# The structure and functions of joints

# Joints

The junction where two or more bones meet

Three main types:

- **Fixed joints –** Joints that are linked together usually by a fibrous connective tissue
- **Cartilaginous joints –** Joints that are connected entirely by cartilage
- **Synovial joints –** Connections between two bones which are separated by an articular cavity

# Fibrous joints

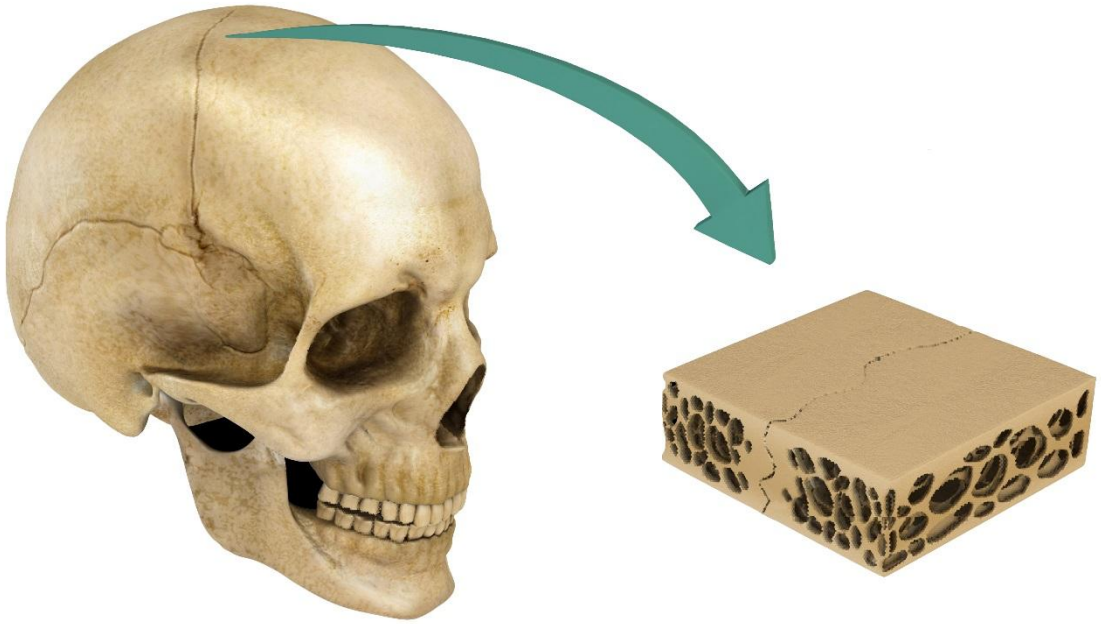
Linked together by fibrous connective tissue

Allow no movement or very little movement.

Three types:

- **Sutures -** bones joined by a layer of dense fibrous connective tissue, e.g. between the bones of the skull.
- **Gomphoses** - a cone shaped peg, fits into a socket, e.g. the teeth and adjoining bones.
- **Syndesmosis -** two adjacent bones are linked by a ligament or interosseous membrane, e.g. the radius and ulna

# Fibrous joints



# Cartilaginous joints

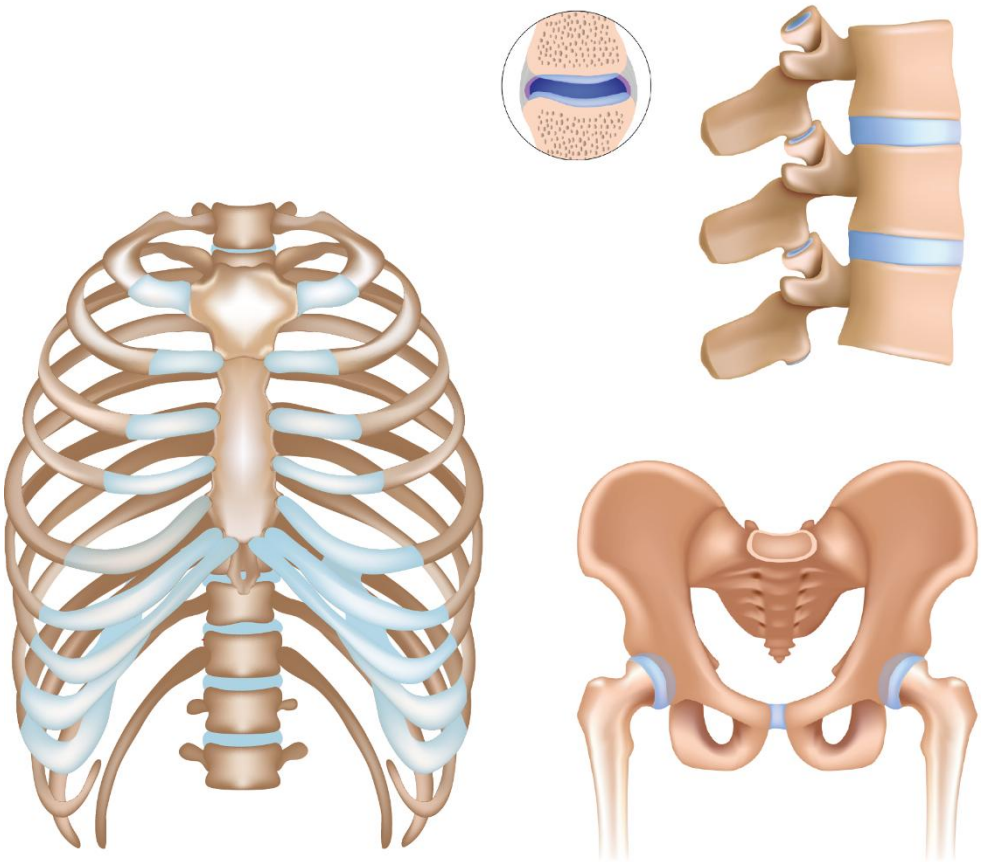
No joint cavity, connected by cartilage.

Allow very little movement or no movement.

Two types:

- **Synchrondrosis**:
  - Connected by **hyaline** cartilage, which has ossified, e.g. the first rib and the sternum
  - No movement
- **Symphysis**:
  - Connected by **fibrocartilage**, e.g. between the vertebral bones and the pubis symphysis
  - Slight movement

