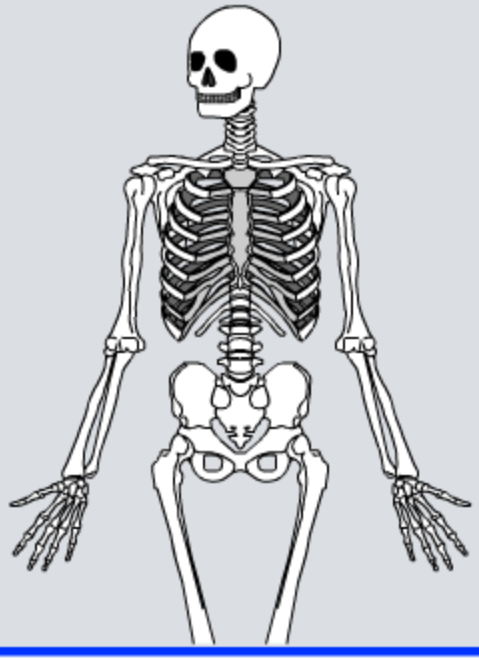
The Musculoskeletal System

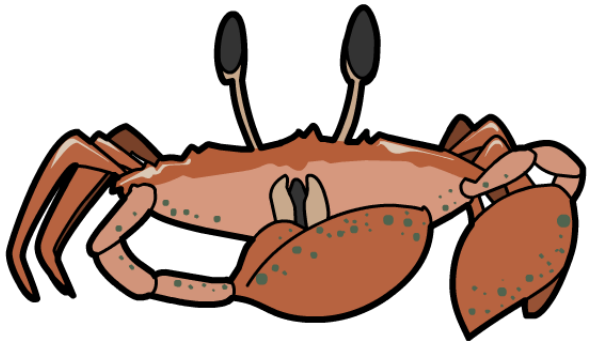


What type of skeleton?

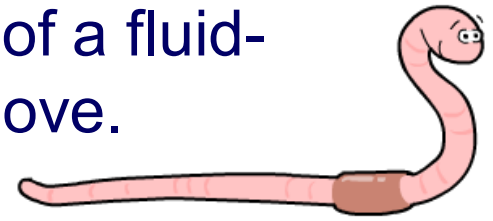
Different animals have different types of skeletons:

- Vertebrates have an **internal skeleton**. This is called an **endoskeleton**.

- Some invertebrates, such as arthropods, have an **external skeleton**. This is called an **exoskeleton**.

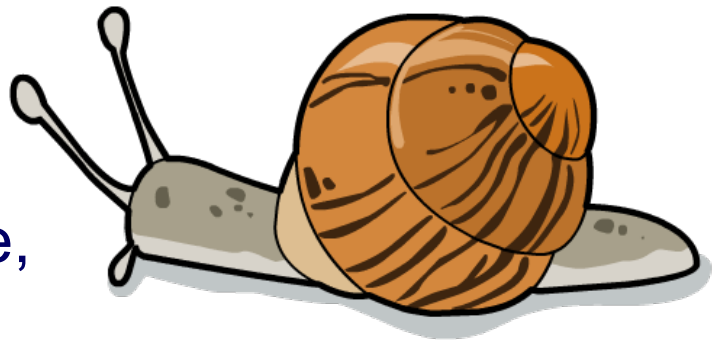


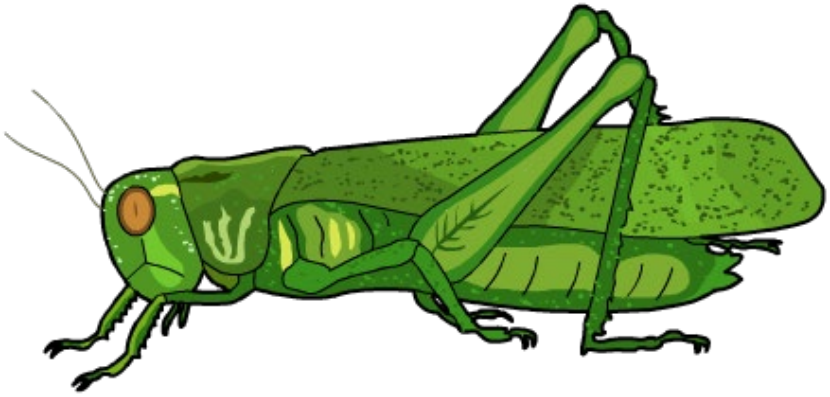
- Some invertebrates, such as worms, have a soft **hydrostatic skeleton**, which consists of a fluid-filled cavity that allows the animal to move.



