



BTEC Extended Certificate in Sport Part 2

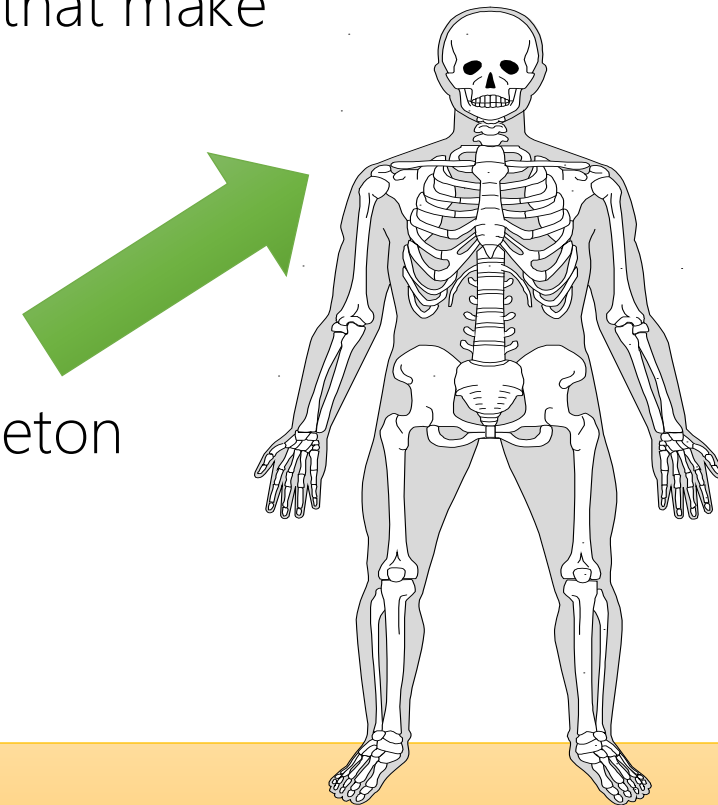
Skeletal System

The adult human skeletal system consists of 206 bones, as well as a network of tendons, ligaments and cartilage that connects them. The skeletal system performs vital functions — support, **movement**, **protection**, blood cell **production**, calcium storage and endocrine regulation — that enable us to survive.



It is important to be able to identify and locate the bones that make up the human skeleton.

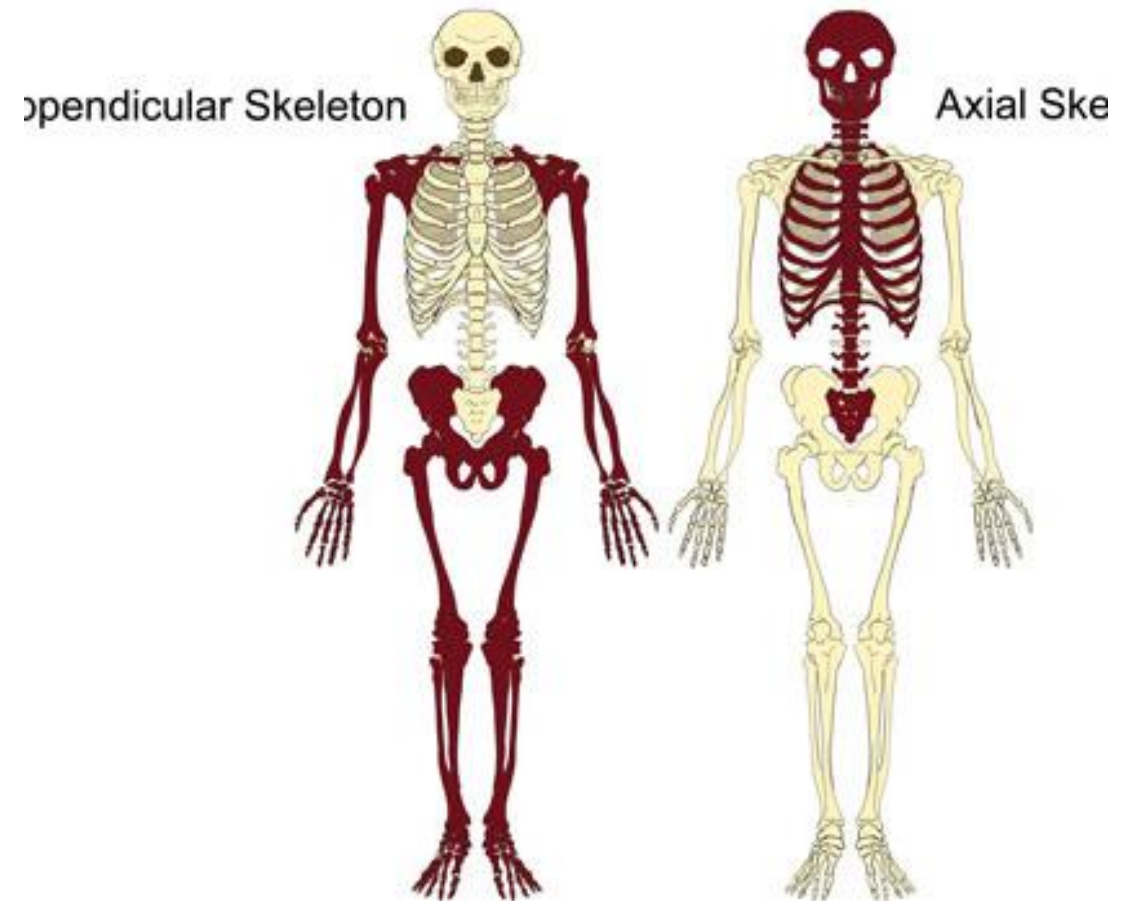
Spend the next 5 minutes labelling as much of the skeleton hand out as you can. IN PENCIL.



We are composed of one skeleton that can be divided into two major regions, the axial and appendicular skeleton.

