

# PHYE 281 – Applied Kinesiology

## Lecture 1

### Introduction and Skeletal System Fundamentals

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## Objectives

Define Kinesiology

Understand anatomical planes and frames of reference

Understand the organization and function of the skeletal system

Identify the types of bones, and the parts of a typical long bone

Describe bone growth and development

Compare and contrast the three types of joints

Identify the components of a synovial joint

List the types and movements of synovial joints, and how these movements are measured

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# What is Kinesiology?

The study of muscles, bones, and joints as they are involved in the analysis of movement

Understanding kinesiology allows you to teach others how to condition and train the human body

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# Who Needs Kinesiology?

Anatomists

Physical Educators

Sports Coaches

Athletic Trainers

Strength Coaches

Massage Therapists

Personal Trainers

Physical Therapists

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# Frames of Reference

Basis from which to describe location of anatomical landmarks and joint movements

These include

Anatomical Position

Directional Terms

Anatomical Planes and Sections

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# Anatomical Position and Terms

## Anatomical Position

Feet flat, facing forward,  
palms forward

## Anatomical Terms

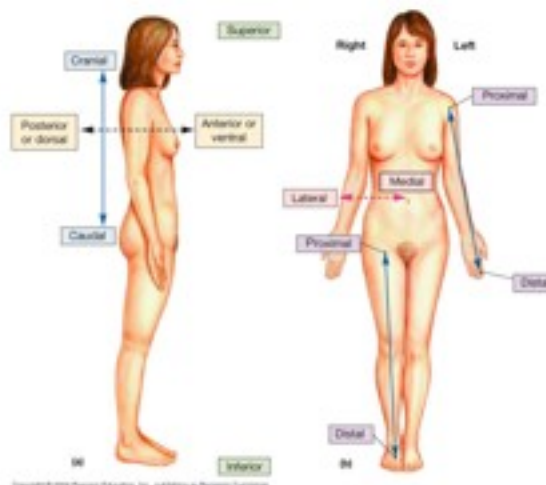
Right/Left

Superior/Inferior

Anterior/Posterior

Proximal/Distal

Medial/Lateral



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# Anatomical Planes

## Frontal (Coronal) Plane

Front/Back Sections

Jumping Jacks

## Sagittal Plane

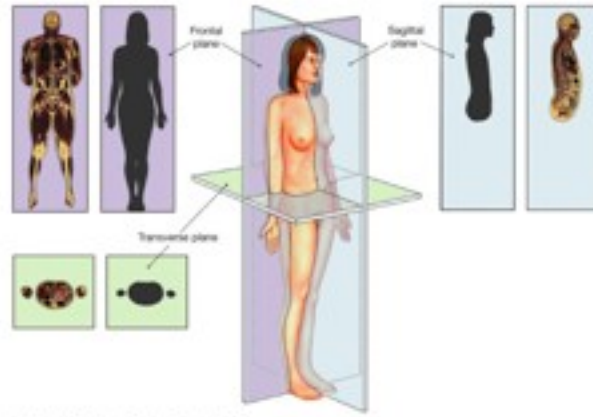
Right/Left Sections

Situps

## Transverse (Horiz.) Plane

Top/Bottom Sections

Spinal Rotation Left and Right



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# Skeletal System Function

Protection of organs: brain, heart, lungs . . .

Support of body

Attachment for muscles

Movement

Bones serving as levers, joints as fulcrums

Production of blood cells

Stores energy as fat in marrow

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# Skeletal System Organization

