

**SUPPORT,  
MOVEMENT  
AND  
LOCOMOTION**

# Bones

- Functions of the skeleton
  - Locomotion
    - The ability to move from place to place
  - Support
    - Holds the body off the ground
    - Keeps its shape even when muscles are contracting to produce movement
  - Movement
    - The skeleton works with muscles which are attached to it to produce movements and many bones of the skeleton act as levers.

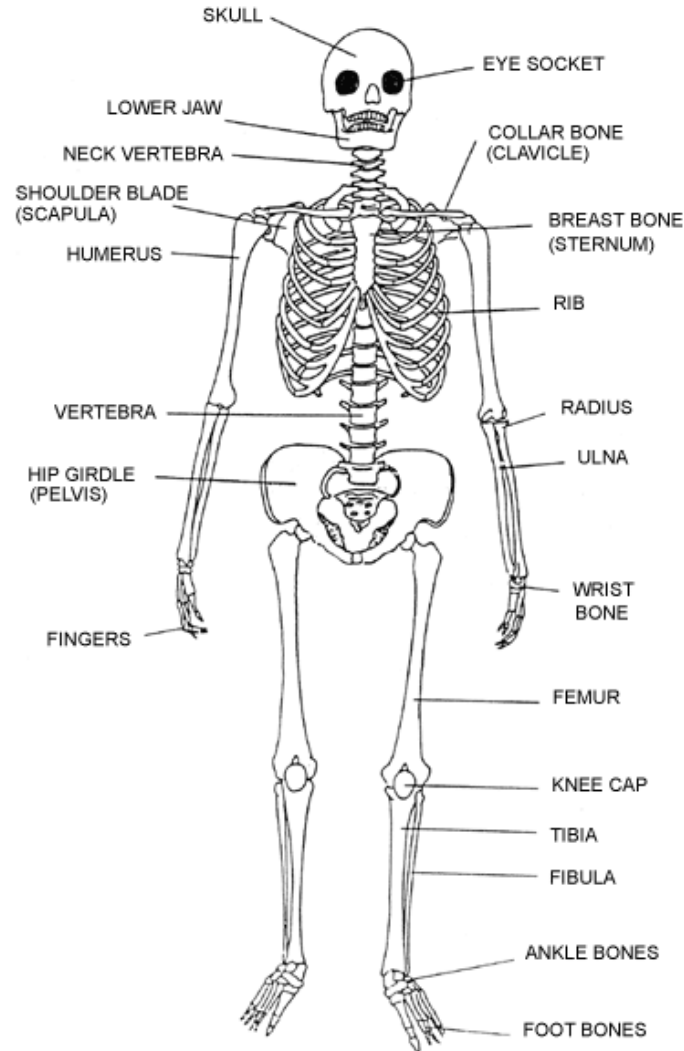
## – Protection

- The brain is protected by the skull
- The vertebrae is protected by the spinal cord
- The ribs and breastbone (sternum) protect the lungs and heart
- The pelvis shields the reproductive organs

## – Production of blood cells

- Red and white blood cells are made in the bone marrow.