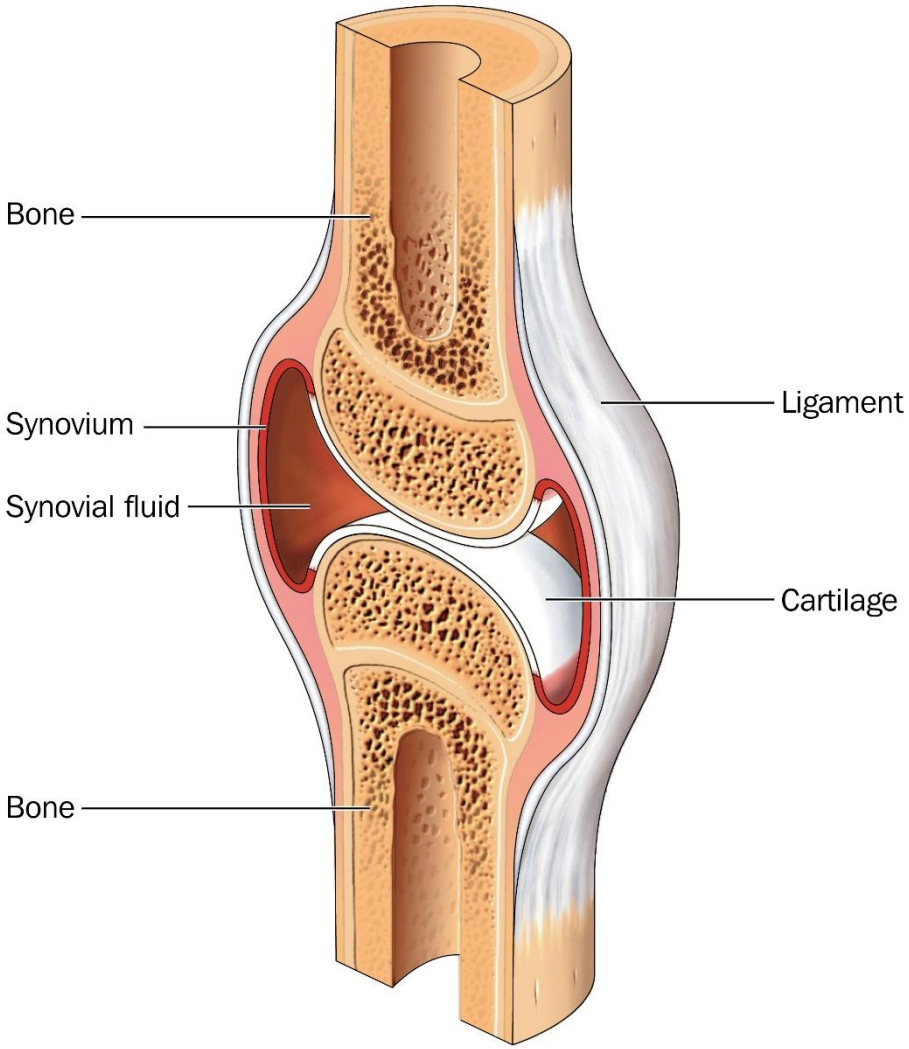
# Cartilaginous joints



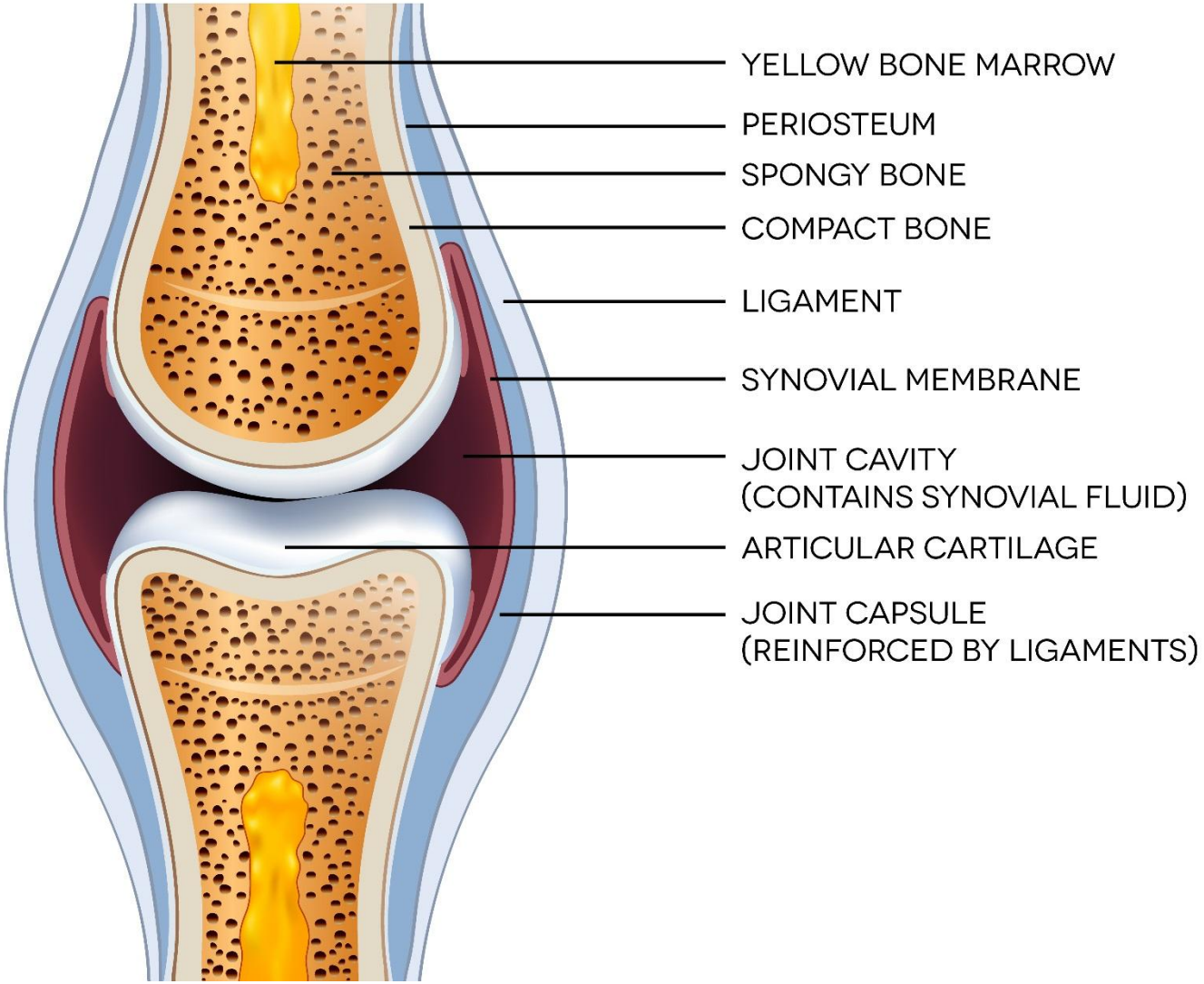
# Synovial joints

- Freely movable
- Whole joint surrounded by a capsule
- Synovial cavity or joint cavity between bones
- Cartilage covers ends of the bones. Bone ends are covered with hyaline (articular) cartilage
- Bones connected and stabilised by ligaments
- Capsule contains a synovial membrane that secretes synovial fluid
- Synovial fluid lubricates the joints