Exoskeletons

Most molluscs are surrounded by a **calcium carbonate exoskeleton**, or shell. This hard tissue is excreted from the body at stages throughout life, growing with the rest of the animal.





Arthropods have a jointed exoskeleton called a **cuticle** surrounding the soft tissue. This contains a protein called **chitin** that provides flexibility and strength.

Exoskeletons provide organisms with protection and support.

Disadvantages of an exoskeleton

Arthropod exoskeletons are quite rigid, therefore an animal can only grow until it fills its existing exoskeleton.

In order to grow bigger, an arthropod needs to shed its exoskeleton and form a new one. This is known as **molting**. Without the exoskeleton, the animal is much more vulnerable.

An exoskeleton is heavy, so it can limit how large an arthropod can grow.

Endoskeletons

An endoskeleton is an internal framework of rigid structures. In most vertebrates the endoskeleton is made up of bone, with some cartilage.

Cartilage is a type of flexible connective tissue. Humans have cartilage in the outer ear, trachea, nose and at the end of long bones.

Some fish have an internal skeleton that consists only of cartilage, e.g. shark and rays.

True or false?

Are these statements about skeletons true or false?

1.	All invertebrates have an endoskeleton.	
2.	Vertebrates have an internal skeleton.	
3.	Hydrostatic skeletons are made of hard material.	
4.	Cartilage is a type of flexible connective tissue.	
5.	Arthropods are surrounded by a calcium carbonate shell.	
6.	Human skeletons are made entirely of cartilage.	

true false

?

solve

Why have a skeleton?

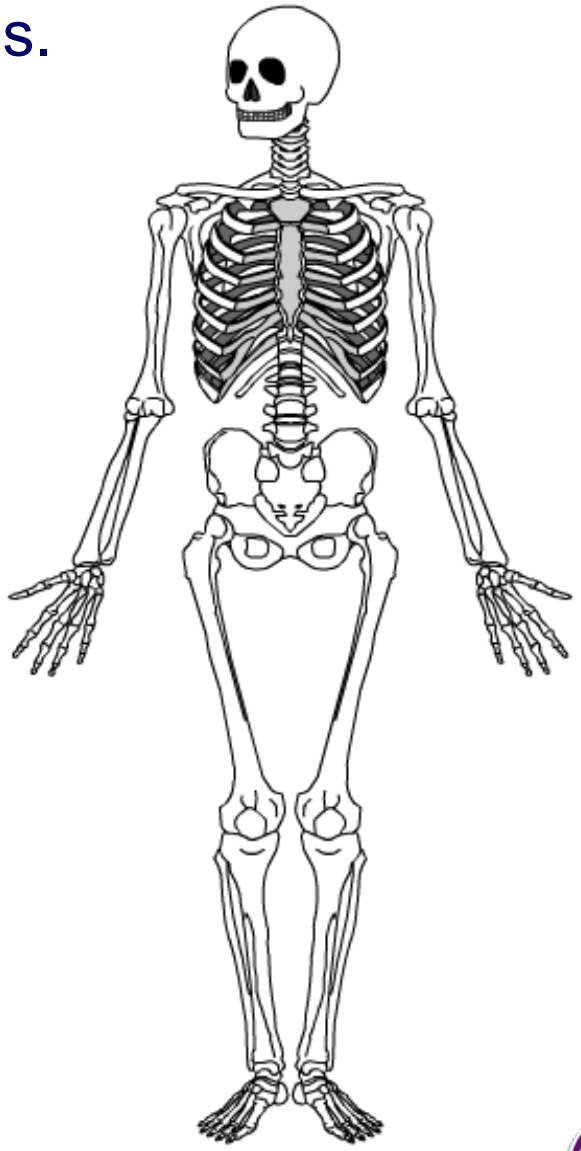
The human skeleton has many functions.