# The Skeleton



- The skeleton can be divided into

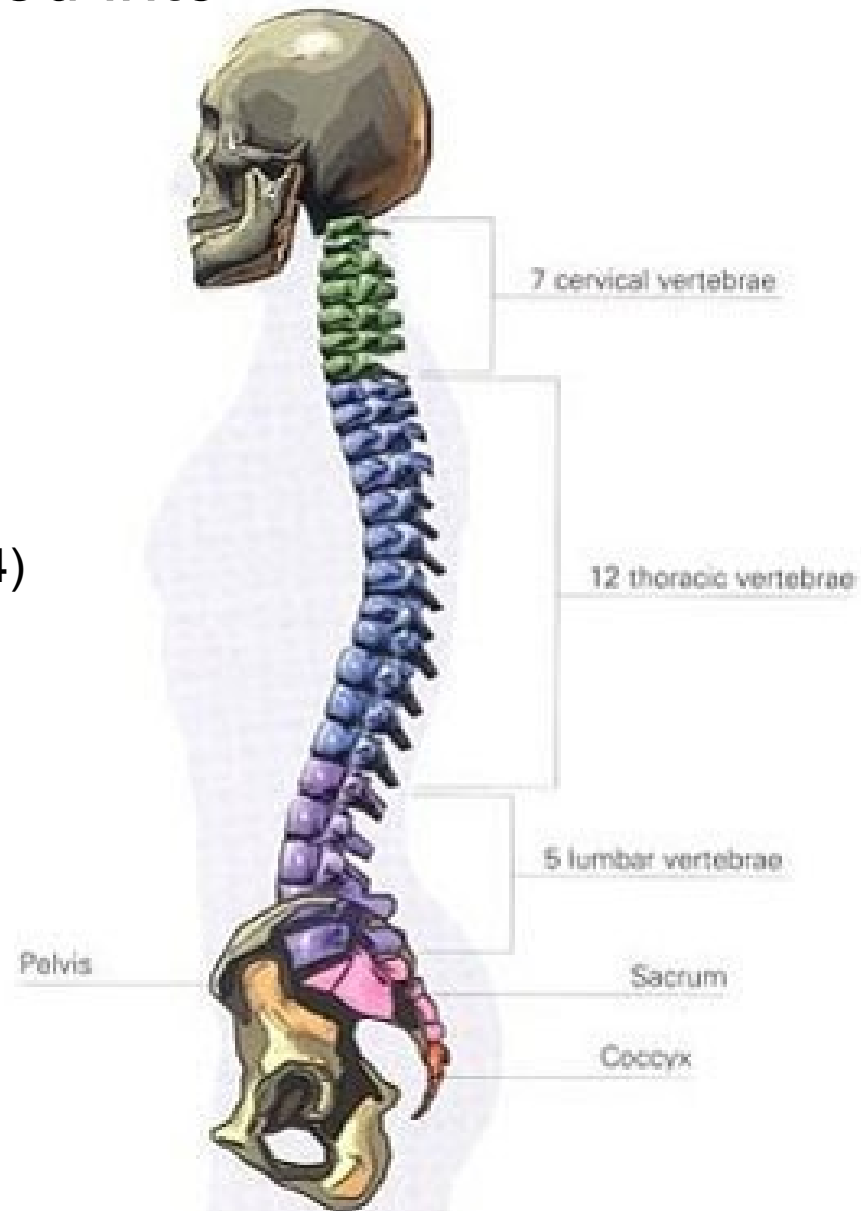
- Axial skeleton

- Skull
    - Vertebrae column (33)
      - Cervical region (7)
      - Thoracic region (12)
      - Lumbar region (5)
      - Sacrum (5)
      - Caudal/Coccygeal region (4)

- Ribs
    - sternum

- Appendicular skeleton

- Fore-limbs
    - Hind-limbs

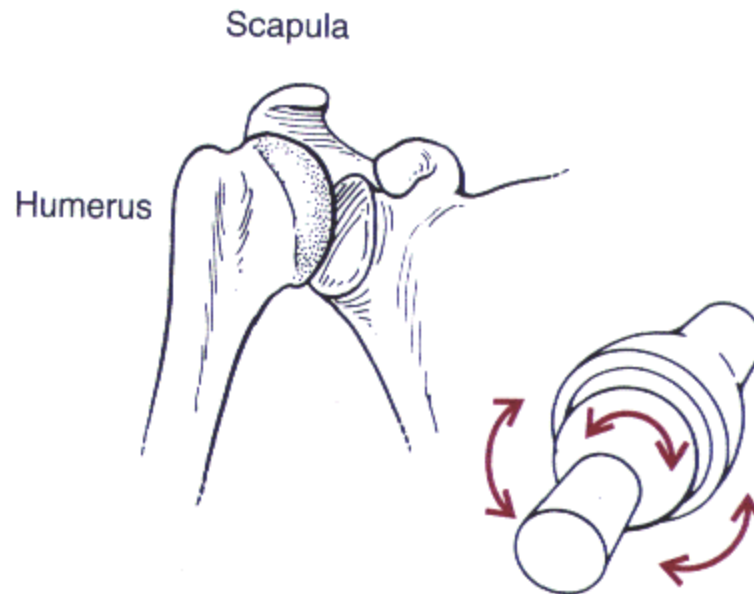


# Joints

- A location at which 2 or more bones make contact
- It is constructed to allow movement and mechanical support
- The joints may be
  - Fixed joint (fused)
  - Moveable joint (synovial)
    - Ball and socket joint
    - Hinge joint
- Most movement occurs at synovial joints.