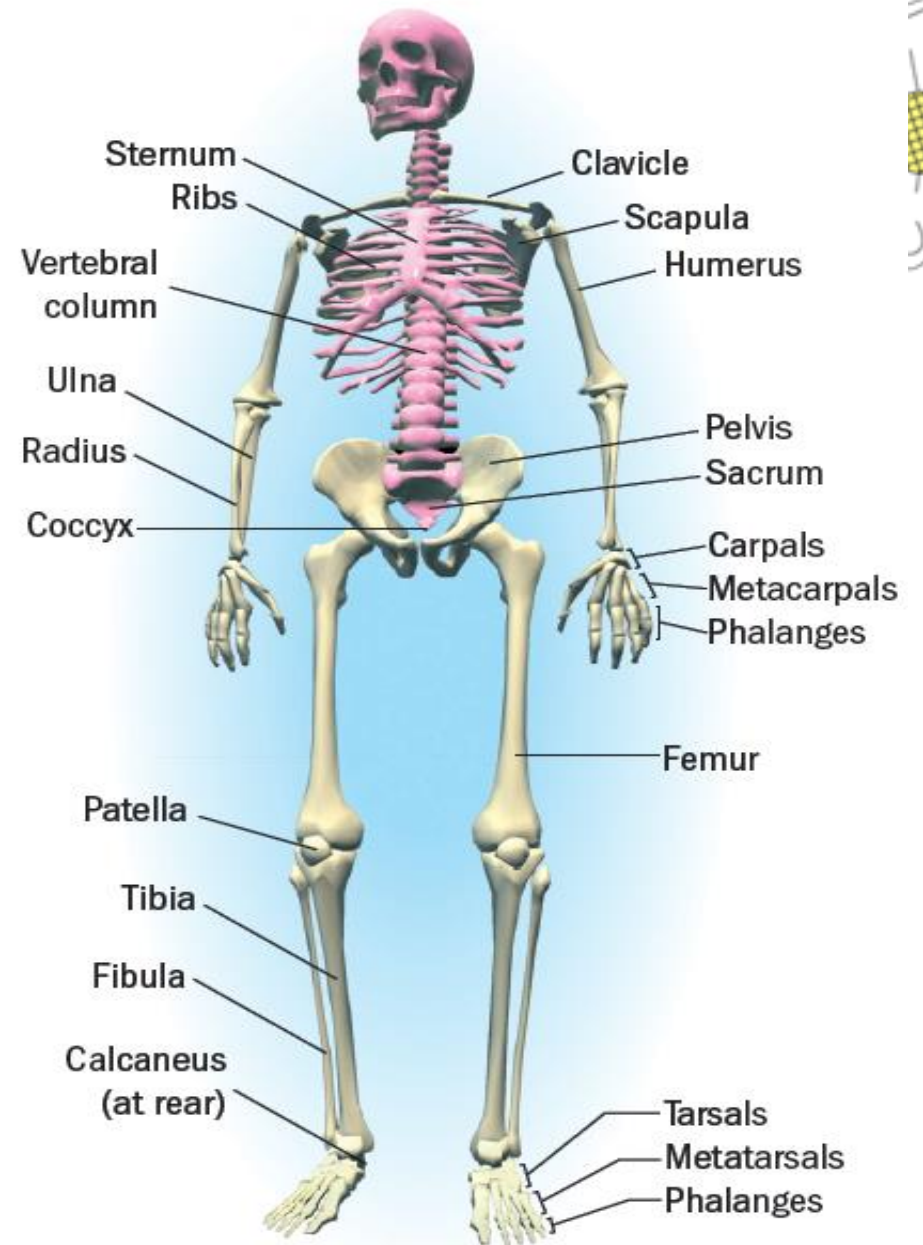


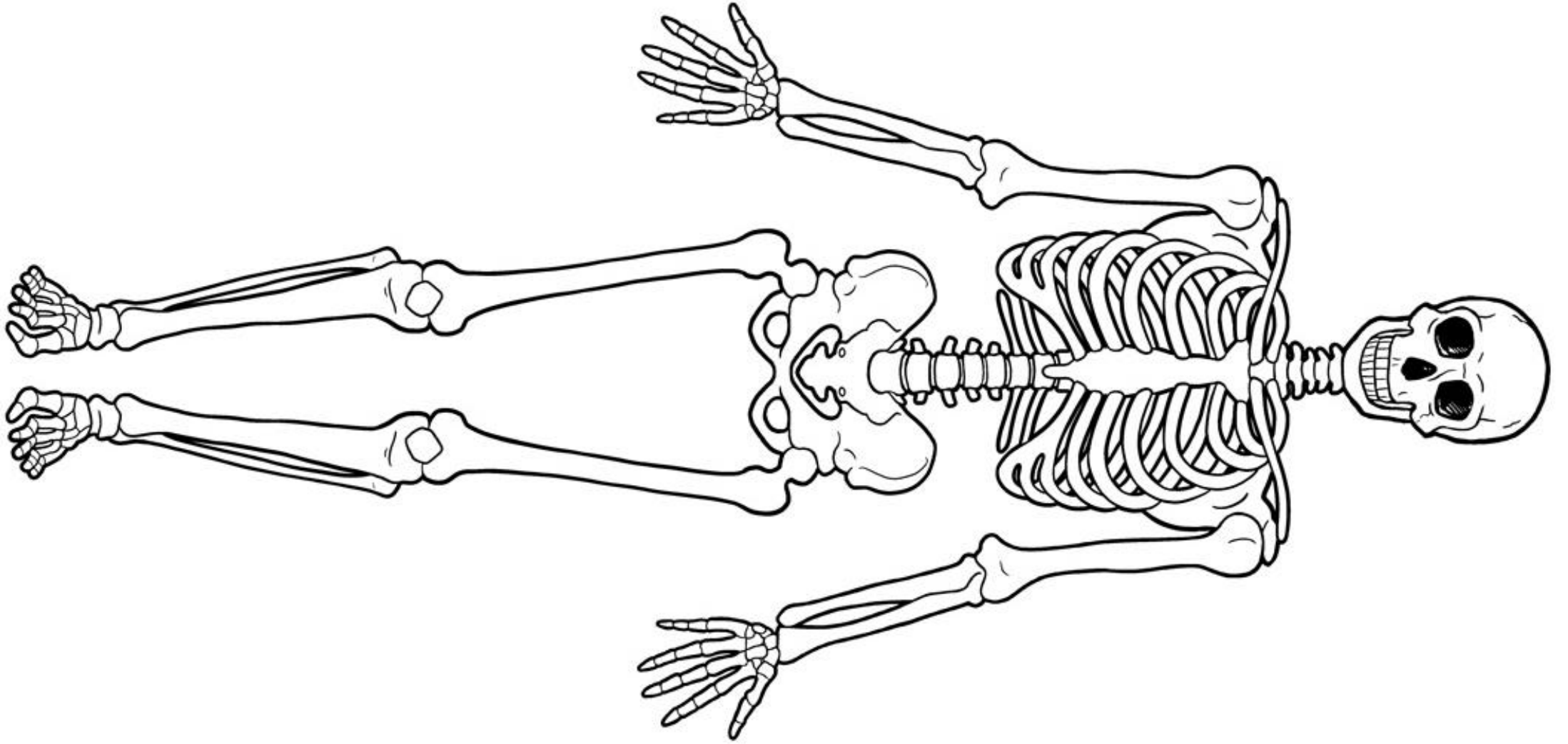
- Remember:
- Appendicular is the longer word, for the longer limbs
- Axial is the shorter word, for the shorter bones.



206 bones

Axial skeleton	Appendicular skeleton
Skull	Shoulder girdle and upper limbs
Thoracic girdle	Pelvic girdle and lower limbs
Vertebral column	







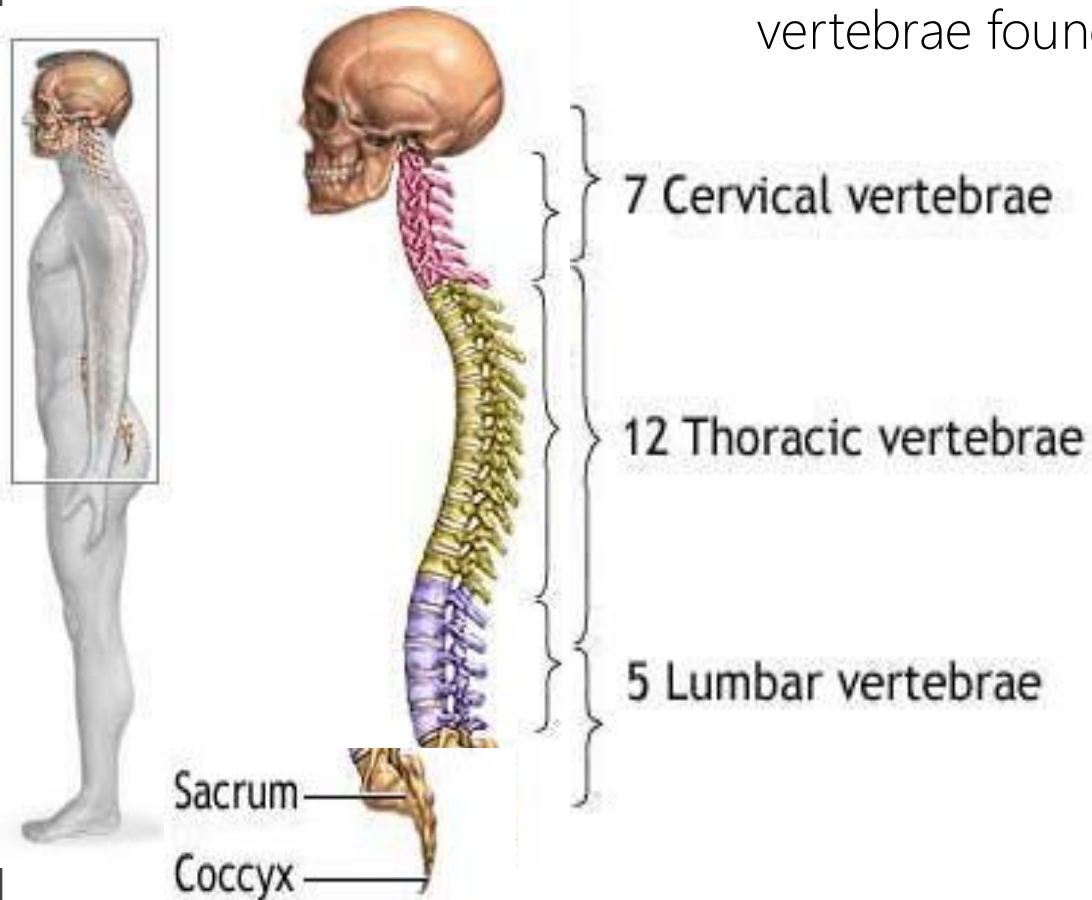
Review Quiz

1. Identify 2 bones in the arm
 2. Identify to bones that are an example of the appendicular skeleton
 3. How many bones are in the human body?
 4. State 2 bones that are in the axial skeleton
 5. Name the 3 different types of connective tissue that hold the skeleton together.
- Bonus: what are the role of each of the connective tissues

The Vertebral Column



The vertebral column has 5 main sections. Using your diagrams, label each component and the number of vertebrae found at each component.