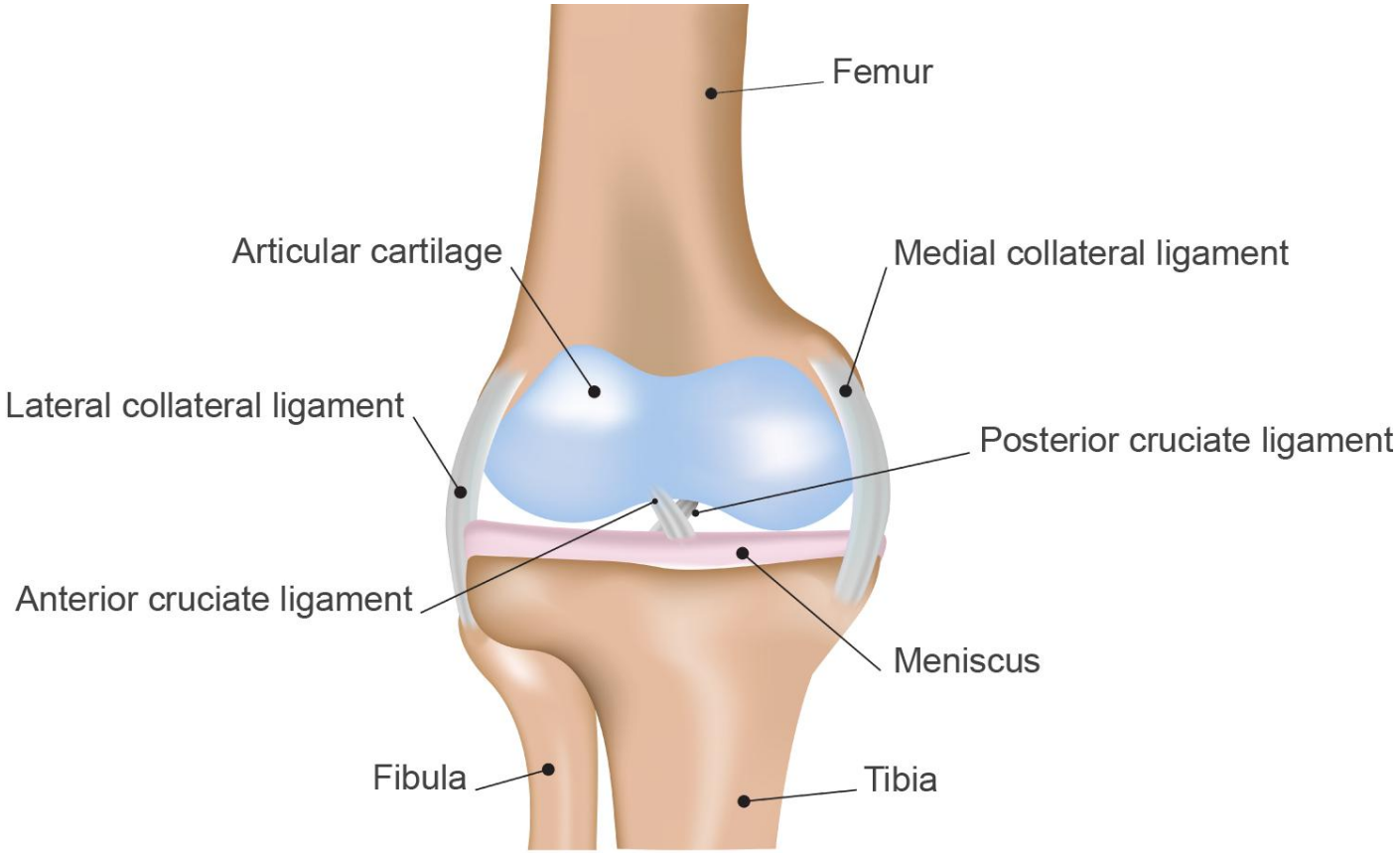
# Structure of a synovial joint



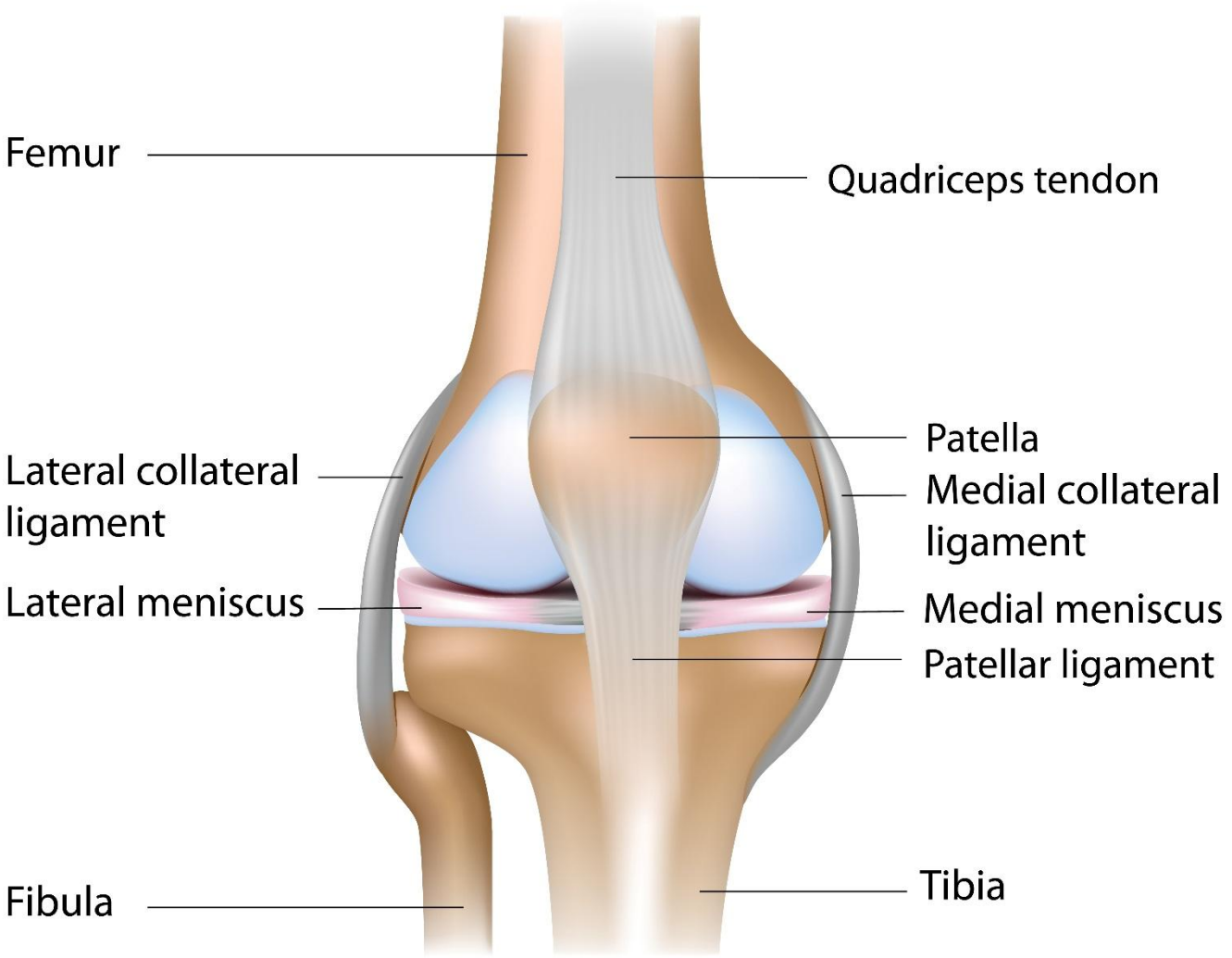
# SYNOVIAL JOINT



# Structure of a synovial joint – the knee joint



# Anterior view of the right knee



# Tendons

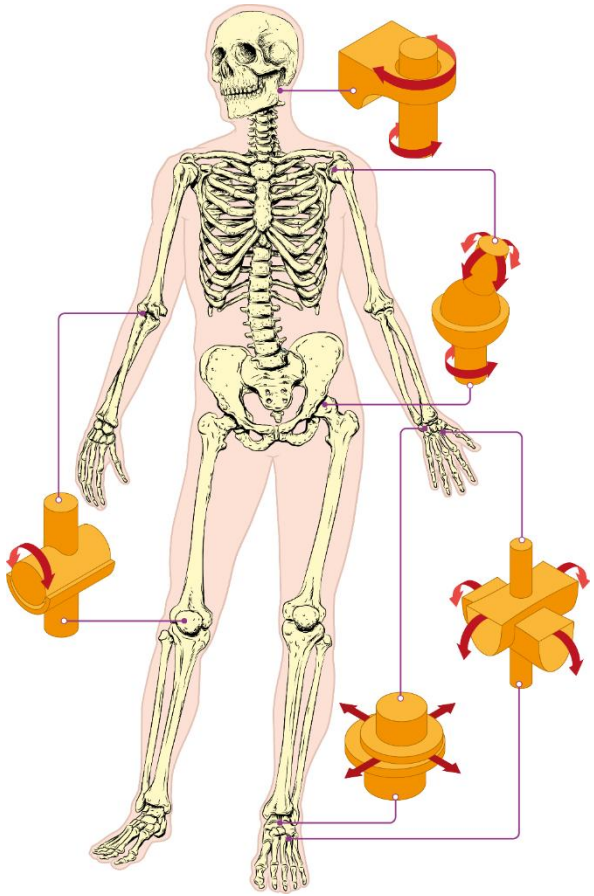
- Connect muscle to bone
- Bundles of collagen fibres
- Connective tissue of muscles
- Insert onto periosteum
- Poor blood supply
- Heal slowly

# Ligaments

- Connect bone to bone.
- Stabilise joints
- Poor blood supply
- Collagen (less extensible)
- Elastin (more extensible)

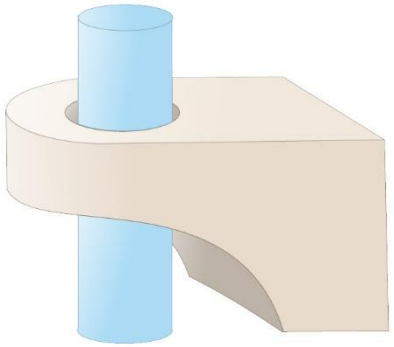
# Types of synovial joint

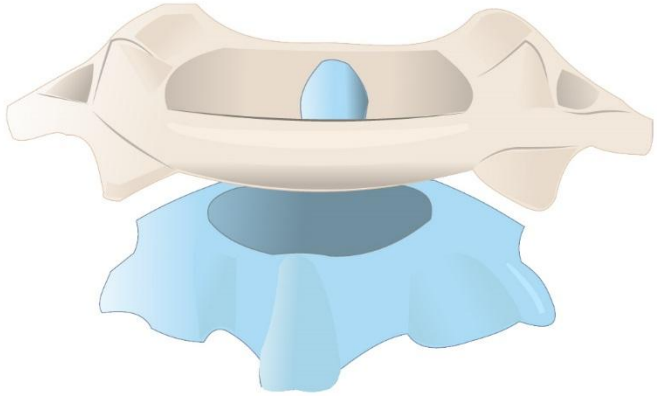
1. Pivot
2. Ball and Socket
3. Hinge
4. Condyloid (Ellipsoid)
5. Saddle
6. Plane (Gliding)