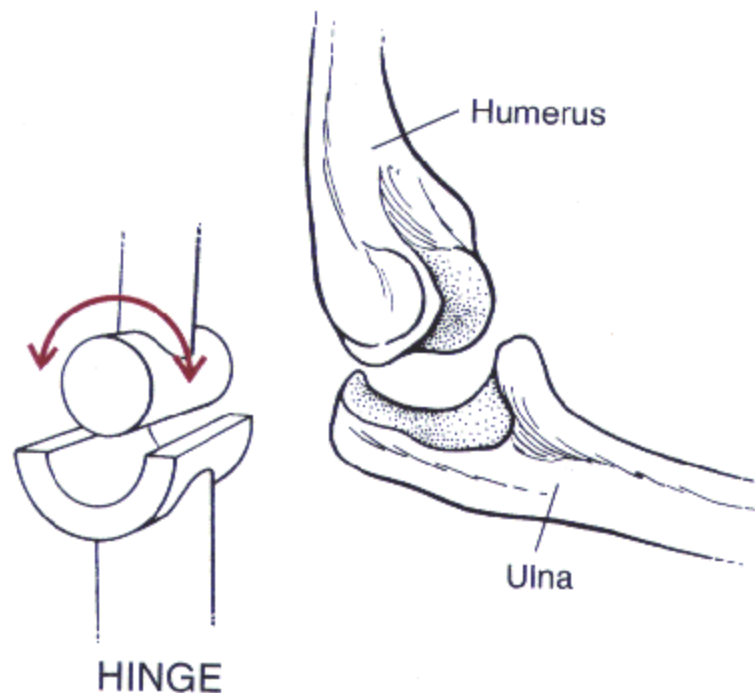
# Ball and socket joint

- Found in the hip bone and shoulder
- Allows the most movement of all the joints (move in all directions)



# Hinge joint

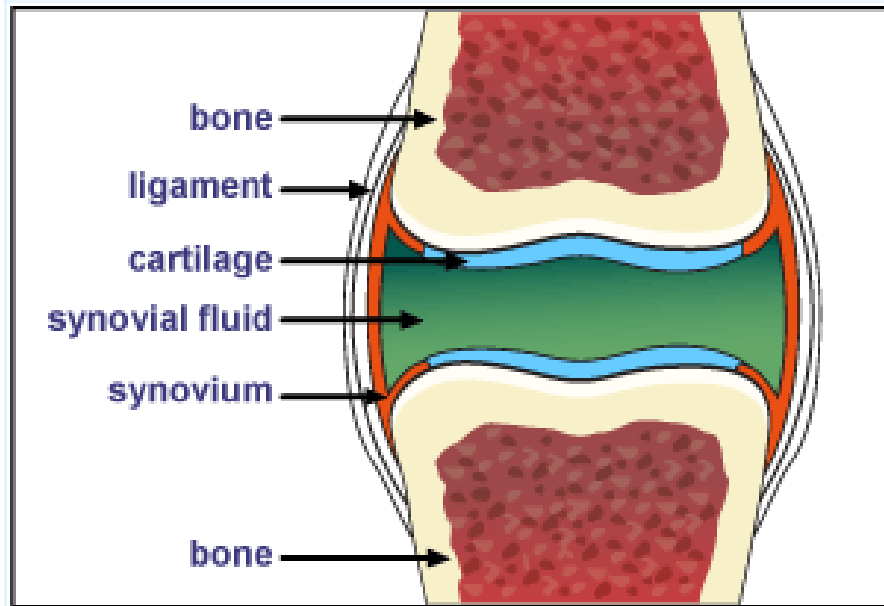
- Found in the elbow and the knee
- Allow bones to move back and forth, like hinge in a door (move in 1 direction)





# Structure of Synovial Joint

Movement at joint could cause friction. The synovial joint is adapted to reduce friction.



# Synovial Joint

The functions of the structures in a synovial joint are:

- Cartilage – covers the ends of bones. It is smooth and acts as a shock absorber and stops the 2 bones from rubbing together.
- Synovial membrane – encloses the joints and secretes synovial fluid.
- Synovial fluid – serves to lubricate the joints and makes movement easy.
- Ligaments – tough elastic strands that hold 2 bones together at the joints and prevent dislocation.