Protection – It protects delicate parts of the body like the brain and lungs.

Shape – It gives us our shape and determines our size.

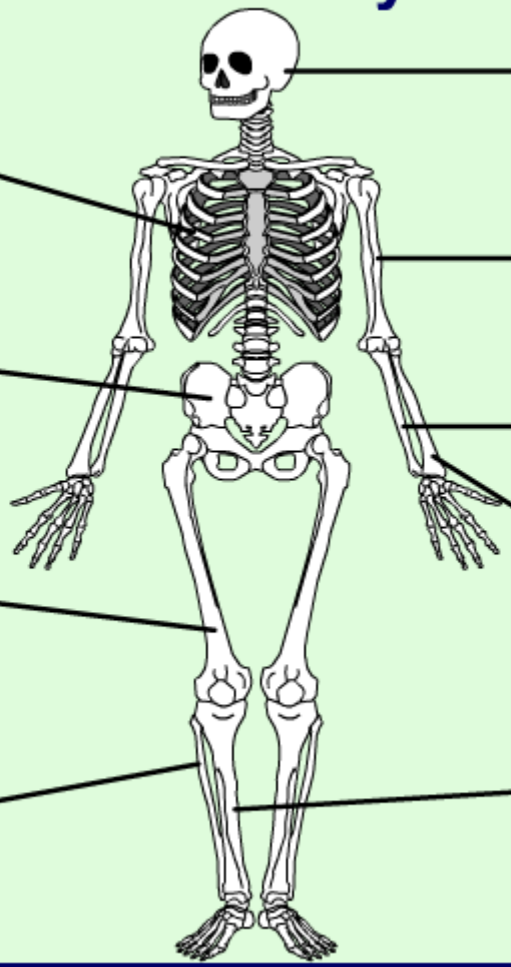
Support – It supports muscles and organs.

Movement – Muscles are attached to the bones and move them as levers.



Identifying bones in the human skeleton

Which bones can you name?