# Pivot joints

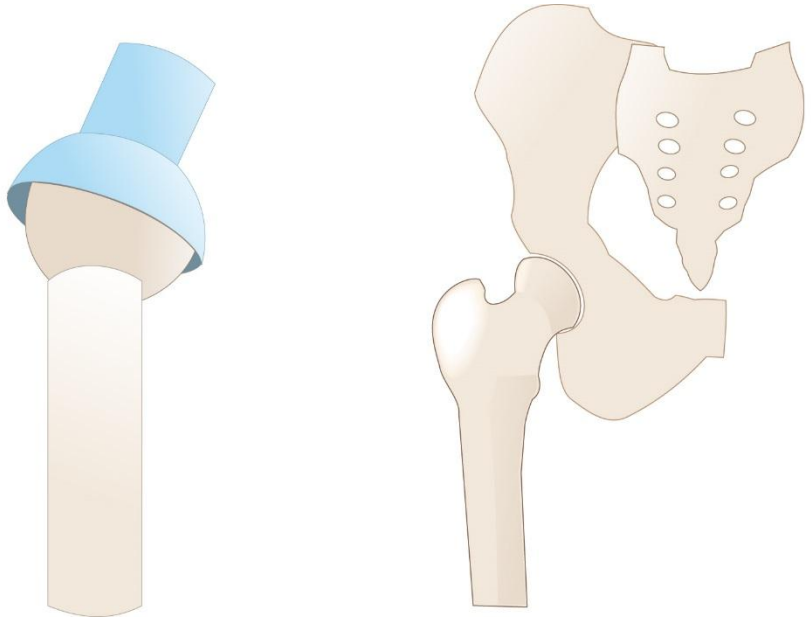
- Allow rotation
- Movement plane (the transverse plane)
- Uniaxial or monaxial
- The atlas and axis (cervical vertebrae C1 and C2)





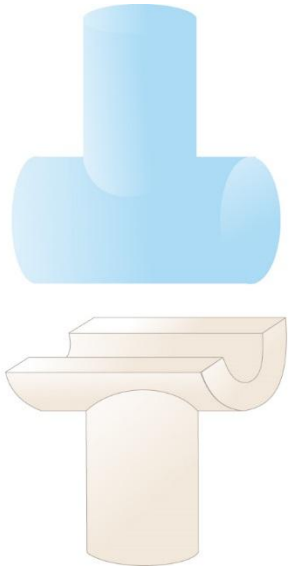
# Ball and socket

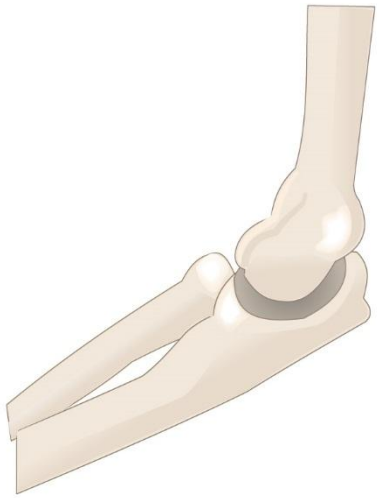
- Triaxial or multiaxial
- Move in all three movement planes (the sagittal plane, frontal plane and transverse plane).
- Hip and shoulder



# Hinge joints

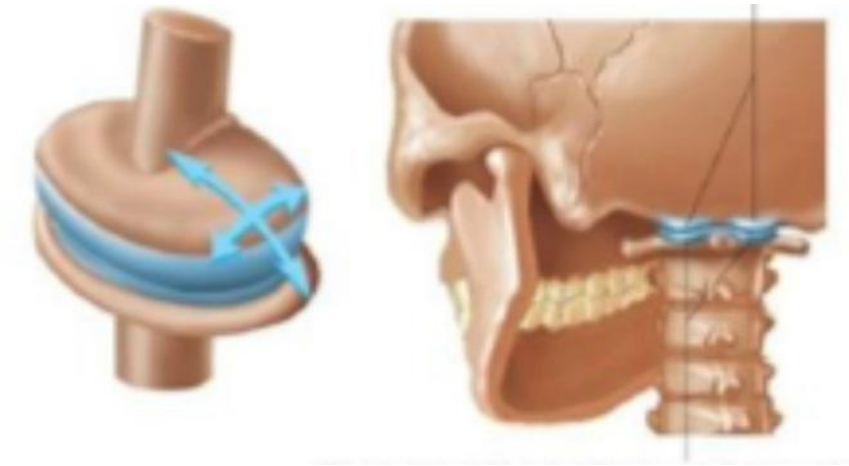
- Knee and elbow
- Uniaxial
- Move in one plane





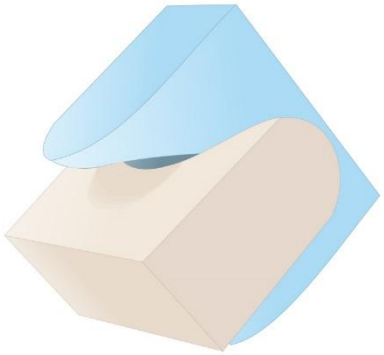
# Condyloid (Ellipsoid) joints

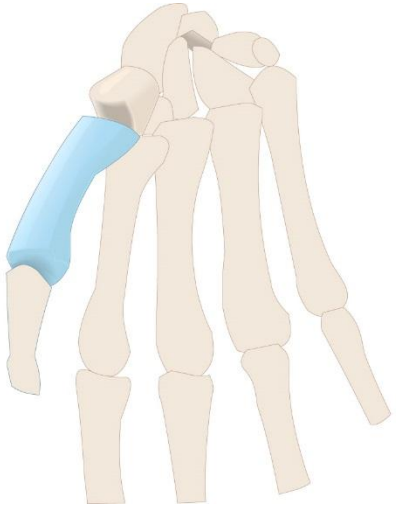
- Allow movements side to side and back and forth
- Move in two movement planes (the frontal and sagittal planes)
- Biaxial
- The wrist, which allows flexion, extension, abduction and adduction



# Saddle joints

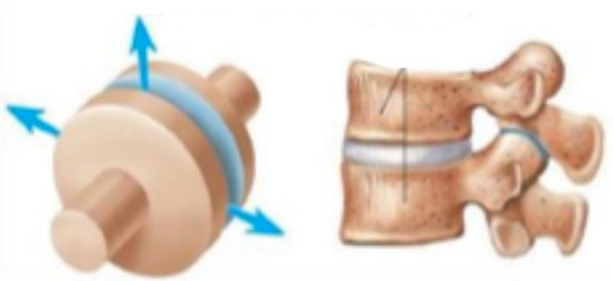
- Modified ellipsoid joints
- Move side to side and back and forth
- Biaxial
- The joint between the metacarpal of the thumb





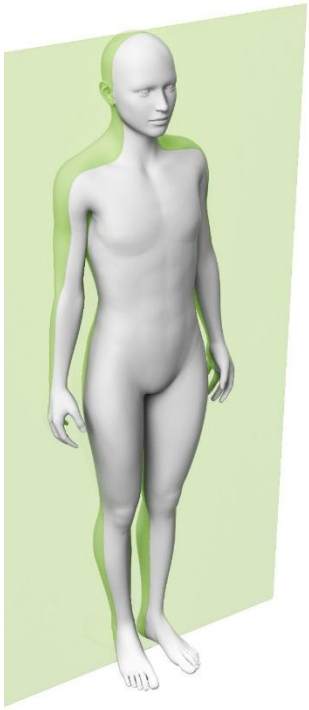
# Plane or gliding joint

- Allow movement back and forth and side to side over another surface
- Do not move around a point of axis - nonaxial
- No rotation
- Carpals, tarsals, scapula and clavicle