A mnemonic to help you remember the order...

C = Cool/Cervical

T = Teachers/ Thoracic

L = Love/ Lumbar

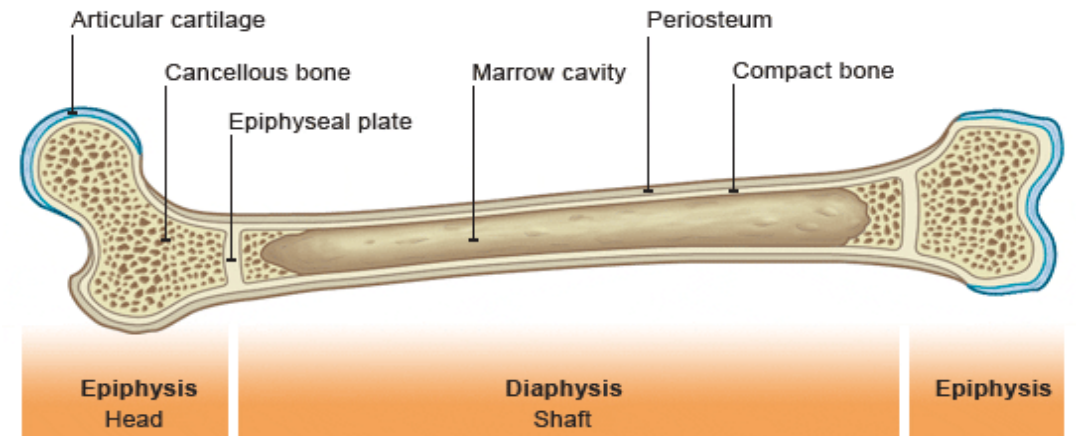
S = Sport/Sacrum

C = Courses/Coccyx

Bone growth and formation (ossification) – Bones of embryos are made mostly of cartilage, so they are soft. The process of ossification uses calcium to create bone as the child grows and matures. Bones gradually become hard and strong due to growth plates which can be found in the epiphysis of long bones, allowing the bones to grow longer. However, with age, bones lose their density and strength. When severe, osteoporosis can develop.



<https://www.youtube.com/watch?v=78RBpWSOI08>



Osteoblasts – makes collagen to help to create bone. The osteoblasts fill the small holes within the matrix of the bone and once settled become osteocytes.

Osteoclasts – allow the remodelling of bone. They are responsible for breaking down bone. The osteoblasts then rebuild the bone.

Remember:

Osteoblasts - Build

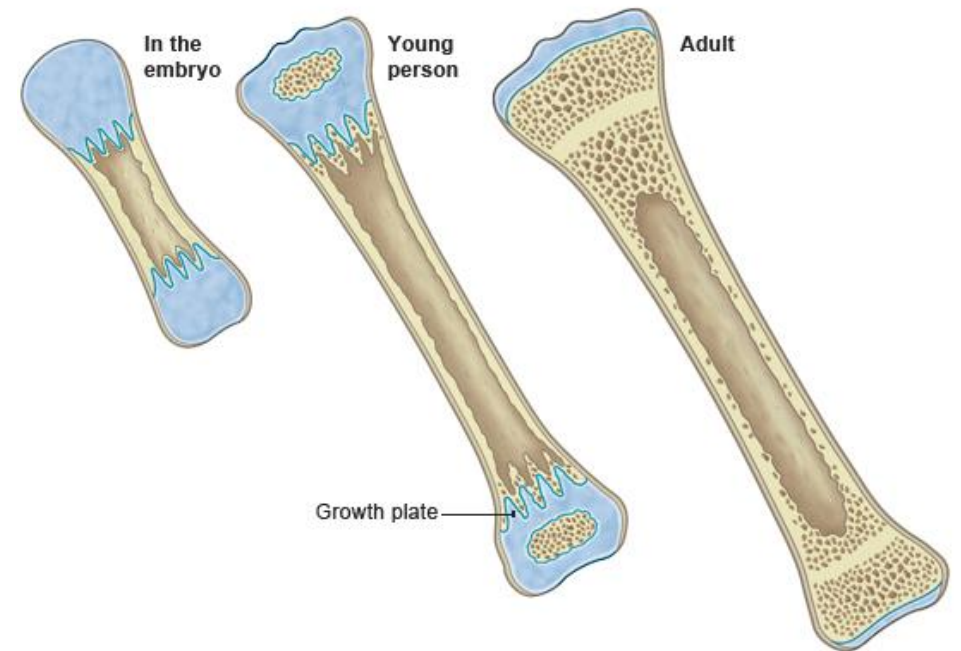
Osteoclasts – Clear

Epiphyseal Plate – At the End of the bone

We Do - Bone Growth



Bones are rigid organs that constitute part of the endoskeleton of vertebrates. Bone tissue is a type of dense connective tissue that appears static, but is actually constantly remodelled throughout the life of the vertebrate organism. Bone remodelling also occurs in response to trauma, such as following an accidental fracture.



Using Chapter 1 hand-outs write into your notebooks what Osteoclasts, Osteoblasts and the Epiphyseal plate are.

5 minutes.



1. Identify 5 sections of the vertebrae
2. How many vertebrae are in each section?
3. State the key term for the process of bone growth
4. Explain the difference between the roles of the osteoblasts and osteoclasts.
5. Describe the role of the epiphyseal plate.

Bonus: what is the name of the condition where bone density is reduce with age?

-

Long Bones

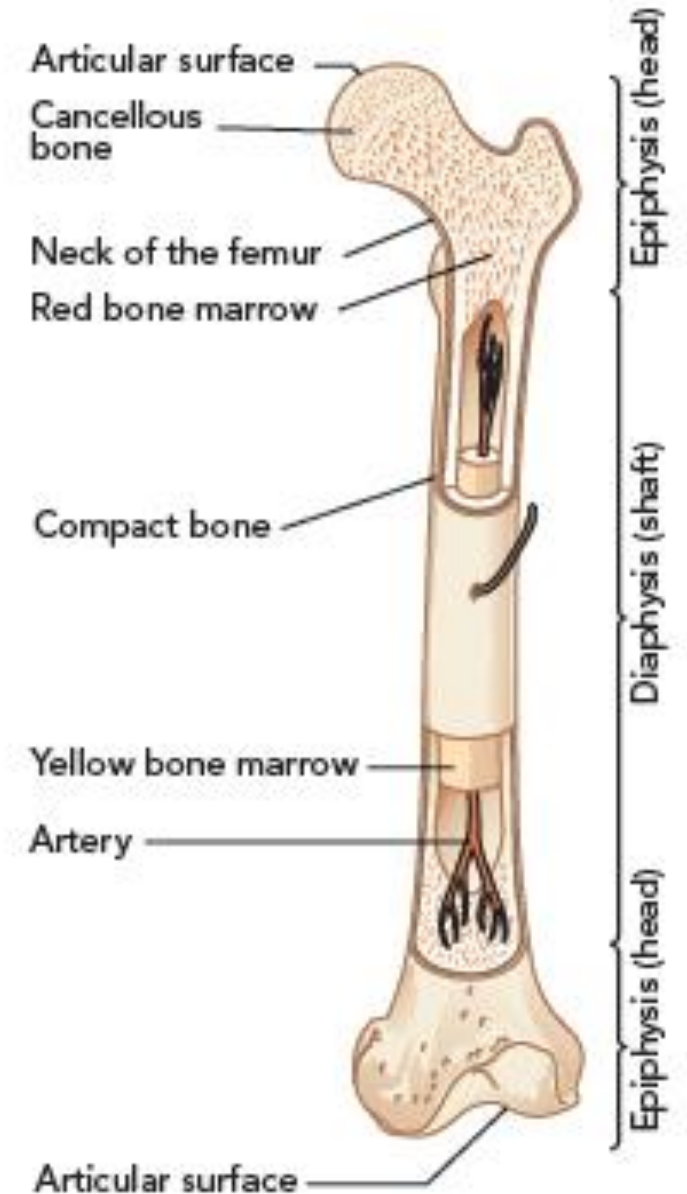
Long bones can make up some of the longest bones in the body, such as the Femur, Humerus and Tibia but are also some of the smallest including the Metacarpals, Metatarsals and Phalanges.

