Guided Notes: the Skeletal System

Part 1: Types of Bones & Functions of the Skeleton

Classification of Bones

Complete the chart using the information from the unit notes

Bone Type	Description of Bone	Examples (Name & Location)	Sketch of Bone Type
Long			
Short			
Flat			
Irregular			

Functions of the Skeleton

1.

2.

3.

4.

5.

Part 2: Gross Anatomy of Bones

What are the differences between compact and spongy bones? Draw a picture if needed to help demonstrate the differences.

Structure of Short, Irregular, and Flat Bones

- Consist of thin plates of _____ bone covered by _____ bone
- Outside and inside of plates covered by connective tissue membranes called the _____ and _____
- If they form moveable joints, _____ cartilage covers their surfaces
- In flat bones, spongy bone is called the _____

Structure of Typical Long Bone

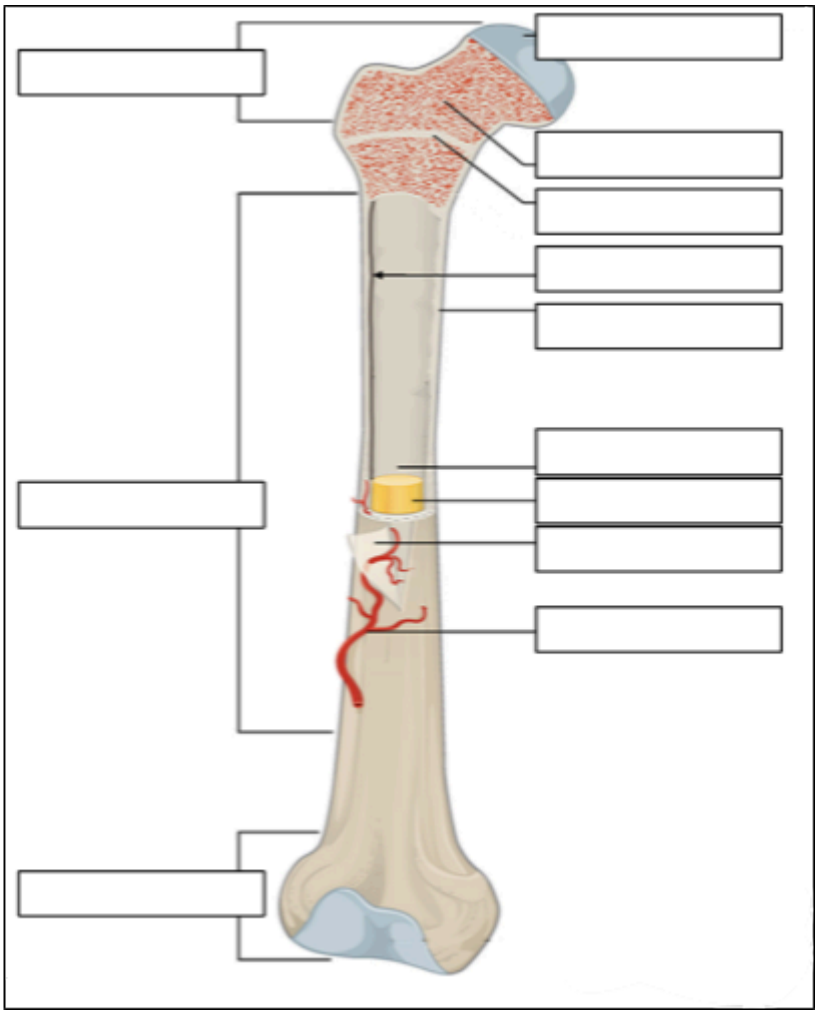
1. Shaft (called the _____)
    a. Makes up most of bone's _____.
    b. Composed of _____ bone wrapped around a central medullary cavity that contains_____ and is called the_____.
2. Bone Ends (called the _____)
    a. Composed mostly of_____ bone enclosed by thin layer of _____ bone
    b. _____ cartilage covers the external surface of the epiphyses and helps decrease friction at joint surfaces
    c. _____line: remnant of the epiphyseal plate, a disc of _____cartilage that grows during childhood to lengthen the bone
    d. _____: flared portion where the diaphysis and epiphysis meet
3. Membranes
    a. _____: outer fibrous CT covering; continuous with ligaments and tendons attached to it; richly supplied with _____ and _____ vessels via nutrient _____.
    b. _____: delicate inner CT lining _____ cavity

What is the function of a hematopoietic tissue? What is another name for this type of tissue?