Adult Skeleton has 206 Bones

Axial Skeleton - 80 Bones

Skull, vertebrae, ribs, sternum

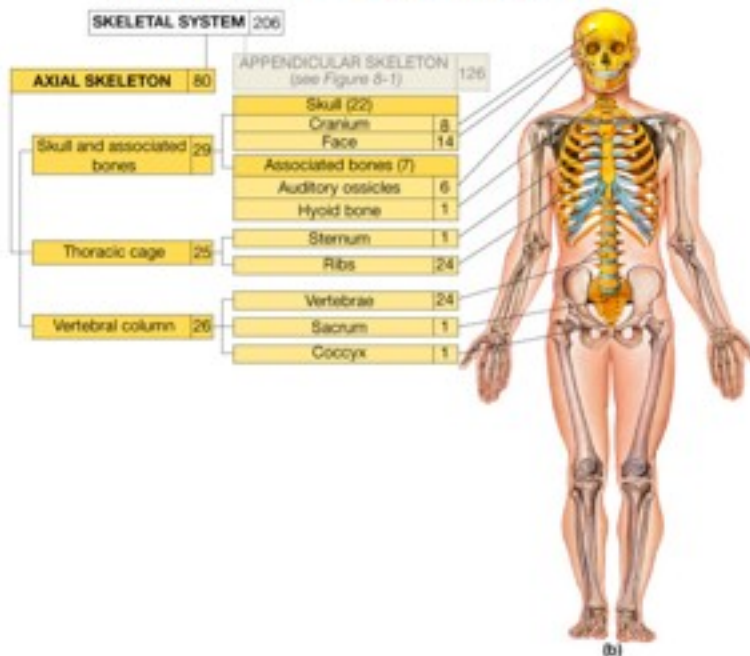
Appendicular Skeleton - 126 Bones

Pectoral girdle and upper limb

Pelvic girdle and lower limb

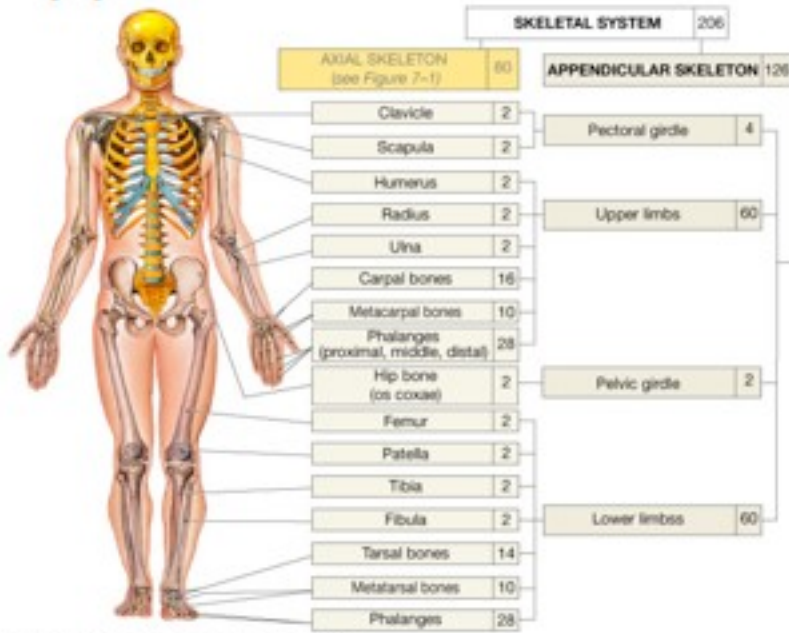
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## Axial Skeleton