Long bones are longer than they are wide

The ends of long bones are called 'Epiphysis' which contain growth plates. The epiphysis are covered with hyaline cartilage to protect the bone and absorb shock.

The shaft (middle) of the bone is called the Diaphysis

Long bones have an outer layer of compact bone and an inner layer of cancellous (spongy) bone which contains the bone marrow.



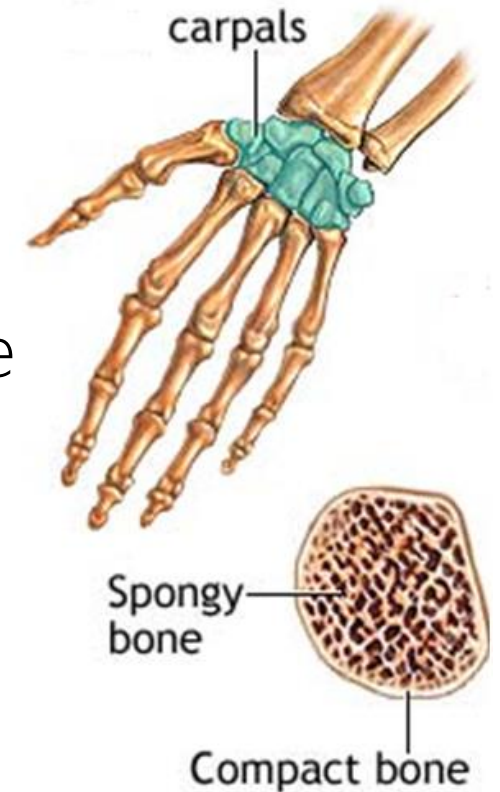
Short Bones

Short bones are approximately as wide as they are long

The main function of a short bone is to provide support and stability with little movement.

Examples of short bones are the Carpals and Tarsals - the wrist and foot bones.

They consist of only a thin layer of compact, hard bone with cancellous bone on the inside along with relatively large amounts of bone marrow.



Flat Bones

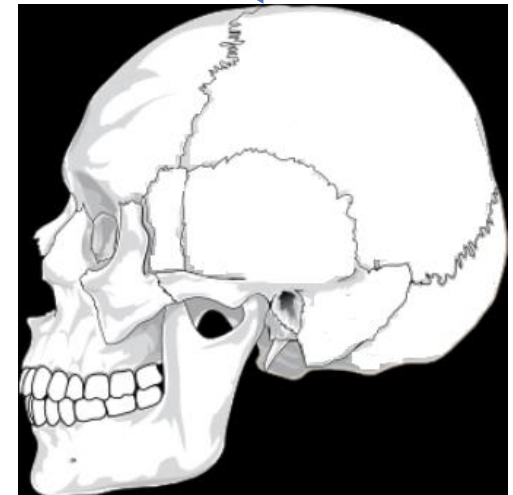
Flat bones are strong, flat plates of bone with the main function of providing protection to the bodies vital organs and being a base for muscular attachment.

Examples of a flat bone is the Scapula (shoulder blade), the Sternum (breastbone), and the Cranium (skull).

The anterior and posterior surfaces are formed of compact bone to provide strength for protection. The centre of the bones are formed of cancellous (spongy) bone and varying amounts of bone marrow.



Suture (flat bones
'fuse' together)



Sesamoid Bones

Sesamoid bones are usually short or irregular bones, imbedded in a tendon.

The most common example is the Patella (kneecap) which sits within the Patella or Quadriceps tendon.

Other sesamoid bones are the Pisiform (smallest of the Carpals) and the two small bones at the base of the 1st Metatarsal.

Sesamoid bones are usually present in a tendon where it passes over a joint which serves to protect the tendon.

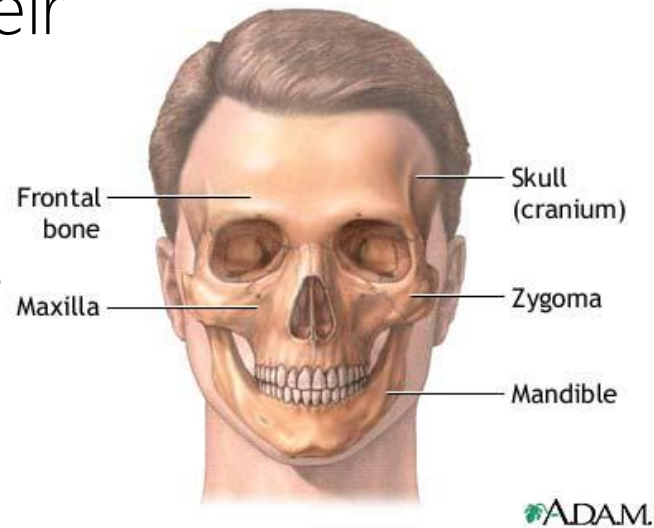


Irregular Bones

These are bones in the body which do not fall into any other category, due to their non-uniform shape.

Examples of these are the Vertebrae, Sacrum and Mandible (lower jaw).

They primarily consist of cancellous bone, with a thin outer layer of compact bone.





1. Identify the 5 types of bone
2. What type of bone is described as being imbedded in a tendon?
3. What type of bone is described as being non-uniform in shape?
4. What type of bone is described as strong bones that provide protection?
5. What type of bone is described as being longer than they are wide?
6. What type of bone is described as being as wide as they are long?

I Do



The main functions of the skeletal system are:

- Blood Cell Production – Stored within your long bones is Marrow. Bone Marrow is continually producing Red and White blood cells. Essential function – as a large number of RBC die every minute.
- Attachment for Skeletal Muscle – parts of the skeleton provide a surface for your muscles to attach too. Tendons attach muscle to bone – levers – provides movement.

Remember:

**B
A
P
S
S**

I Do



- Protection – protects vital organs. Cranium protects your brain; Thorax protects heart and lungs; Vertebral Column protects spinal cord.
- Store of Minerals – Supply of minerals such as Calcium and Phosphorus. Essential for bone growth and maintenance. Released into the bloodstream as and when the body needs them.
- Supporting framework – Gives your body shape and provides a supporting framework, it also bears the weight of an individual's mass. Some bones also reduce friction across the joints.

Remember:

B

A

P

S

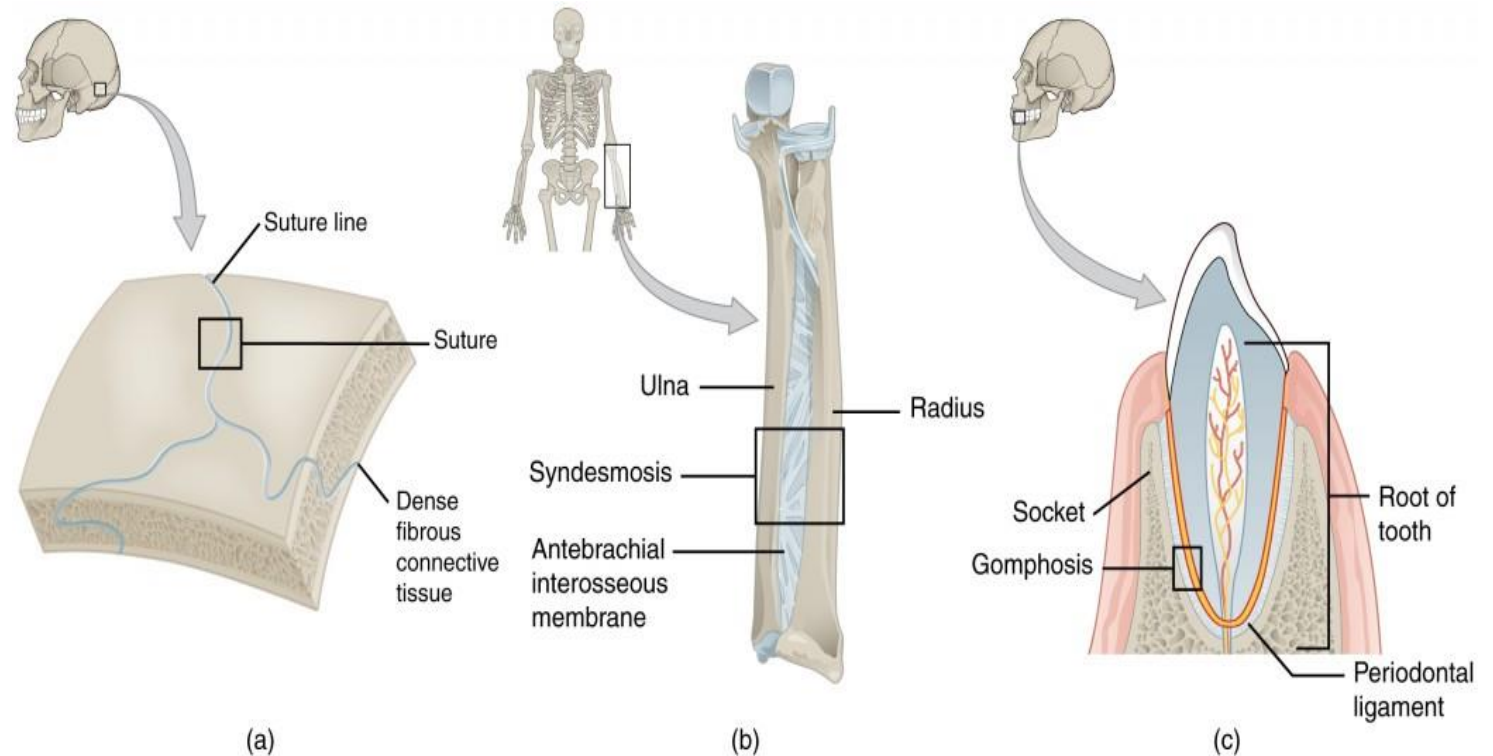
S

A joint is the point where two or more bones meet. There are three main types of joints; Fibrous (fixed), Cartilaginous (slightly moveable) and the Synovial (freely moveable) joint.



Fibrous joints (Fixed)

This type of joint is held together by only a ligament. Examples are where the teeth are held to their bony sockets and at both the radioulnar and tibiofibular joints. a. Skull, b. arm and c. tooth.



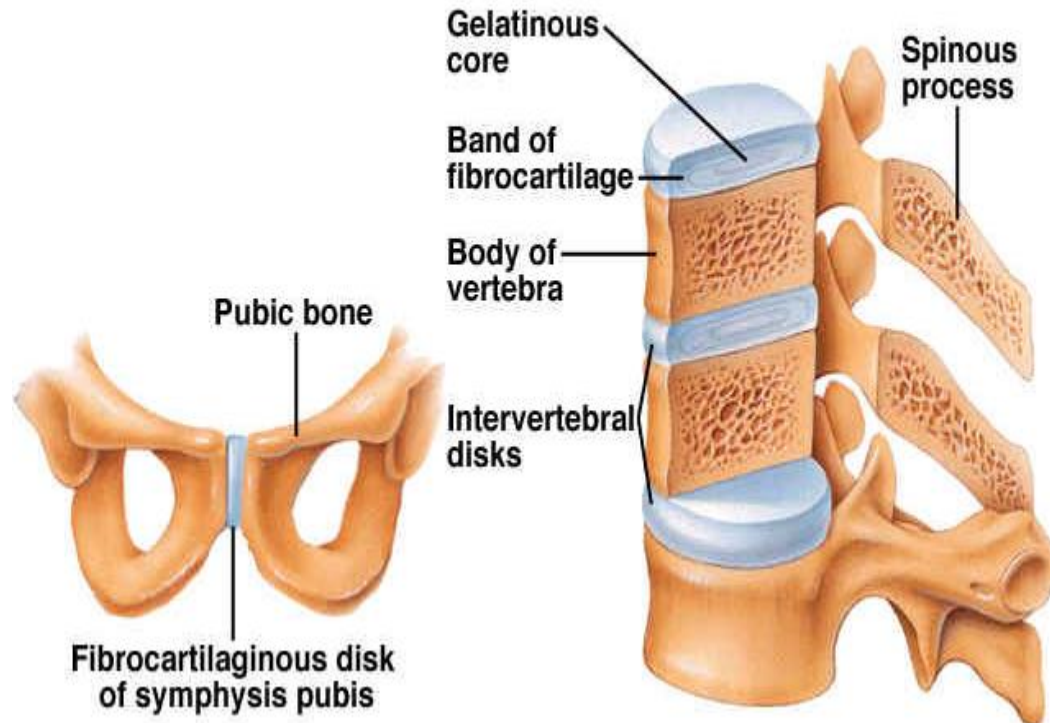
Remember:

Fibrous are Fixed by ligaments and cannot move



These joints occur where the connection between the articulating bones is made up of cartilage for example between vertebrae in the spine. Rib, sternum, coccyx.

Cartilaginous Joint — Symphysis



Remember:

Cartilaginous are filled with cartilage – reducing movement, so that it is slight.

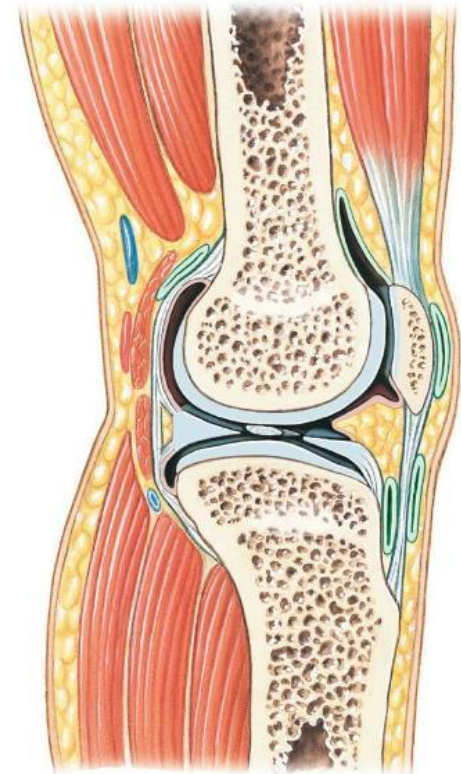
I Do - Synovial Joints (Freely moveable)



- Synovial joints make up a lot of the joints in the body. These joints allow movement to take place. There are 6 types of freely moveable or synovial joints.

Remember:

Synovial fluid is like WD40 – it lubricates the joint, meaning a **freely movable** joint



I Do - Synovial Joints structure



Connects to the bone via tendons, allows movement.