Where are these tissues found in both long bones and other bones (short, flat, and irregular)?

Labeling Practice - Label the diagram based on the bone diagram on the slides

- nutrient artery
- spongy bone
- diaphysis
- medullary cavity
- proximal epiphysis
- distal epiphysis
- periosteum
- compact bone
- endosteum
- epiphyseal line
- yellow bone marrow
- articular cartilage



Part 3: Microscopic Anatomy of Bones

Fill in the following table regarding the different types of cells found in bones.

Type of Cell	Structure (i.e. what does it look like?)	Location	Function (i.e. What does it do?)	Sketch of the Cell
Osteogenic cell				
Osteoblast				
Osteoclast				
Osteocyte				

Challenge Question - A person has overactive osteoclasts. Predict what might happen to their bones over time.

Structure of Compact Bone - Osteons

- The basic structural unit of compact bone is called an _____, also called the or the _____ system . These are elongated cylinders oriented parallel to the long axis of the bone.
- _____are situated within cavities known as _____
- Lacunae are arranged in concentric rings called _____; _____ fibers arranged in adjacent lamella run in alternating patterns to resist twisting
- Central or _____ canal runs through center and contains small blood vessels and nerve fibers
- _____ canals (perforating canals) lie at right angles to the long axis of the bone and connect the blood and nerve supply of the medullary cavity to the central canals
- _____connect the lacunae to each other and to the central canal; tie all the osteocytes in a mature osteon together, allowing them to communicate and permitting nutrients and wastes to be replayed from one osteocyte to the next throughout the osteon

What is more organized, compact bone or spongy bone?

In spongy bone, _____)align precisely along lines of stress and help the bone resist stress. They contain irregular arranged _____ and _____ interconnected by _____. There are no _____ in spongy bone.

Labeling - Label the following on the diagram using the information provided on the slides.

