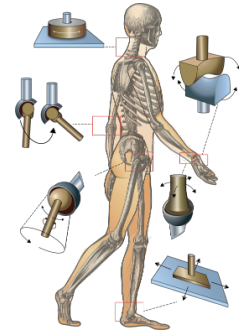


WHAT ARE JOINTS?

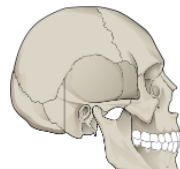
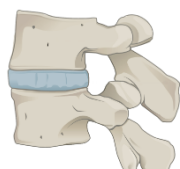
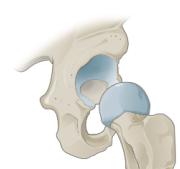
Introduction

Joints, also called **articulations**, are junctions where 2 or more bones are joined by soft tissue. If 2 bones meet, it is called a **simple joint**, and if 3 or more bones meet it is a **compound joint**. Joints have 3 main functions: to hold bones together, to bear weight, and to allow the body to move.

Joints are classified in 2 major ways: structural and functional. The **structural classification** of joints is based on how the articulating bones are attached. There are 3 types: a **fibrous joint** is where the bones are connected by fibrous connective tissue; a **cartilaginous joint** is where bones are joined by hyaline cartilage or fibrocartilage; and a **synovial joint** is where bones are not directly in contact but are connected within a fluid-filled joint cavity.



The **functional classification** of joints is based on the degree of movement they permit. There are 3 types: **synarthroses** are immobile or nearly immobile joints; **amphiarthroses** are limited-mobility joints with some flexibility; and **diarthroses** are freely-movable joints with extensive flexibility. All types are summarized in the table below.

Three Types of Joints			
Type	Description	Examples	Diagram
Synarthroses (Fibrous)	<ul style="list-style-type: none"> • Immovable joints: no movement or flexibility • Consist of edges of bones connected by dense fibrous connective tissue 	<ul style="list-style-type: none"> • Skull bones (<i>sutures</i>) • Radius to ulna • Tooth to jawbone (<i>gomphosis</i>) 	
Amphiarthroses (Cartilaginous)	<ul style="list-style-type: none"> • Semi-movable joints: limited movement and light flexibility • Consist of two bones connected by cartilaginous tissue 	<ul style="list-style-type: none"> • Intervertebral disks in spine • Pubic symphysis 	
Diarthroses (Synovial)	<ul style="list-style-type: none"> • Freely-movable joints: allow for extensive movement and flexibility • Consist of bones attached by a joint capsule; bones are not technically in contact with each other. 	<ul style="list-style-type: none"> • Knee, shoulder, elbow joints • See section below for more information 	

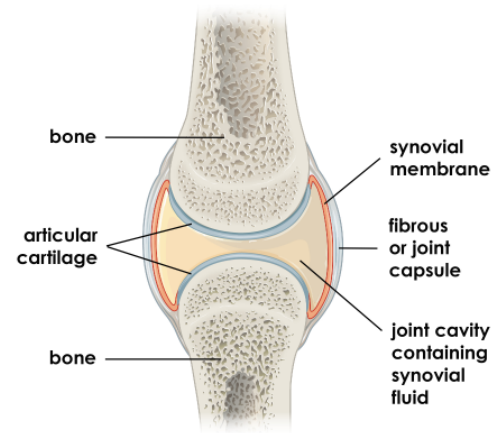
Synovial Joints (Diarthroses)

Synovial joints are the most complicated joints in the body and they are the types of joints that most people visualize when they think of joints. Synovial joints allow for the greatest amount of movement and flexibility because the articulating (moving) bone surfaces are not actually attached to one another.

At a synovial joint, the articulating surface of each bone is covered in **articular cartilage**, a smooth, white connective tissue that allows bones to glide over each other with very little friction. A capsule of connective tissue, called the **fibrous** or **joint capsule**, encases the two bones and forms the **synovial cavity**. The fibrous capsule is made up of two layers: a fibrous outer layer and an inner synovial membrane layer.

The **synovial membrane** is soft tissue that secretes **synovial fluid**, a clear, thick lubricating fluid that further reduces friction between bones during movement. Most synovial joints feature synovial fluid inside a closed sac, called a **bursa**, which further assist movement. In some synovial joints, a pad made of fibrocartilage called the **meniscus** further separates the opposing bones of the joint.

Synovial joints often surrounded by **ligaments**. Ligaments are thick bundles of tough, slightly elastic connective tissue that attach bone to bone and provide support and strength to the joint. Joints are further stabilized by the **skeletal muscles** that are connected to the bones near the joint. For example, muscles at the proximal end of the humerus help to support the joint capsule of the shoulder.



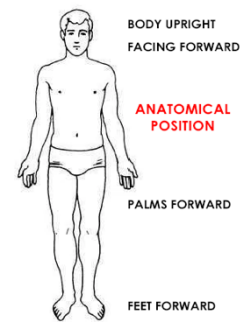
Types of Synovial Joints

Synovial joints are subdivided into different types depending on their features and the range of movement allowed. There **are 6 types of synovial joints** in the body: ball-and-socket, condyloid (ellipsoidal), gliding (plane), hinge, pivot, and saddle joints, which are summarized in the table below.