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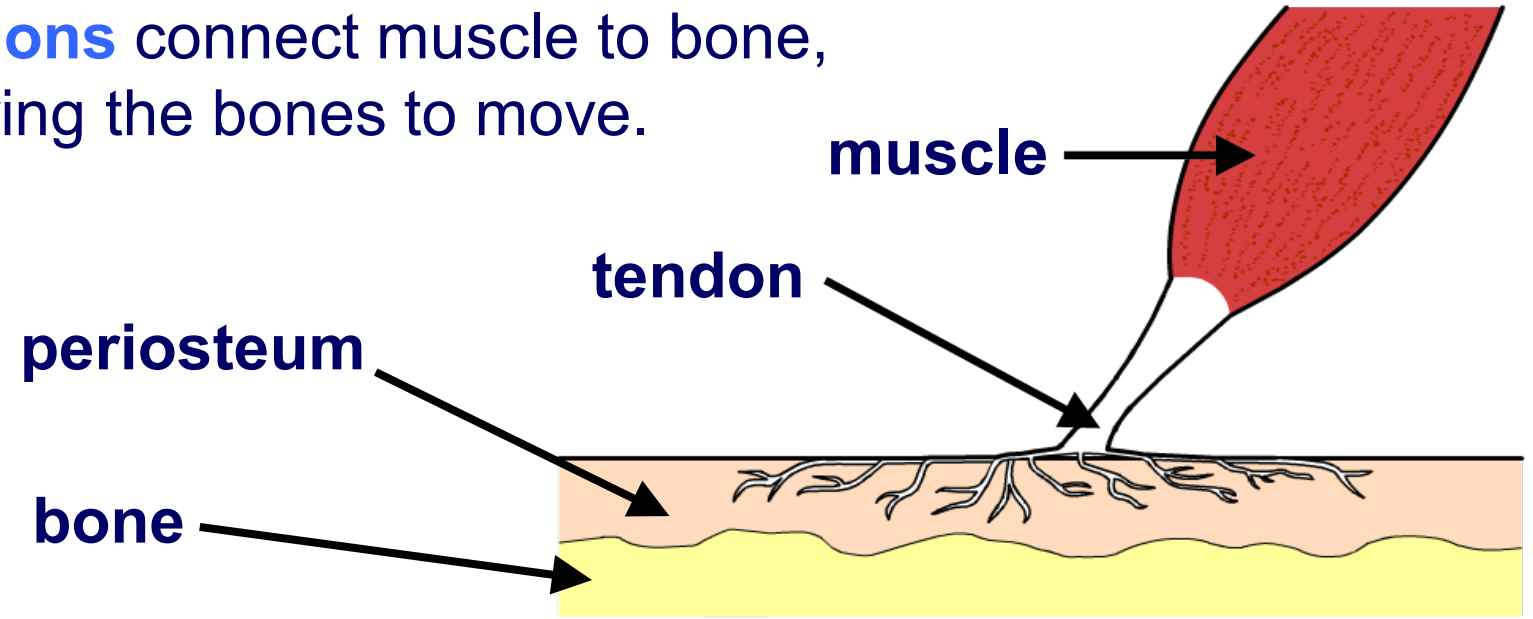
How do we move?

A **joint** is a place where two or more bones meet. Without joints, our skeleton would not be able to move.

The bones at joints are bound together by strong flexible fibers called **ligaments**. Ligaments allow movement while keeping the joint from moving too far, which could cause injury.

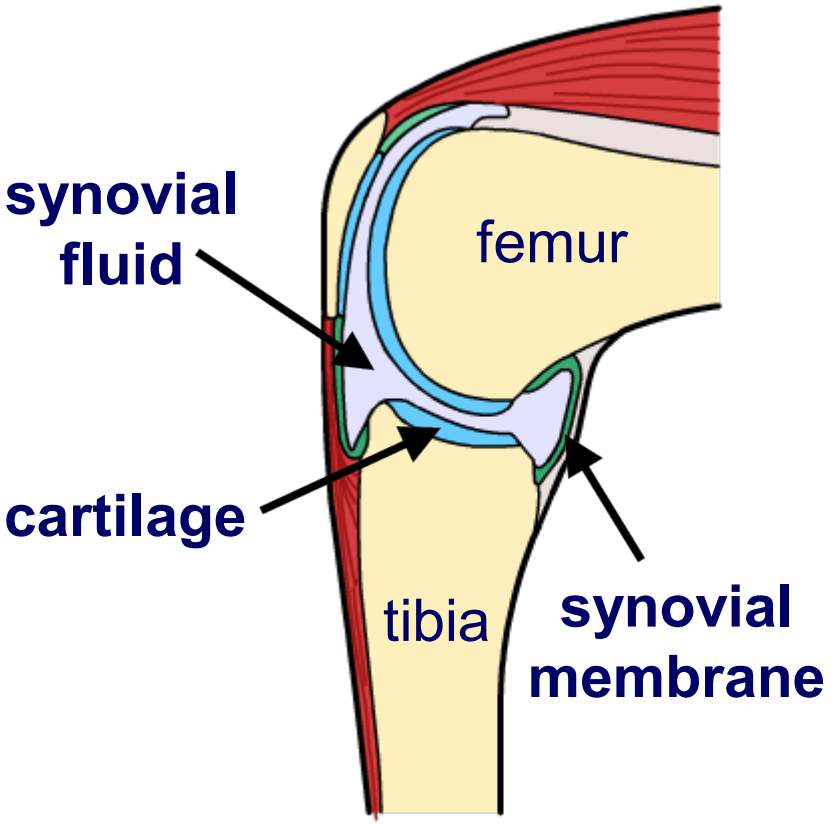
Tendons connect muscle to bone, allowing the bones to move.