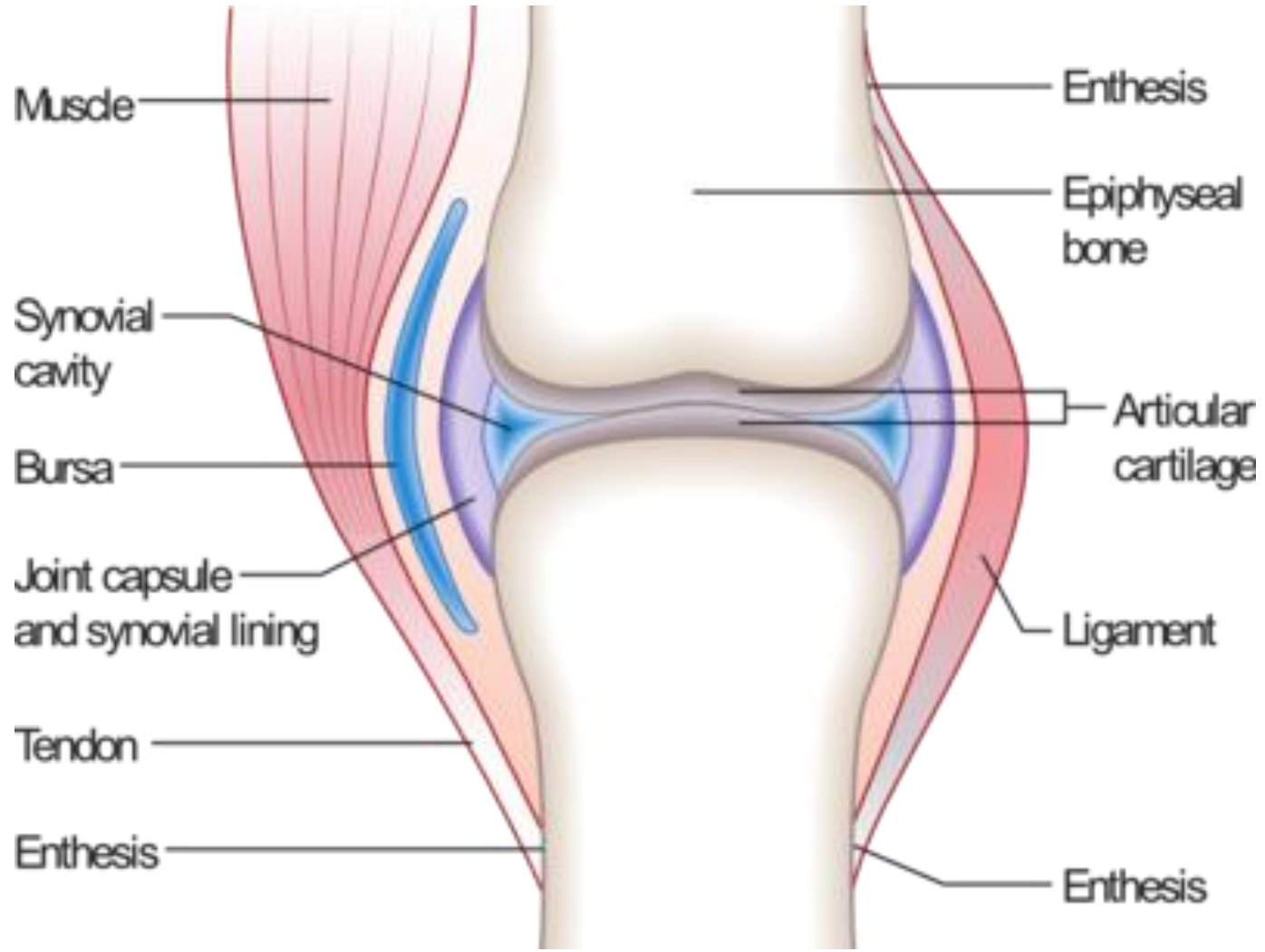
Keeps the synovial fluid in place.

Fluid filled sac that allows cushioning between bone and muscle tissue

Envelope surrounding the synovial joint

Connects muscle to bone

Connective tissue between the tendon and bone



Connective tissue between the tendon and bone

The end of a long bone

The smooth, white tissue that covers the ends of bones where they come together to form joints.

Joins bone to bone to give structure, helps prevent the joints from dislocating.

Connective tissue between the tendon and bone

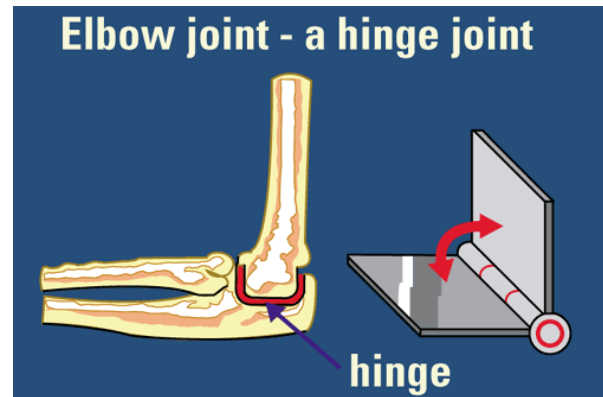


You Do – Complete the sheet

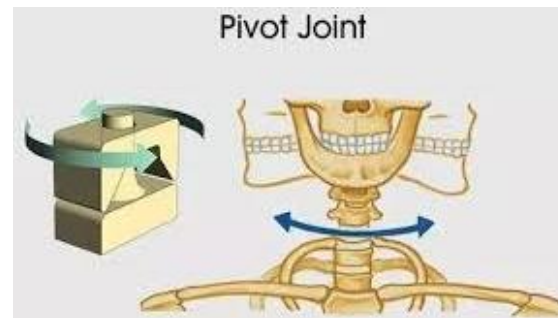
Ball and Socket – Located at the Shoulder / Hip – cup shaped socket – rounded movements – throwing a ball rotation



Hinge – Located at the Knee / Elbow – one direction and back – kicking a ball – draw back and extend through



Pivot – Located at the Neck - side to side rotation – swimming for breathing



Remember:

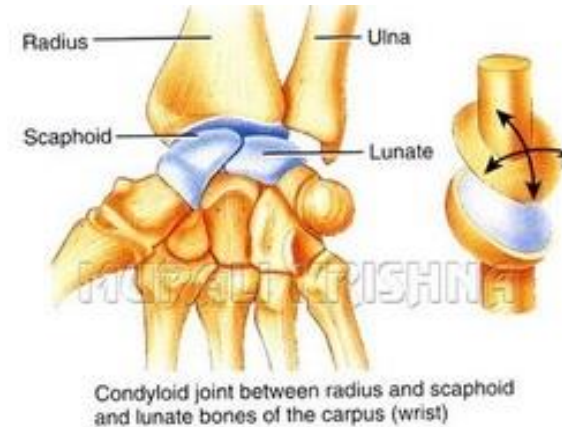
Hinge – door – open / close

Ball and socket – you plug in to a socket – must fit in

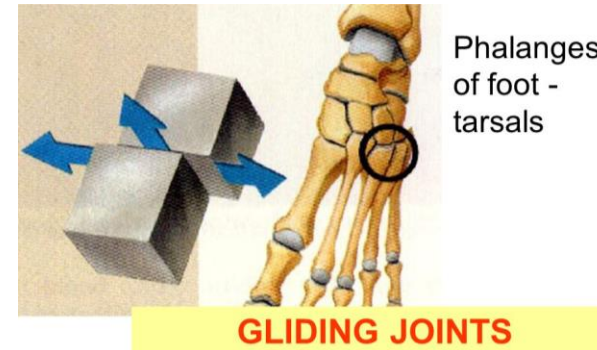
Pivot – slight twist



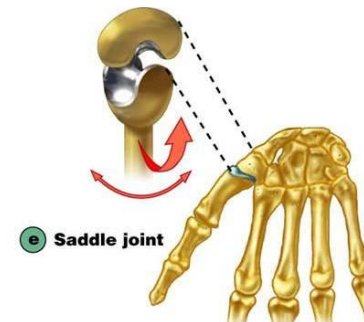
Condyloid – Located at the Wrist – similar to ball and socket restricted by ligaments – one bone sits on another – wrist in basketball



Gliding – Located at the Carpals to wrist / Tarsals to ankle – Movement over a flat surface restricted by ligaments – netball jump – foot downwards with toes out



Saddle – Located at the Thumb – side to side movements or backwards and forwards – used to tighten a racket grip