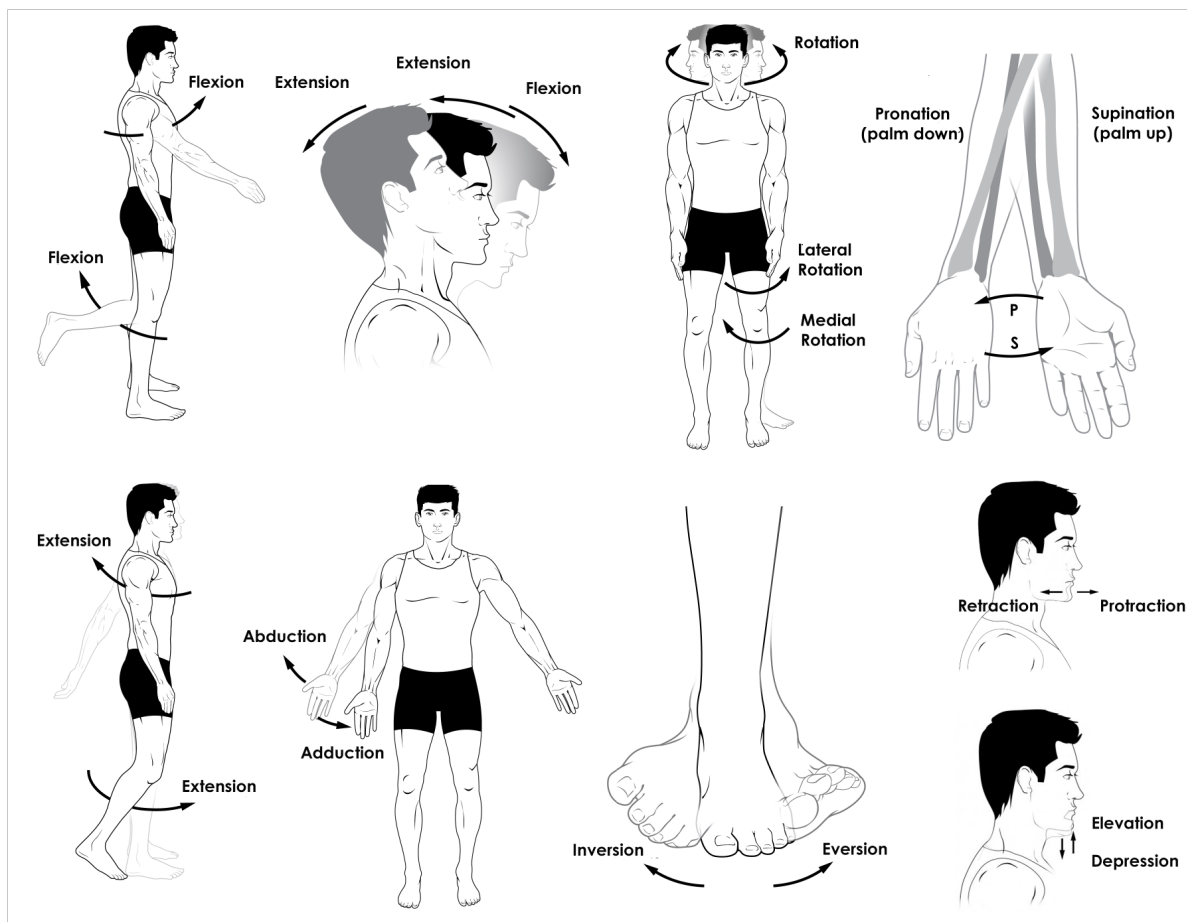
Six Types of Synovial Joints				
Type	Description	Movement	Example	Diagram
Ball and Socket	<ul style="list-style-type: none"> Ball shaped surface that fits into a concave socket 	<ul style="list-style-type: none"> Complete range of motion; widest range of all joints 	<ul style="list-style-type: none"> Shoulder and hip joints 	
Condyloid (ellipsoidal)	<ul style="list-style-type: none"> Oval shaped surface that fits into an elliptical surface 	<ul style="list-style-type: none"> In 2 planes at right angles to each other 	<ul style="list-style-type: none"> Wrist joints; between radius & carpals 	
Gliding (plane)	<ul style="list-style-type: none"> Articulating surfaces, usually flat 	<ul style="list-style-type: none"> Gliding; a nonaxial movement 	<ul style="list-style-type: none"> Between wrist bones 	
Hinge	<ul style="list-style-type: none"> Spool-shaped surface that fits into a concave surface 	<ul style="list-style-type: none"> In 1 plane about a single axis, like door hinge 	<ul style="list-style-type: none"> Elbow, knee, ankle, finger joints 	
Pivot	<ul style="list-style-type: none"> Arch-shaped surface that rotates around a rounded pivot 	<ul style="list-style-type: none"> Rotation 	<ul style="list-style-type: none"> Between axis and atlas 	
Saddle	<ul style="list-style-type: none"> Saddle-shaped surface that fits into a socket curved in opposite direction 	<ul style="list-style-type: none"> Like condyloid, Similar to a rider in a saddle 	<ul style="list-style-type: none"> Thumb joint 	