Synovial joints

Synovial joints are **highly mobile** joints, like the shoulder and knee.

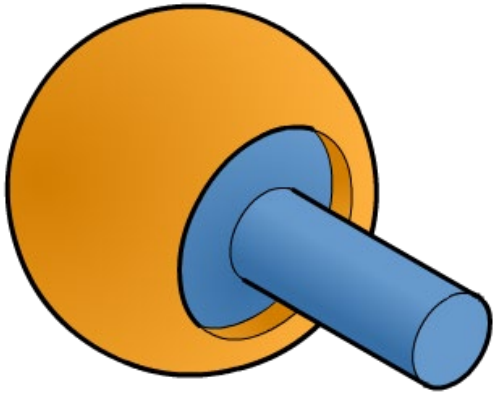
Synovial joints contain **synovial fluid**, which is retained inside a pocket called the **synovial membrane**. This **lubricates** or 'oils' the joint.



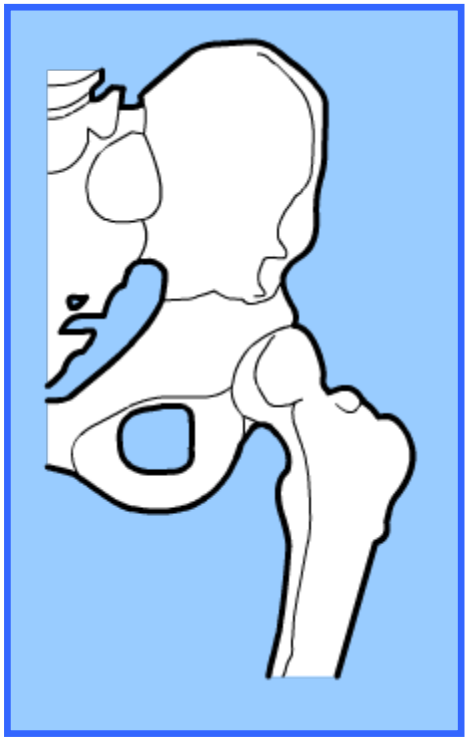
Smooth coverings of **cartilage** at the ends of the bones stop them from rubbing together, and provide shock absorption.

Ball and socket joints

There are several different types of **synovial joint** in the body.



In **ball and socket joints**, the rounded end of one bone fits inside a cup-shaped ending on another bone.

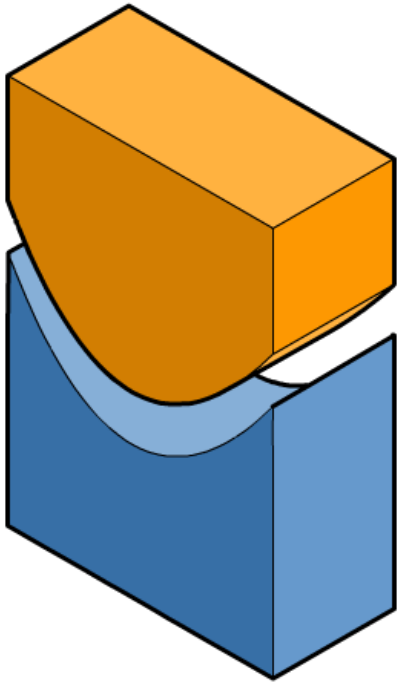


Ball and socket joints allow movement in **all directions**, as well as **rotation**. The most mobile joints in the body are ball and socket joints.