# Types of Muscles

- 3 types:
  - Voluntary (skeletal muscle)
    - Attached to the bones of the skeleton and are under our conscious control. It is also known as striated muscles due to the striated appearances.
  - Involuntary
    - Line the walls of stomach, intestine and bladder. It is involuntary in action and its contractions are slow and sustained.
  - Cardiac muscle
    - Forms the walls of the heart. It consists of a striped and branching network of fibres. It is automatic and rhythmic in action.

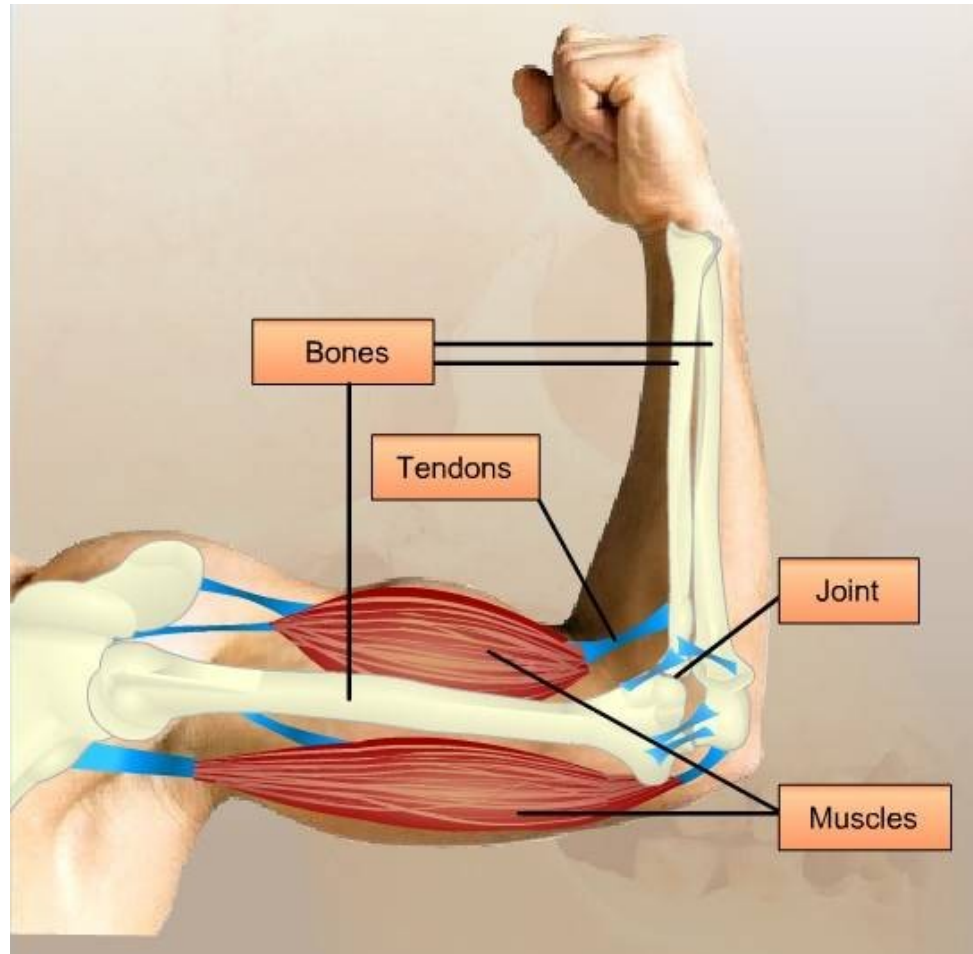
# Skeletal muscles

- Muscles can only contract and relax
- The ends of skeletal muscles are attached to bones by tough inelastic tissue called tendon.
- Muscles can pull but never push.
- They pull only when they contract. When it is contracted, its length shortened.
- When returning to their original length, they relax (NOT 'expand')

# Antagonistic pairs

- Muscles are arranged in antagonistic pair.
- The pair of muscles are arranged in such a way that when one contracts, it produces an opposite effect on the other muscle in the pair, E.g.: the biceps and triceps muscles in the human arm.
  - When a muscle contracts and flexes the joint (flexor), the other muscle relaxes and straightens the joint (extensor)