Body Movements

Synovial joints allow the body to have a wide range of movements. Each movement at a synovial joint is the result of contraction or relaxation of the muscles that are attached to bones on either side of the joint. Each type of synovial joint produces a different type of movement. In addition, several joints may work together to produce more complex movements. Movements at synovial joints are typically **paired**, with one being the opposite of the other and are always in relation to **anatomical position**, a term which means an upright stance, with upper limbs to the side of body and palms facing forward. Several common types of body movements are summarized in the table below.



Common Types of Body Movements (Paired Vertically)					
Flexion	Abduction	Pronation	Eversion	Lateral Rotation	Protraction
Bending a limb; decreasing the angle of a joint	Movement away from the midline of the body	Rotation of arm or leg so palm is down or sole out	Movement of sole away from midline of the body	Rotation away from the midline	Movement forward
Extension	Adduction	Supination	Inversion	Medial Rotation	Retraction
Straightening a limb; increasing angle of a joint	Movement toward the midline of the body	Rotation of arm or leg so palm is up or sole in	Movement of sole towards the midline of the body	Rotation towards the midline	Movement backward



REVIEW - WHAT ARE JOINTS?


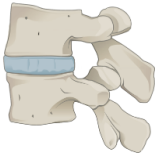
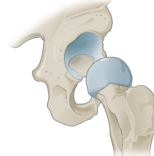
1. What is the definition of a joint? What is another anatomical name for a joint?

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2. Fill in the table below to summarize the three main functions of joints.

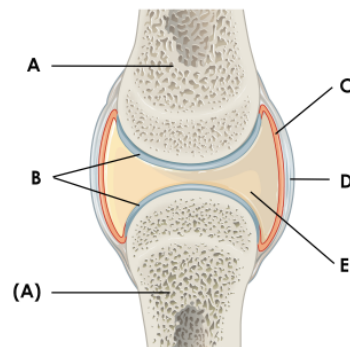
Main Functions of Joints		

3. Joints are classified in 2 major ways: structural and functional. Fill in the table below to summarize both types of joint classifications.

Comparison	Immovable Joints	Semi-Movable Joints	Freely-Movable Joints
Sample Diagram			
Structural Classification			
Definition of Term Above	<i>Joint where bones are connected by fibrous connective tissue</i>	<i>Joint where bones are joined by hyaline cartilage or fibrocartilage</i>	<i>Joint where bones are connected through a fluid-filled joint cavity</i>
Functional Classification			
Definition of Term Above			
1-3 Examples			

4. Identify the major parts of a synovial joint / diarthrosis shown in the diagram below.



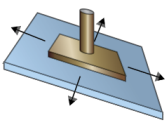
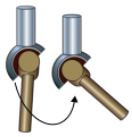
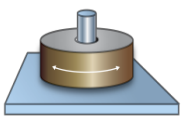
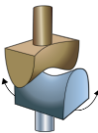
Parts of a Synovial Joint	
A	
B	
C	
D	
E	



5. Match each structure found in a typical synovial joint / diarthrosis with the correct description.

Bone Structure		Description	
	articular cartilage	A	Bands of connective tissue that support and strengthen the joint
	joint capsule	B	Soft tissue that lines the synovial cavity; secretes synovial fluid
	synovial cavity	C	Clear, thick, lubricating fluid; reduces friction during movement
	synovial membrane	D	Smooth, white tissue; allows bones to glide over each other
	synovial fluid	E	A closed sac of synovial fluid; found in most synovial joints
	bursa	F	Connective tissue capsule that encases bones within the joint
	ligaments	G	Space created within the joint capsule; filled with fluid

6. Fill in the summary table to summarize the 6 main types of synovial joints.

Type	Diagram	Description	Movement	Example
			<i>Complete range of motion; widest range of all joints</i>	<i>shoulder, hips</i>
<i>condyloid (ellipsoidal)</i>		<i>Oval shaped surface that fits into an elliptical surface</i>		<i>wrist joints</i>
		<i>Articulating surfaces, usually flat</i>		<i>between wrist bones</i>
			<i>One plane about a single axis, like door</i>	
		<i>Arch-shaped surface that rotates around a rounded pivot</i>		
			<i>Like condyloid, similar to a rider in a saddle</i>	

7. Match each type of body movement with the opposite, paired motion.

Paired Motions				Paired Motions			
A	flexion	<i>pairs with</i>		C	eversion	<i>pairs with</i>	
B		<i>pairs with</i>	adduction	D	lateral rotation	<i>pairs with</i>	
C		<i>pairs with</i>	supination	E		<i>pairs with</i>	retraction