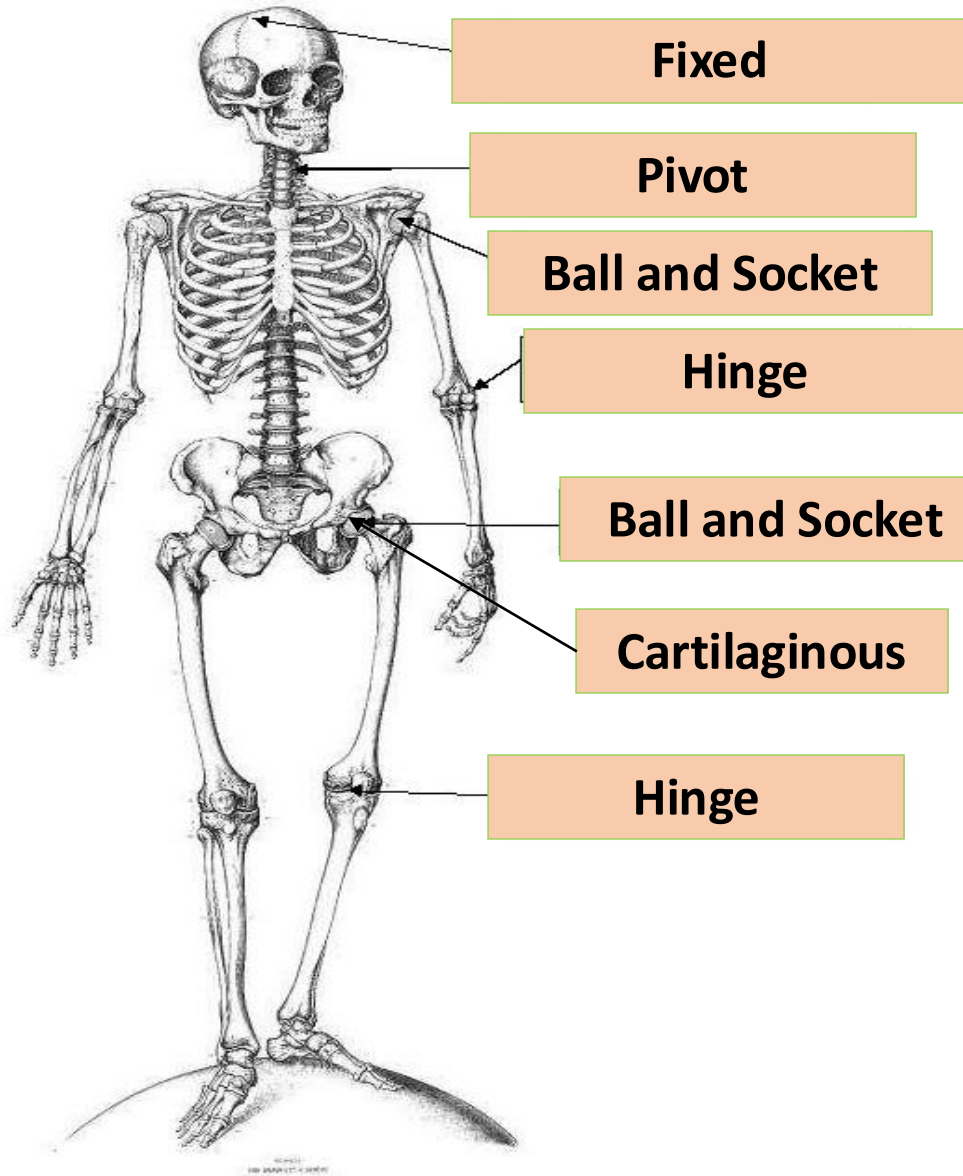


Remember:

Condyloid -

Gliding -

Saddle – like riding a horse – one over another



Task

Research and name the others on the body:

Ankle, Wrist, Radio-Ulnar

Review

Ball and Socket

Condyloid

Gliding

Hinge

Pivot

Saddle

Examples

Shoulder & Hip

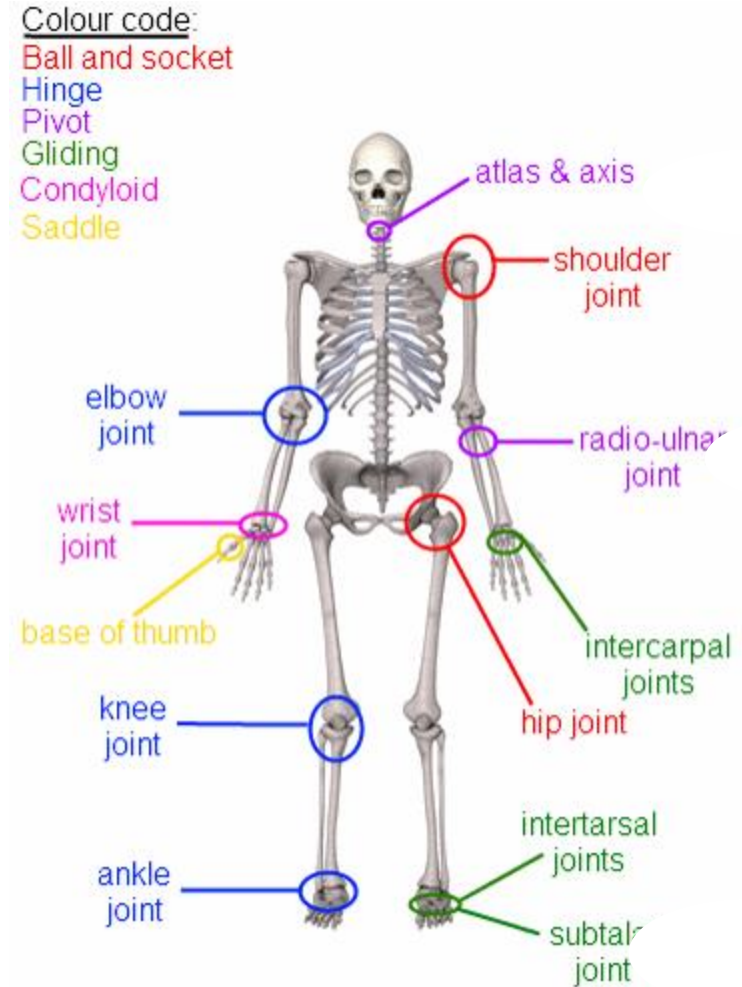
Wrist

Inter-carpal / Inter-tarsal

Elbow, Knee & Ankle

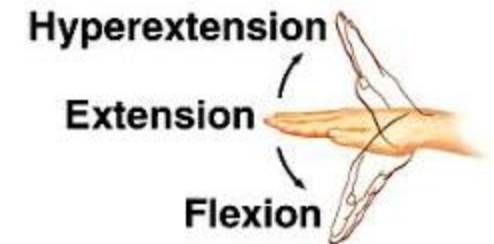
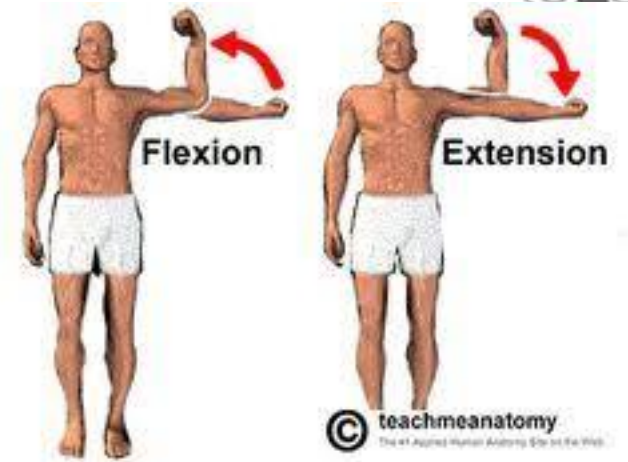
Neck & Radio-Ulnar

Thumb / Carpal



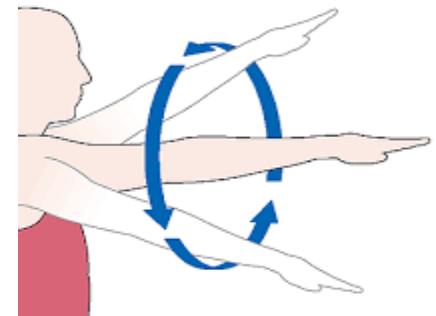
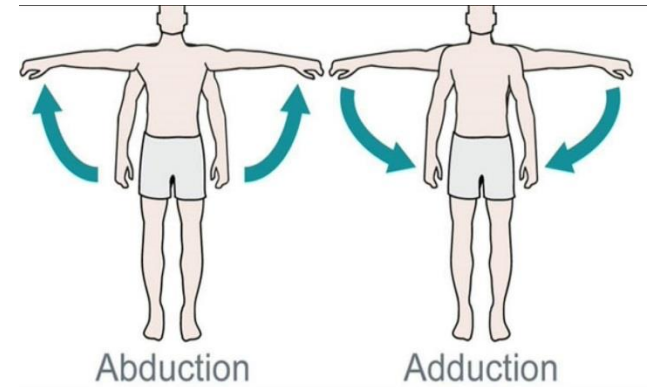
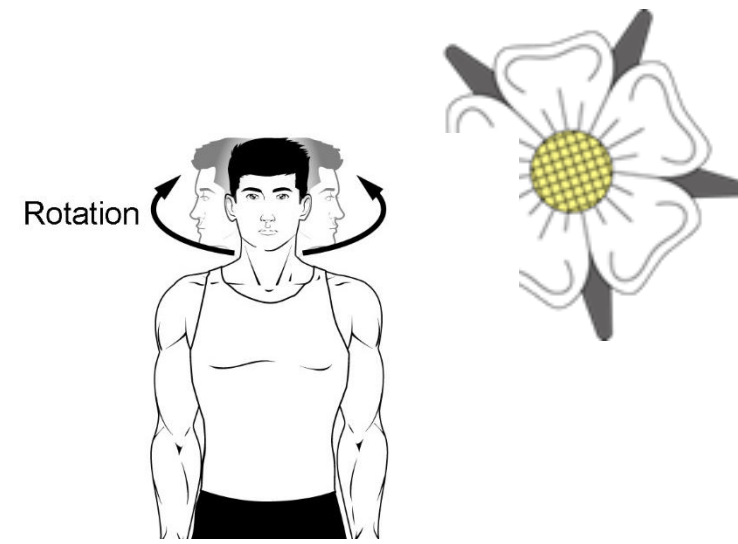
I Do - Joint Movement

- **Flexion** – reducing the angle of the joint where 2 limbs meet via bending.
- **Extension** – Increasing the angle of the joint via straightening.
- **Hyper-extension** – Further extension beyond the anatomical positioning.
- **Lateral flexion** – bending sideways – such as at the hips.