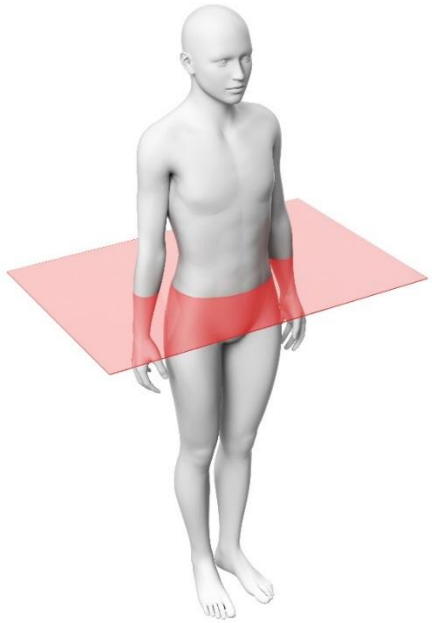
# Movement planes

**Sagittal**



**Frontal**

**Transverse**



# Movement planes

**Frontal or coronal plane**

- Vertical plane that dissects the body into front and back
- Anterior/posterior axis movements: adduction, abduction, lateral flexion, eversion and inversion

**Sagittal or median plane**

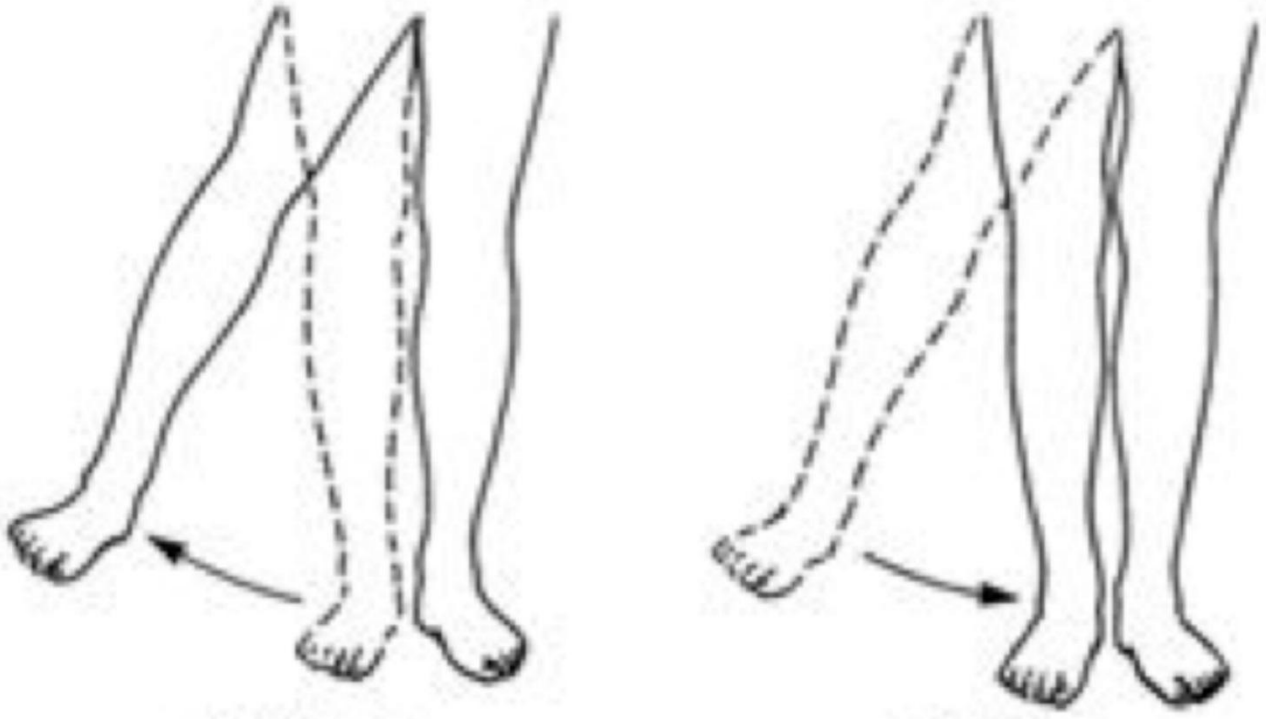
- Vertical plane that dissects the body into left and right sides
- Bilateral axis movements: flexion and extension

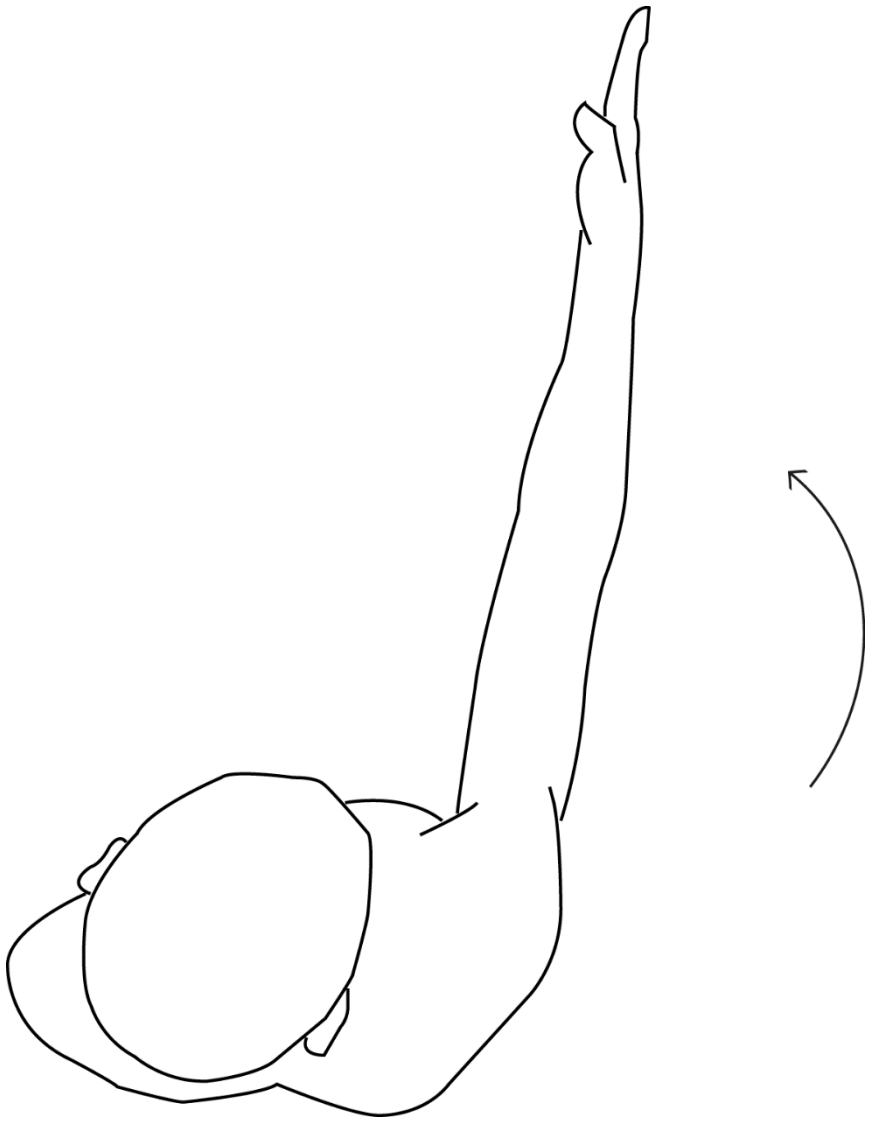
**Transverse (horizontal) plane**

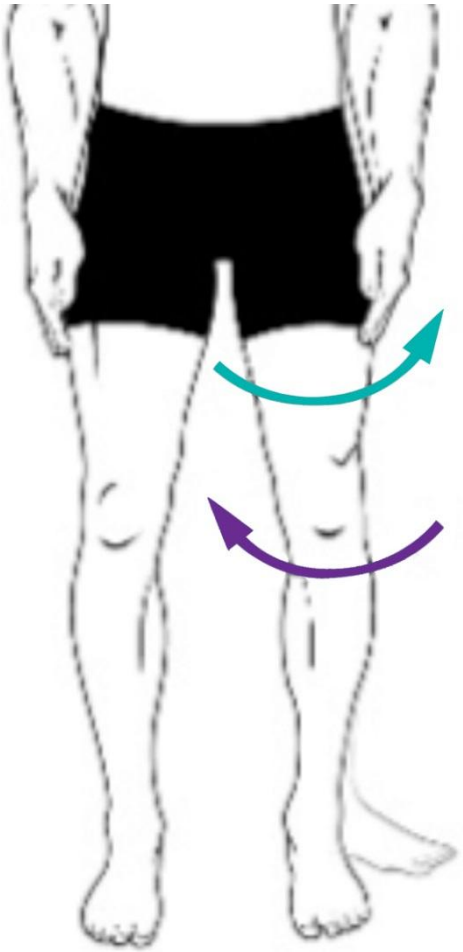
- Horizontal plane that dissects the body into upper and lower
- Vertical axis movements: internal rotation, external rotation, horizontal flexion and extension

