, like between the vertebrae.
- **Synovial** – most joints within the skeletal system.
6 Types of Synovial Joints

- Plane / Gliding
  - Saddle
  - Vertebrae
  - Proximal metacarpal bone of thumb

- Hinge
  - Pivot
  - Humerus
  - Ulna

- Ball-and-Socket
  - Ellipsoid
  - Scapula
  - Ulna
  - Occipital condyle of skull
  - Superior articular facet of first vertebra
The Skull

Frontal view

- Frontal bone
- Sphenoid bone
  - Lesser wing
  - Greater wing
- Temporal bone
- Lacrimal bone
- Zygomatic bone
- Ethmoid bone
  - Orbital plate
  - Middle nasal concha
  - Perpendicular plate
- Inferior nasal concha
- Vomer
- Maxilla
  - Infraorbital foramen
  - Anterior nasal spine
- Mandible
  - Ramus
  - Mental foramen

8 Cranial Bones

- Frontal (1)
- Sphenoid (1)
- Ethmoid (1)
- Temporal (2)
- Parietal (2)
- Occipital (1)
Work independently:

To answer Check Your Recall Questions 12-16, page 147.
Vertebral Column

Cervical _____ bones
Thoracic _____ bones
Lumbar _____ bones
Sacral _____ bones
Vertebral Column

- Label, which vertebrae are these?
- Label, where will you find them?
- Label the processes.
C1 and C2 Cervical Vertebrae

Find and Label; what is the name for the C1 vertebrae?

Find and Label; what is the name for the C2 vertebrae?
- Fill in the:
  - Lamina
  - Pedicle
  - Body
- Find and underline transverse process and vertebral foramen
Fig. OP4
Left: Line of gravity in a normal spine. The forces are distributed equally on the surface of the endplate avoiding stress peaks.
Right: the kyphotic deformity creates asymmetrical loading of the endplate which increases the risk of further fractures and increasing deformity.
Vertebral Deformities
Work independently:

To answer Check Your Recall Questions 17-19, page 151.
DO NOW

Describe a typical vertebrae, and distinguish among the cervical, thoracic, and lumbar vertebrae.
**Thoracic Cage**

*Includes ribs, thoracic vertebrae, sternum, and the costal cartilages that attach the ribs to the sternum.*

*These bones support the pectoral girdle and upper limbs, protect the viscera in the thoracic and upper abdominal cavities, and play a role in breathing.*
Thoracic Cage

• **Ribs**
  - 12 pairs, each attached to a thoracic vertebrae.
  - First 7 pair are called *true*
  - Remaining 5 pair called *false*, 3 pair of these fused together into the 7th rib.
  - Bottom 2 pair are called floating ribs

• **Sternum**
  - Or breastbone located along the midline in the anterior portion of the thoracic cage.
  - Three portions,
    - manubrium - upper portion
    - body – middle portion
    - xiphoid process – downward projection at bottom of body
Pectoral girdle

• The shoulder girdle is composed of;
• 2 clavicles – 2 scapula
Pectoral Girdle

- **Clavicles**
  - Clavicale runs horizontally between the manubrium and the scapulae
  - Helps to hold shoulders in place

- **Scapulae**
  - The spine of the scapulae leads to two processes;
  - *Acromion* that forms the tip of the shoulder
  - *Corocoid* that curves anteriorly and inferiorly to the clavicle
Acromion Process
Humerus

- Long bone
- Smooth rounded head fits into glenoid cavity
- Olecranon fossa is received by the Ulnar process so that you can straighten your arm at the elbow
Ulna-Radius

- Ulna is longer than radius, its proximal articulates at trochlear of humerus
- Radius is on the thumb side of forearm and attaches to the wrist. Its articulation at the radial notch allows the radius to rotate the wrist
Hand

- Made up of the wrist, palm and fingers.
- 8 small carpal bones in two rows of four (the carpus)
- The carpus articulates with the radius on proximal side
- The carpus articulates with the metacarpals on the distal side
Check Your Recall

• Use the reading from pages 152 -157 to answer questions 20-26. Turn into “in box”.
DO NOW

What bones make up the pectoral girdle?

What is the name of the long bone of the arm?

On next available left side
Pelvic Girdle

- Consists of two hip bones
- 1. ilium - largest upper portion
- 2. Ischium – lowest portion
- The pubis is the anterior portion of the hip bones
Hip bone

- Acetabulum – where hip and femur connect
- More flare for a woman’s hip at the ilium
Femur

The longest bone

Fovea capitis is place of articulation with hip

Greater and lesser trochanter – provide attachments for muscles of the lower body.

Later and medial condyles articulate with Tibia of lower leg
Tibia - Fibula

Tibia is the larger of the two leg bones.

Its proximal end has a medial and lateral condyle that articulate with the femur.
Bones of the Feet

- The foot is made of seven tarsal bones
- Five elongated metatarsals
- 3 x 5 phalanges
You Do

• Check your Recall pages 157 – 161
• Numbers 27-31