I Do - Joint Movement

- **Rotation**- Circular movement of limb – such as a rounded movement at the shoulder.
- **Abduction**- Movement away from vertical midline of the body
- **Adduction**- Movement towards vertical midline of the body
- **Circumduction**- Circular movement that is a conical action – twisting wrists



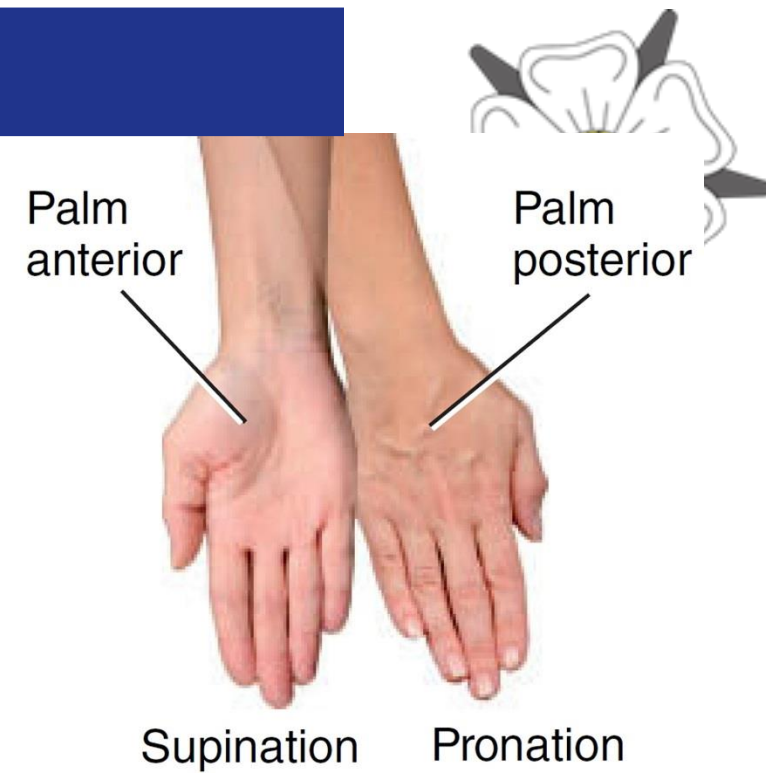
Remember:

Abduction – to **abduct** something is to **take it away**

Adduction – to **add** it back on to the body.

I Do - Joint Movement

- **Supination** – partial rotation of the radio-ulnar joint for palms to face up.
- **Pronation** – partial rotation of the radio-ulnar joint for palms to face down.
- **Dorsiflexion** - Flexion of the ankle by raising the toes
- **Plantarflexion** – Extension of the ankle by pointing toes down



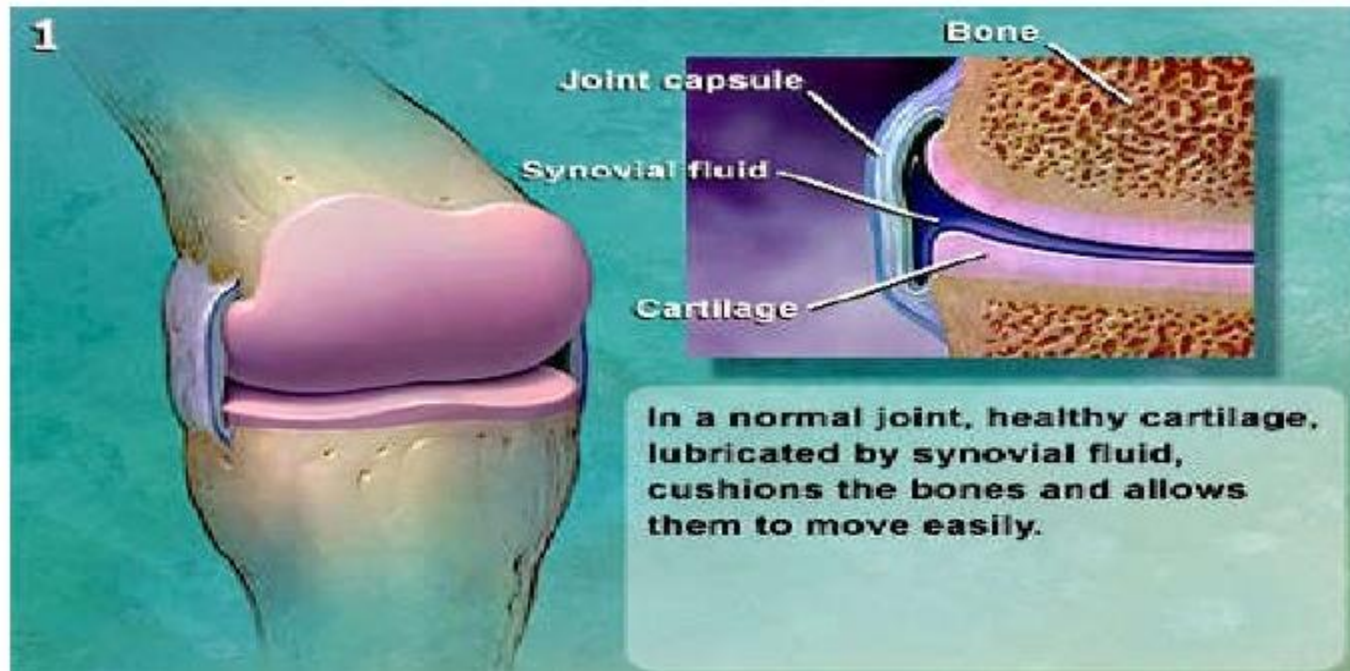
Remember:

Plantarflexion – to **plant a seed** using a trowel causes you to point downwards.

Short term responses of exercise on the Skeletal system



- Increased production of Synovial fluid
- Cartilage temporarily swells as it absorbs synovial fluid



What would an increase in synovial fluid mean?

What would swelling and an increase in cartilage help?

Long term effects/ adaptations of exercise on the Skeletal system



I Do

- Increased bone density – bones get thicker and stronger
- Reduced risk of Osteoporosis
- Increased mineral storage
- Increased red blood cell production
- Ligaments become stronger
- Tendons become stronger
- Increased number of capillaries

Remember:

Ligaments **Link Bone to Bone**

As the songs goes: '**Like Big Butts**'

Tendons **Link Muscle to Bone**

Which helps your **LiMB's**

Additional Factors of the Skeletal System



Age

- **Age** impacts bone development from childhood.
- As a child, the process of ossification (bone growth) is continuous, with constant remodelling occurring.
- This usually allows children's bone density to increase and their susceptibility to injury to decrease.

Osteoporosis

- **Osteoporosis** is a bone disease which causes the bone density to decrease and bones to become weaker.
- This makes bones more brittle.
- A lack of mineral uptake (calcium or vitamin D) will contribute to this.
- This can be overcome through weight-bearing activities

Weight-bearing activities

- Any activity bearing your own body weight, e.g: running, jumping, gymnastics.

Arthritis

- There are two forms of arthritis:
- **Osteoarthritis**: a thinning of the cartilage – causing pain and a lack of movement.
- **Rheumatoid arthritis**: an inflammation of the joint, creating pain and the joint becomes less stable.
- This will decrease the movement at a joint and potentially cause a deformity.