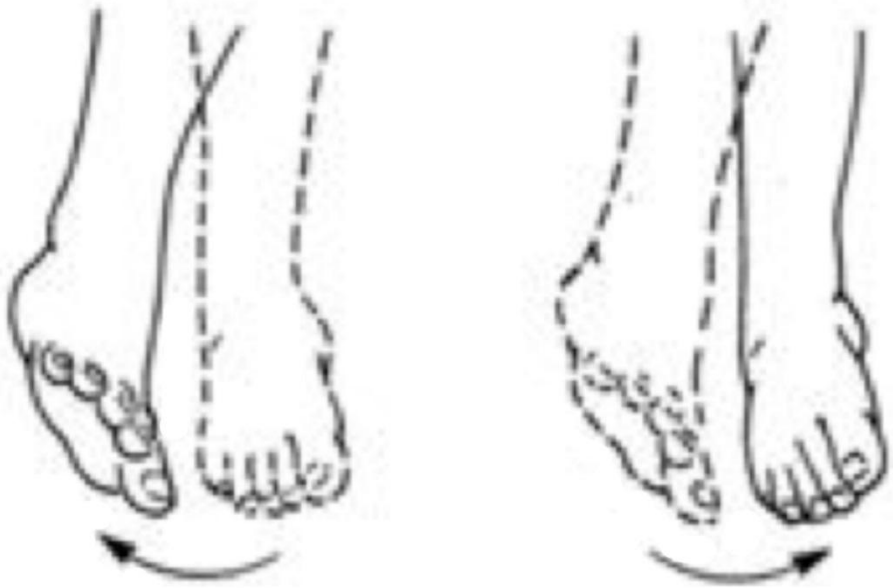
# Joint actions

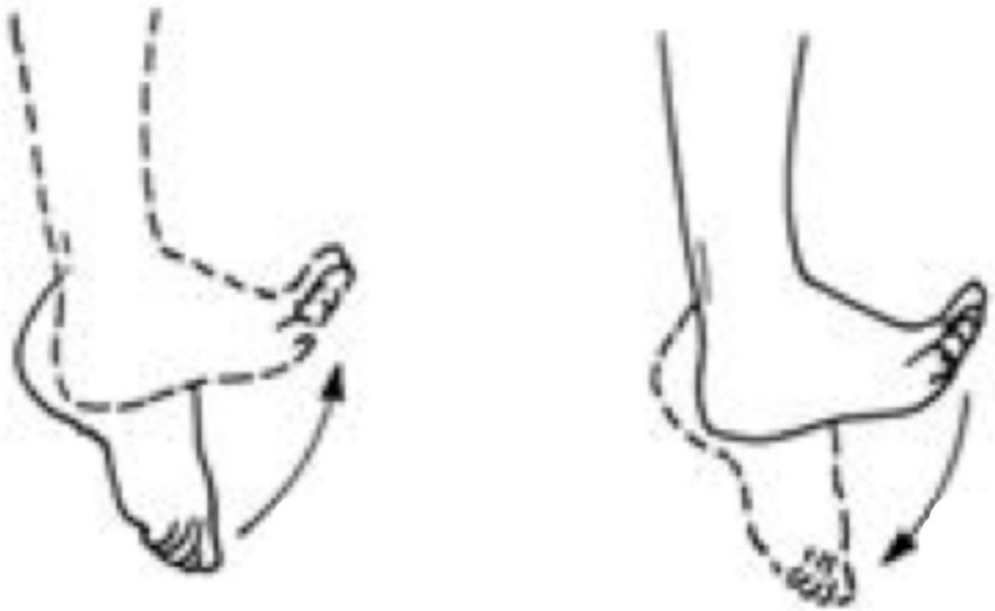
- Extension
- Flexion
- Adduction
- Abduction
- Dorsi flexion
- Plantar flexion
- Circumduction
- Lateral flexion
- Rotation
- Pronation
- Supination
- Eversion
- Inversion