perforating canal

osteon

periosteum

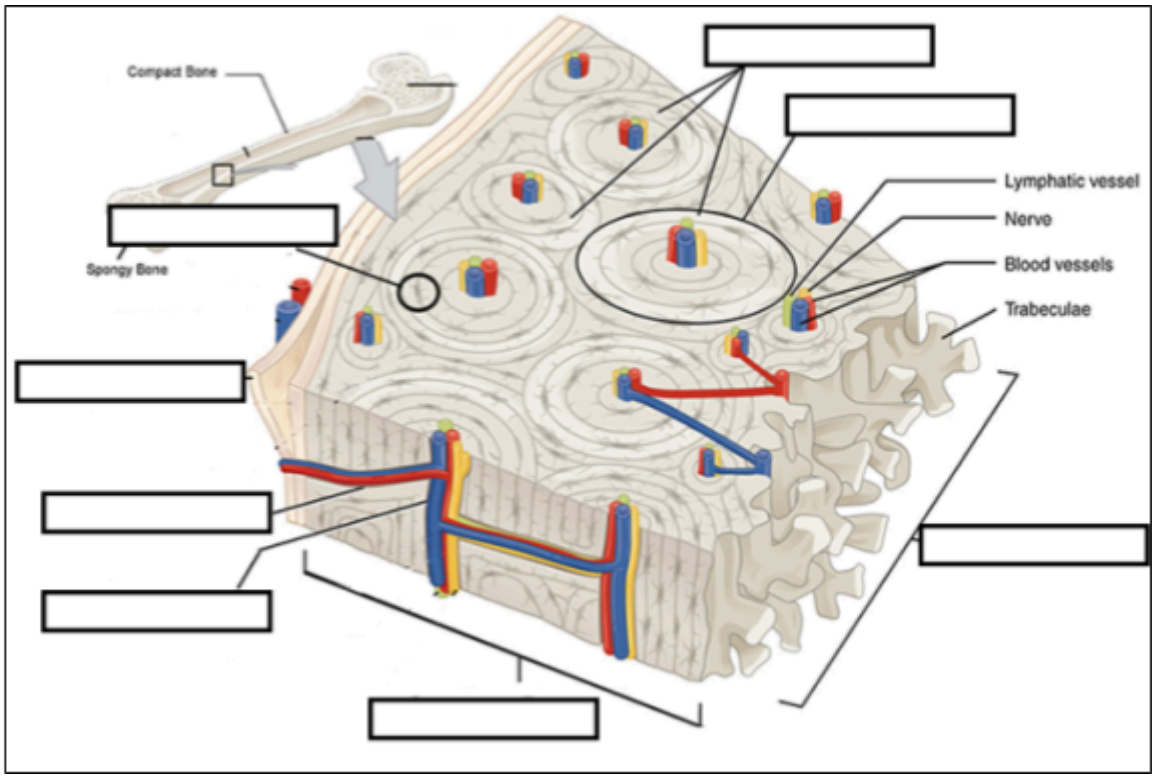
compact bone

central canal

spongy bone

lamellae

osteocyte



Part 4: Chemical Composition of Bone

1. _____ Components: bone cells and osteoid
    a. Osteoid (bone matrix) includes ground substances and _____ fibers which are secreted by osteoblasts; accounts for flexibility of bones
2. _____Components: mineral salts
    a. _____ by mass; _____ or mineral salts; largely calcium phosphates; account for exceptional hardness of bones

Part 5: Bone Development (Ossification)

Define ossification in your own words:

Complete the following table to summarize the types of ossification:

Type of Ossification	What It Replaces	Example Bones Formed
Endochondral		
Intramembranous		

Steps of Endochondral Ossification - Summarize each stage

1. Bone Collar Formation:
2. Cavities Form in the Cartilage:
3. Periosteal Bud Invasion & Spongy Bone Formation:
4. Diaphysis Elongation & Medullary Cavity Formation:
5. Secondary Ossification in Epiphyses:

Postnatal Bone Growth

1. **Growth in Length:** What happens at the **epiphyseal plate** during growth?
2. **Growth in Width (Appositional):** Which two cells are involved?
3. **At what age do most epiphyseal plates close? _____**

Challenge Question - A child has a growth hormone deficiency. What effect would this have on their bones compared to a child with normal hormone levels?

Part 6: Bone Remodeling

1. What percentage of bone is replaced each year? (Compact vs Spongy Bone)
    - Compact: _____ | Spongy: _____
2. What are the two main processes in bone remodeling?

Cells Involved in Bone Remodeling - Complete the chart

Process	Cell(s) Involved	What is Does
Bone Deposition		
Bone Resorption		

Hormonal Control of Remodeling

1. What does parathyroid hormone (PTH) do when blood calcium levels are low?

2. What is Wolff's Law (write in your own words)?

3. Application Question: Why might the bones in a weightlifter's arms look different from the bones of someone who never lifts weights?

Challenge Question - An elderly patient has very low estrogen levels after menopause. What might happen to her bone remodeling rate, and why?

Part 7: Fracture Types & Bone Repair

Fractures are categorized by what three features? Describe the feature in your response:

1.

2.

3.

Types of Fractures - Fill in the chart below

Fracture Type	Description
Comminuted	
Compression	
Spiral	
Epipheseal	

Depressed	
Greenstick	

Stages of Fracture Repair

Write **1 sentence summaries** for each stage:

1. Hematoma Formation:

2. Fibrocartilaginous Callus Formation:

3. Bony Callus Formation:

4. Bone Remodeling:

Application Question- A patient has a compound fracture in their tibia. Which stage of bone repair would be most important for stabilizing the bone early on, and why?

Real-Life Case - A runner increases mileage too quickly and develops stress fractures.

1. What part of bone remodeling (deposit or resorption) might be out of balance?

2. What advice would you give them to help restore healthy remodeling?

Part 8: Joints: Classification & Function

Structural Classification of Joints

Complete the table below to summarize the structural classification of joints.

Structural Type	What It's Made Of	Examples
Fibrous		
Cartilaginous		
Synovial		

Synovial Joints: Types & Examples

What fills the joint cavity and what does it do?

Types of Synovial Joints - Fill in the chart:

Synovial Joint Type	Movement Allowed	Examples
Gliding (Plane)		
Pivot		
Hinge		
Condyloid		
Saddle		
Ball-and-Socket		

Choose ONE type of synovial joint and draw a simple sketch of how the bones articulate. Label the movement (e.g., hinge = flexion/extension).

Challenge Scenario - Why would a ball-and-socket joint be more likely to dislocate than a hinge joint?

Part 9: Movements at Joints

Movement	What It Means (Your Words)	Example Joint
Flexion		
Extension		
Abduction		
Adduction		
Rotation		
Circumduction		
Supination		
Pronation		
Dorsiflexion		
Plantar Flexion		