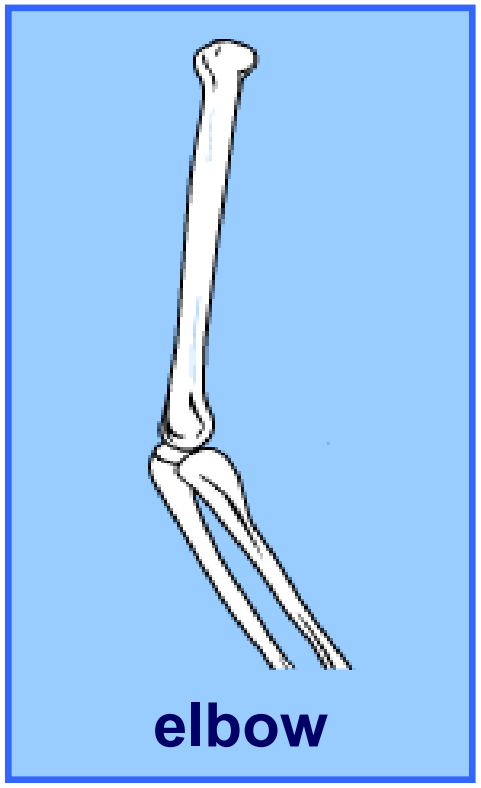
Examples: Shoulder and hip.

Hinge joints

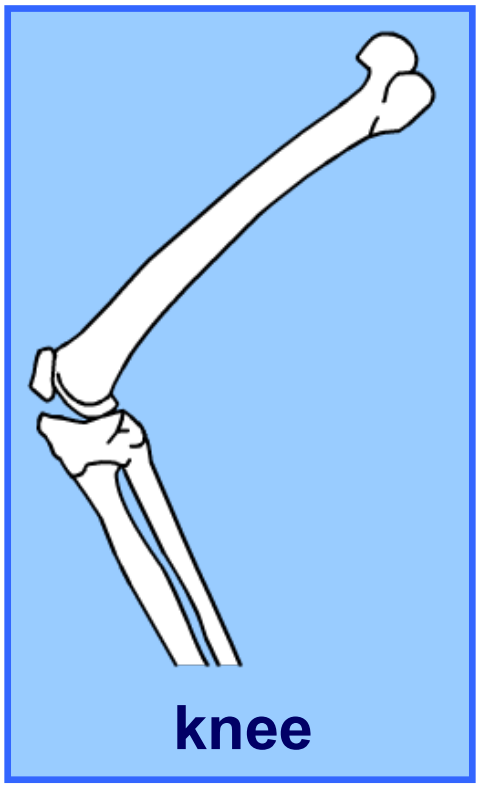
Hinge joints – as their name suggests – only allow **forwards** and **backwards** movement.



Examples: The knee and elbow.



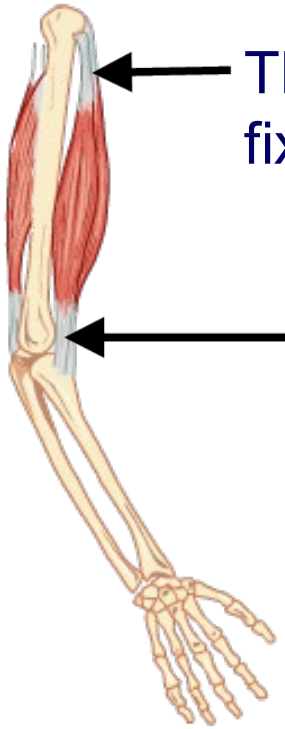
elbow



knee

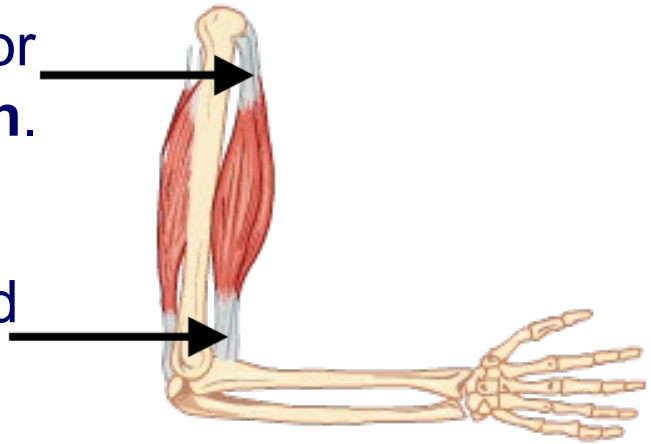
Movement of joints

Muscles are attached to bones by tendons.