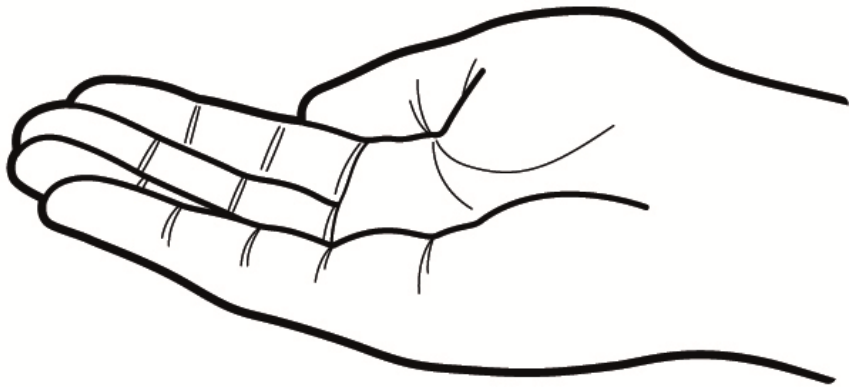




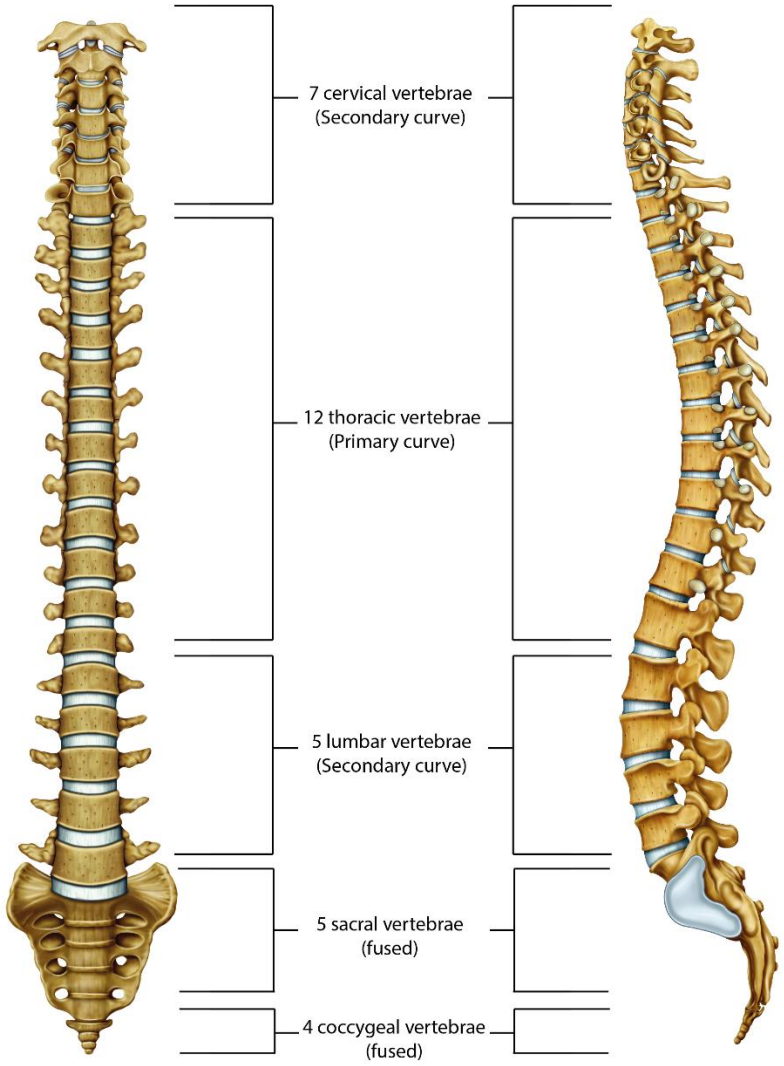




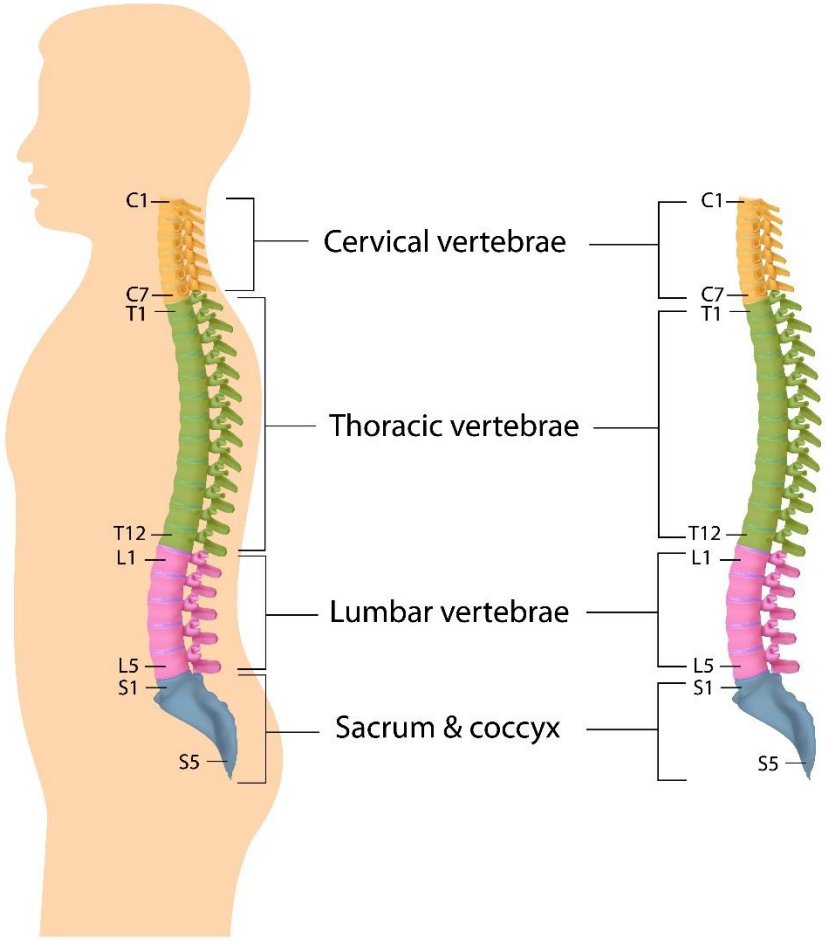




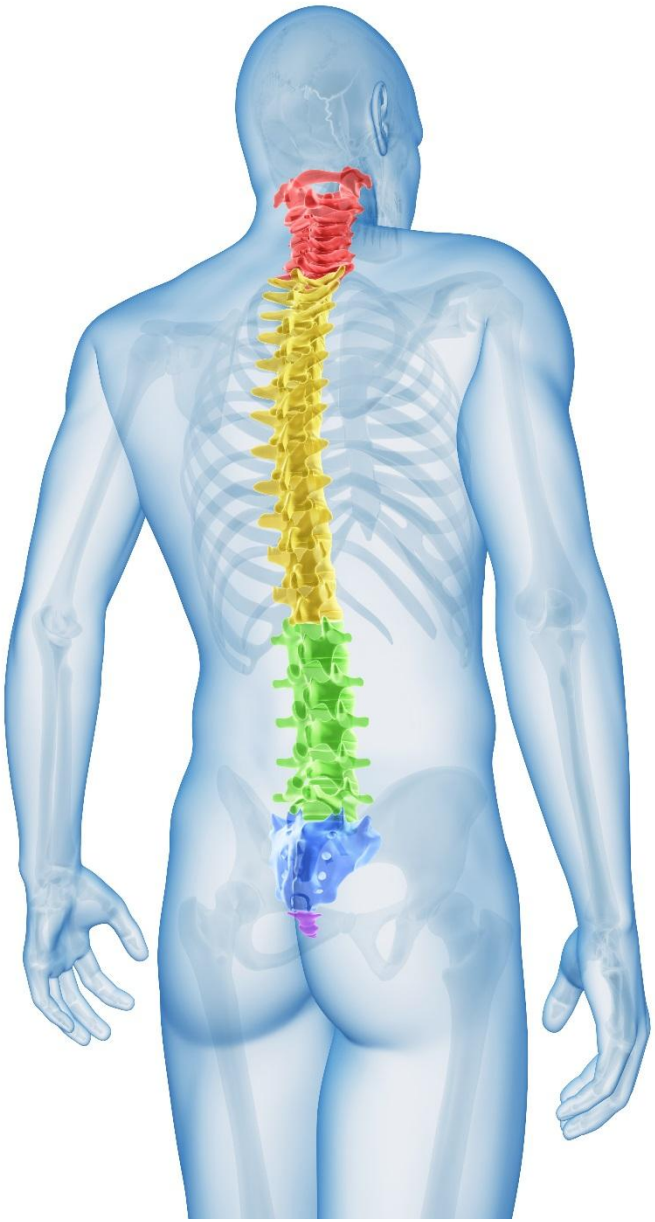
# The spine


7 cervical vertebrae
(Secondary curve)
12 thoracic vertebrae
(Primary curve)
5 lumbar vertebrae
(Secondary curve)
5 sacral vertebrae
(fused)
4 coccygeal vertebrae
(fused)

# The spine


C1
C7
T1
T12
L1
L5
S1
S5
Cervical vertebrae
Thoracic vertebrae
Lumbar vertebrae
Sacrum & coccyx
C1
C7
T1
T12
L1
L5
S1
S5

# Regions of the spine



Cervical - 7

Thoracic – 12

Lumbar - 5

Sacral – 5

Coccyx - 4

# Movement of the spine

**Cervical spine**

- The atlas and the axis form a pivot joint allowing rotation
- The skull sits on top of the atlas bone enabling flexion, extension and lateral flexion

**Thoracic spine**

- Flexion, extension, lateral flexion and rotation
- Collectively, significant rotation

**Lumbar spine**

- Some flexion, a greater range for extension, limited rotation and limited lateral flexion