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# Appendicular Skeleton

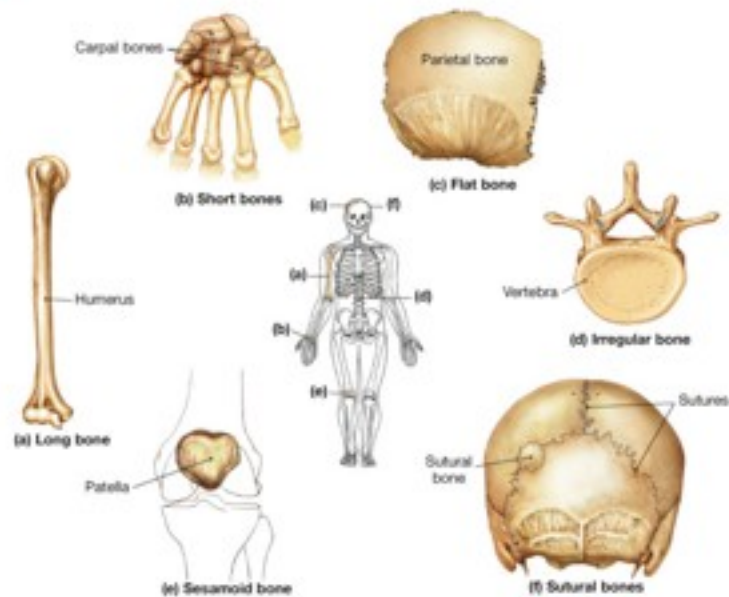


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# Types of Bones

- Long
- Short
- Flat
- Irregular
- Sesamoid
- Sutural



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# Parts of a Long Bone

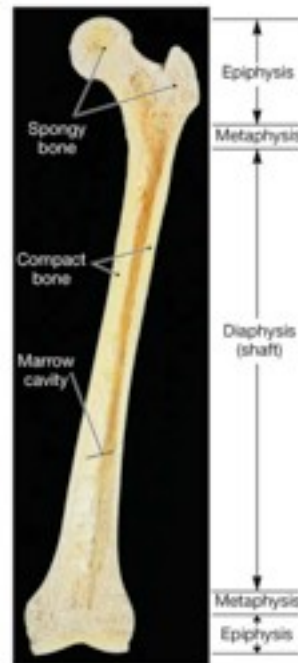
Diaphysis - shaft

Epiphyses - ends

Covered with cartilage

Marrow or medullary cavity

Filled with red or yellow marrow



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# Bone Growth

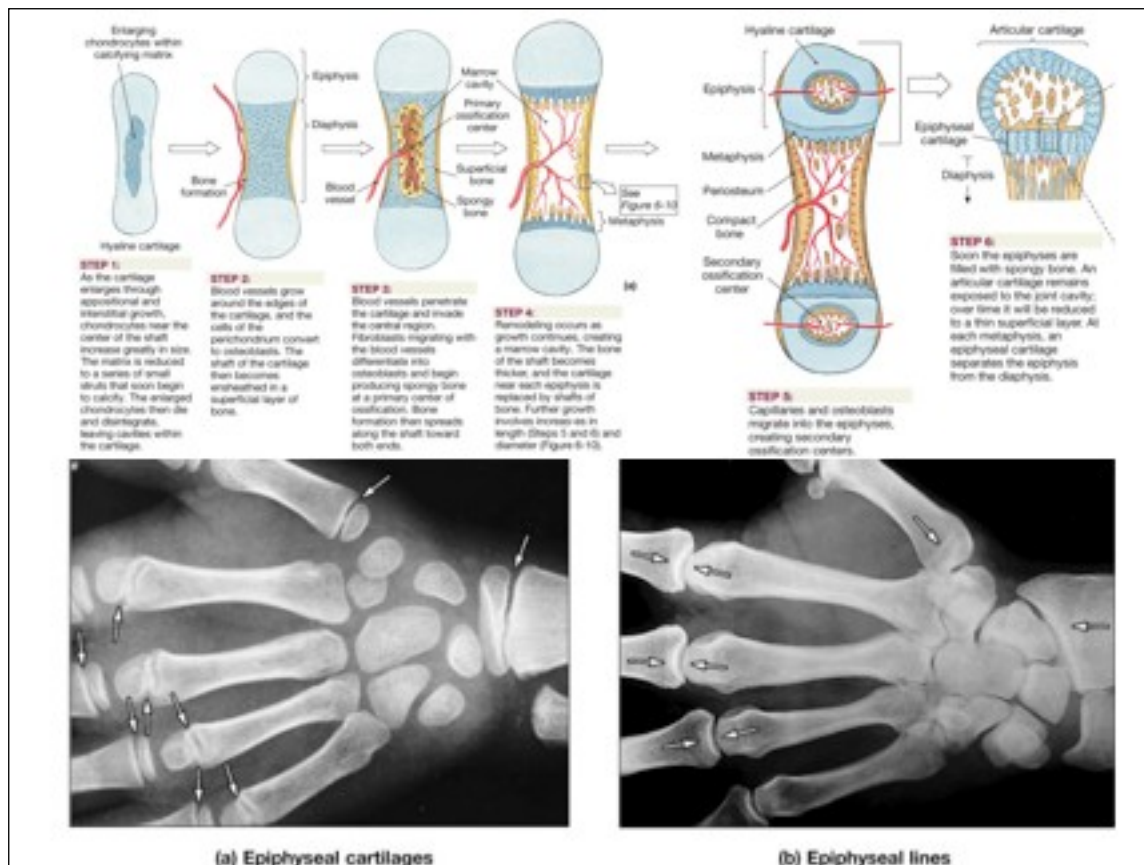
Bone develops from cartilage model

Primary ossification in diaphysis

Secondary ossification centers in epiphyses

Epiphyseal plates remain until growth is complete

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# Articulations

Articulations or joints, are where two or more bones come together

An articulation may or may not have movement

Three major classifications:

Synarthrodial - no movement

Sutures of skull, teeth and jaws

Amphiarthrodial - slight movement

Intervertebral discs, anterior pubis

Diarthrodial - free movement

Synovial joints of human movement

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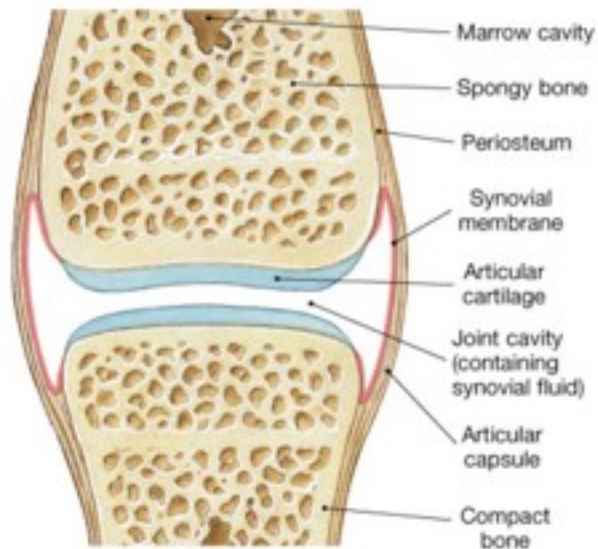
# Synovial Joints

Composed of:

Joint Capsule

Synovial Membrane

Articular Cartilage



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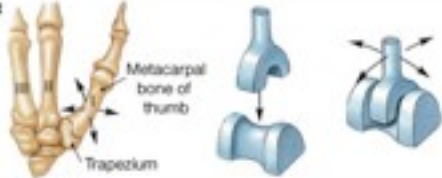

# Types of Synovial Joints

Types of Synovial Joints	Movement	Examples
<p><b>Gliding joint</b></p>	Slight nonaxial or multiaxial	<ul style="list-style-type: none"> <li>• Acromioclavicular and clavicular joints</li> <li>• Intercarpal and intertarsal joints</li> <li>• Vertebrocostal joints</li> <li>• Sacroiliac joints</li> </ul>
<p><b>Hinge joint</b></p>	Monaxial	<ul style="list-style-type: none"> <li>• Elbow joint</li> <li>• Knee joint</li> <li>• Ankle joint</li> <li>• Interphalangeal joint</li> </ul>
<p><b>Pivot joint</b></p>	Monaxial (rotation)	<ul style="list-style-type: none"> <li>• Atlas/axis</li> <li>• Proximal radioulnar joint</li> </ul>

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# Types of Synovial Joints

Types of Synovial Joints	Movement	Examples
<b>Ellipsoidal joint</b> 	Biaxial	<ul style="list-style-type: none"> <li>• Radiocarpal joint</li> <li>• Metacarpophalangeal joints 2-5</li> <li>• Metatarsophalangeal joints</li> </ul>
<b>Saddle joint</b> 	Biaxial	<ul style="list-style-type: none"> <li>• First carpometacarpal joint</li> </ul>
<b>Ball-and-socket joint</b> 	Triaxial	<ul style="list-style-type: none"> <li>• Shoulder joint</li> <li>• Hip joint</li> </ul>

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# Types of Movements

**Flexion**

Decrease angle

**Extension**

Increase angle

**Hyperextension**

Past anatomical position

**Abduction**

Away from midline

**Adduction**

Towards midline



Hyperextension



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# Types of Movement

Supination

Palm anterior

Pronation

Palm posterior

Plantarflexion

Toes downward

Dorsiflexion

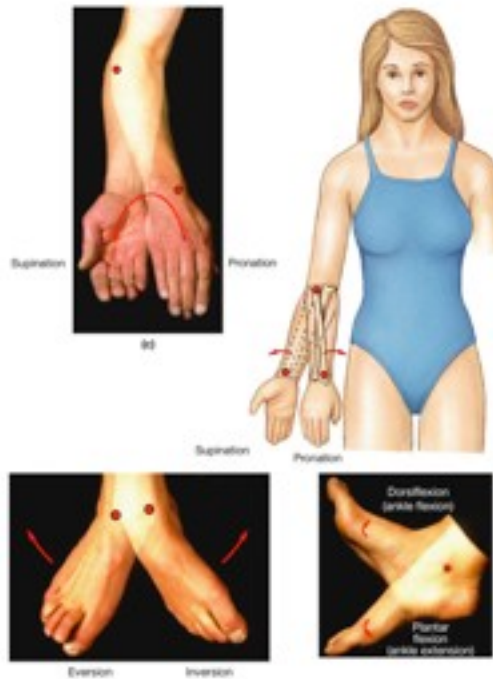
Toes towards leg

Inversion

Sole medially

Eversion

Sole laterally



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# Measuring Joint Movement

Goniometer can measure amount of joint movement

This quantifies Range of Motion

Helpful in determining symmetry and rehabilitation



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