The tendon at the non-moving (or fixed) end is known as the **origin**.

The tendon at the moving end is known as the **insertion**.

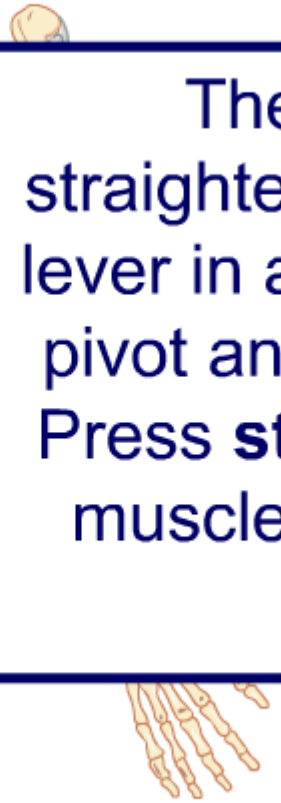


Muscles **pull** by contracting – they cannot push to produce the opposite movement.

Muscles are arranged in **antagonistic pairs**. As one muscle contracts (shortens) its partner relaxes (lengthens). They swap actions to reverse the movement.

Movement of joints

How do muscles make joints move?



The arm bending and straightening is an example of a lever in action – the elbow is the pivot and the bone is the lever. Press **start** to see how the arm muscles produce movement.

start

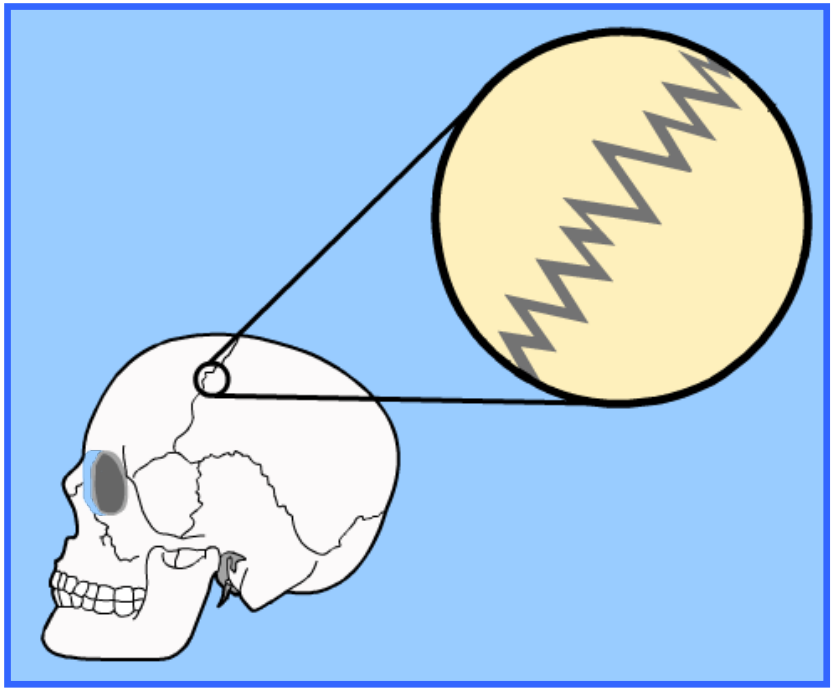
Fixed joints

Some joints in the body are fixed. These are also known as **immovable joints**.

They are sometimes called **fibrous joints** because the bones are held together by tough fibers.

Immovable joints are several bones **fused** together to form a rigid structure.

Examples: The skull and pelvis.



Which joint?

What type of joint do these statements relate to?

ball and socket	hinge	fixed

includes the elbow joint

solve