**Sacral and coccygeal**

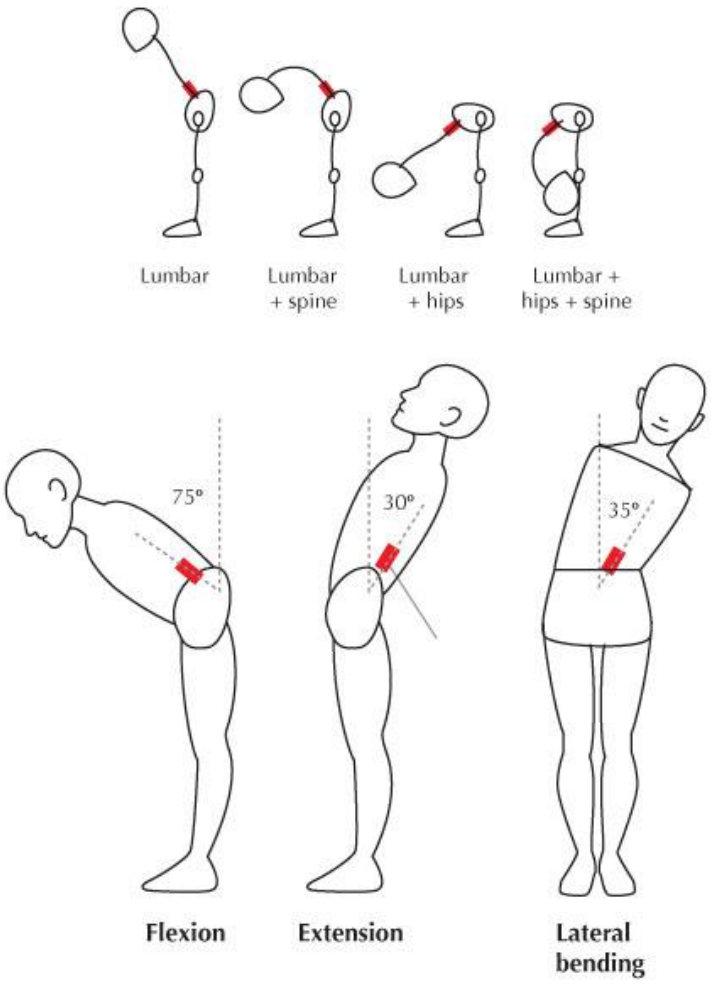
- No movement

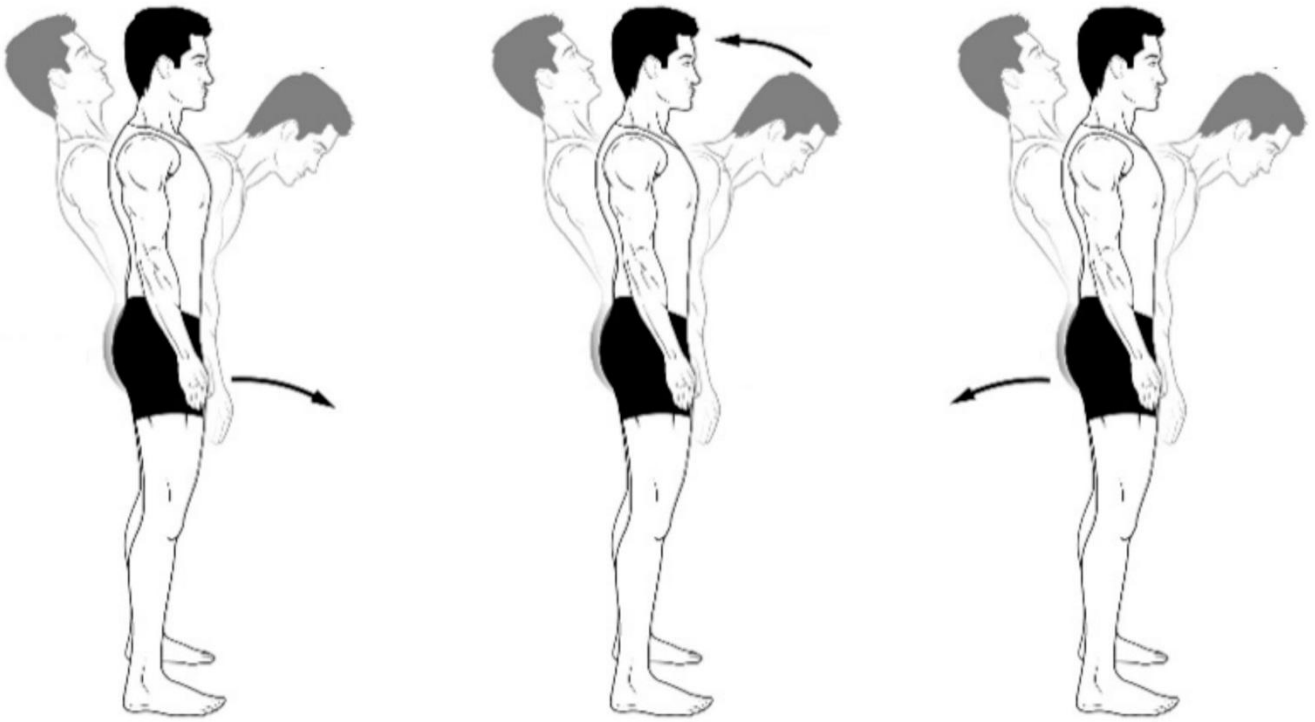
# Activity

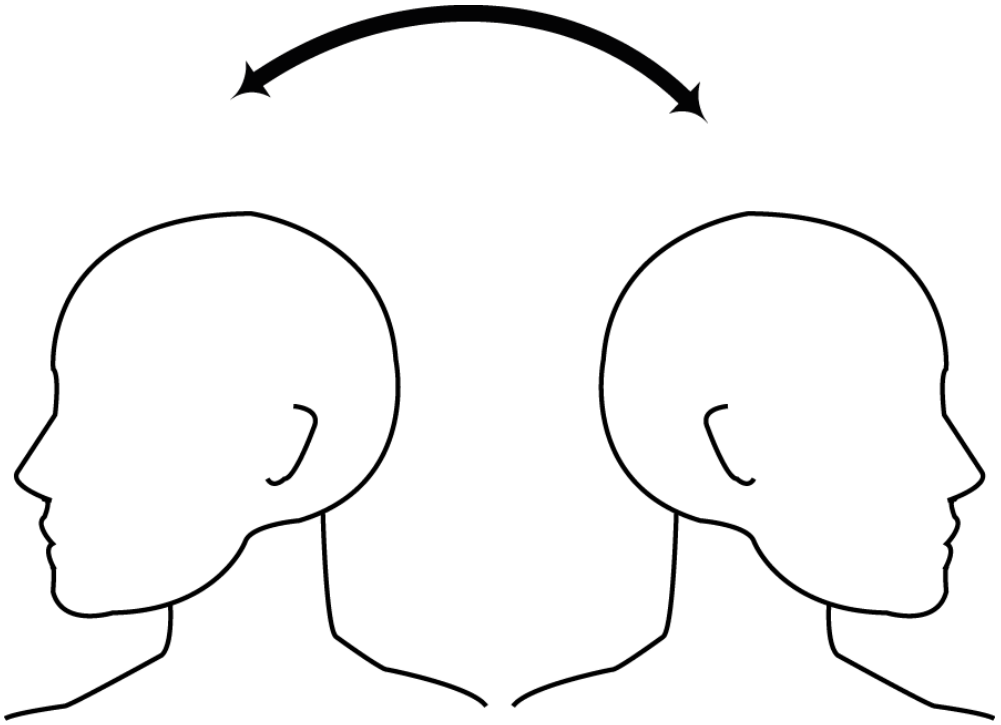
Stand up and perform the movements illustrated on the slides.

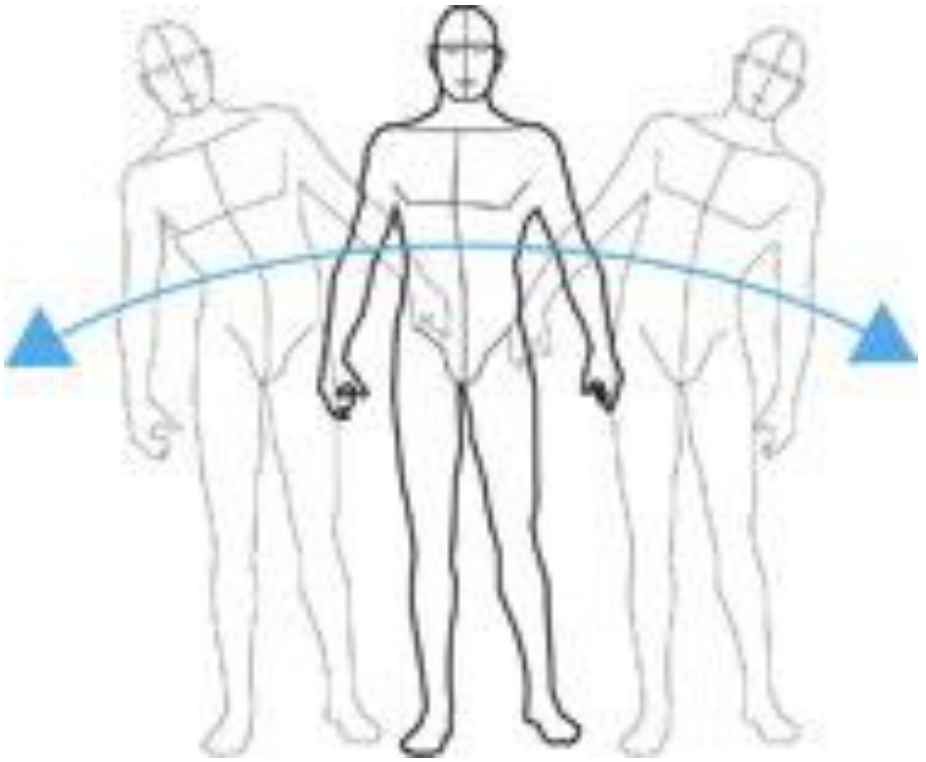
Name the region of the spine moving.

Name the action.


Lumbar
Lumbar + spine
Lumbar + hips
Lumbar + hips + spine
75°
30°
35°
Flexion
Extension
Lateral bending







# Sacroiliac joint

- Between sacrum and iliac bones
- considered to be both synovial (freely moveable) and fibrous (immoveable)
- The lower sections have some movement
- The upper sections have no movement