# Forelimb



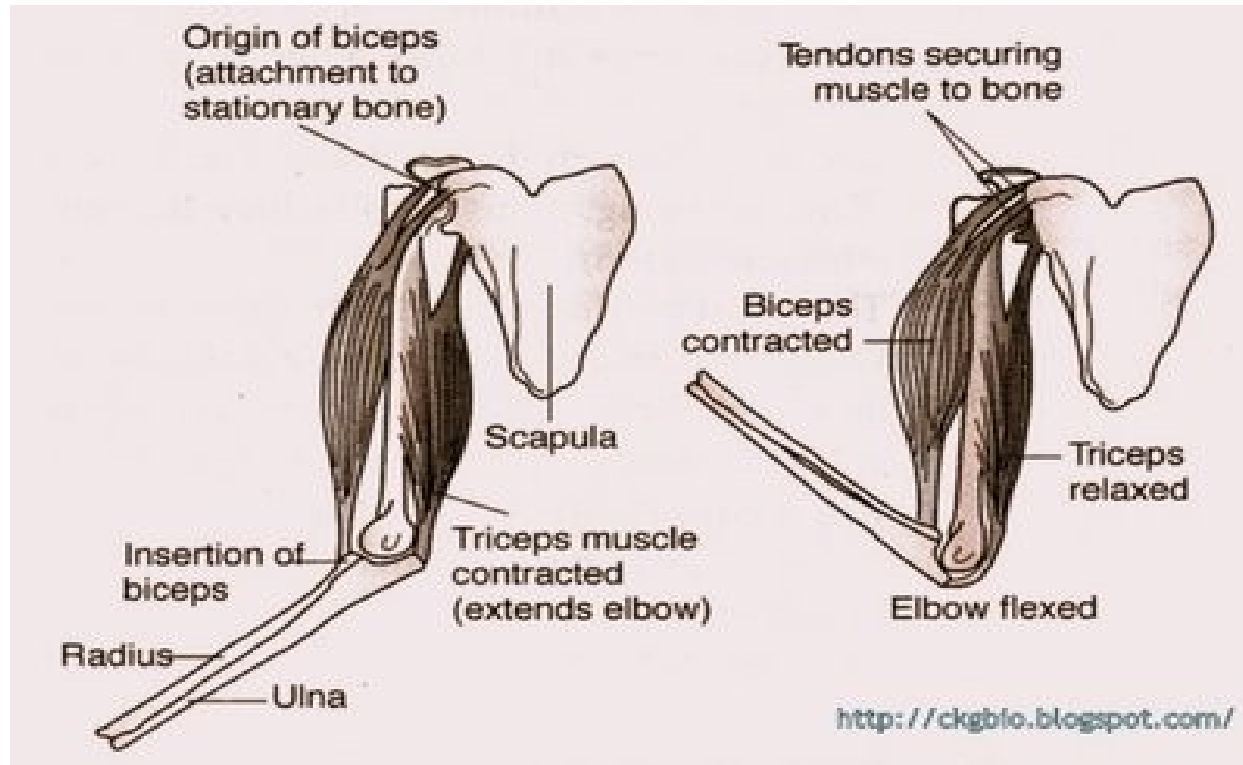
# Bones of Forelimb

- Bones
  - Humerus
  - Radius
  - Ulna (elbow bone)
- Scapula (shoulder bone)

# Muscles of Forelimb

- Muscles
  - Biceps
  - Triceps
- Biceps and triceps work in antagonistic pairs
  - When one contracts, the other relaxes
  - Muscles do not expand





- Arm bending (flexion):
  - When the biceps contracts, radius is pulled up. Flexion of the arm occurs when the triceps relaxes as biceps contract.
- Arm straightening (extension):
  - When the triceps contracts, ulna is pulled down. Extension of the arm occurs when the biceps relaxes as triceps contract.

# Flexor/Extensor

- A flexor is a muscle that causes bending (flexion) of the limb at a hinge joint.
- An extensor causes straightening (extension) of the limb at a hinge joint.
- At the elbow, the biceps is the flexor, and the triceps is the extensor.

# Which muscle is contracting?

