Level 3 Cambridge Technical Sport and Physical Activity

Bridging Unit

The Year 12 Sport course consists of 2 Units:

- Unit 1 Body Systems and the effects of physical activity (Exam)
- Unit 2 Sport Coaching and activity leadership (Coursework)

Unit 1 Tests your knowledge of a range of body systems i.e.

- Skeletal System
- Muscular System
- Cardiovascular system
- Respiratory System
- Energy System

Having a basic understanding of the skeletal and muscular system prior to the course starting will prove very useful.

Tasks

- Please read the power point carefully and complete the tasks at the end of each section.
- Task 1 Skeletal System - Bones
- Task 2 /3 Skeletal System –Function/Bone type
- Task 4 Muscular System – Location/Description
- Task 5 Muscular System – Antagonistic muscle Action
- Transition baseline assessment

Once completed please email your work to:
l.golby@jws.bham.sch.uk

The Skeletal System

What the specification says;

The Learner will:	Learners must be taught:

1. Understand the skeletal system in relation to exercise and physical activity	1.1 The axial and appendicular skeletons, i.e.
	
	Axial skeleton, i.e.
	• cranium
	• sternum
	• ribs
	• vertebral column, i.e.
	  ○ cervical vertebrae
	  ○ thoracic vertebrae
	  ○ lumbar vertebrae
	  ○ sacrum
	  ○ coccyx
	
	Appendicular skeleton, i.e.
	• scapula
	• clavicle
	• humerus

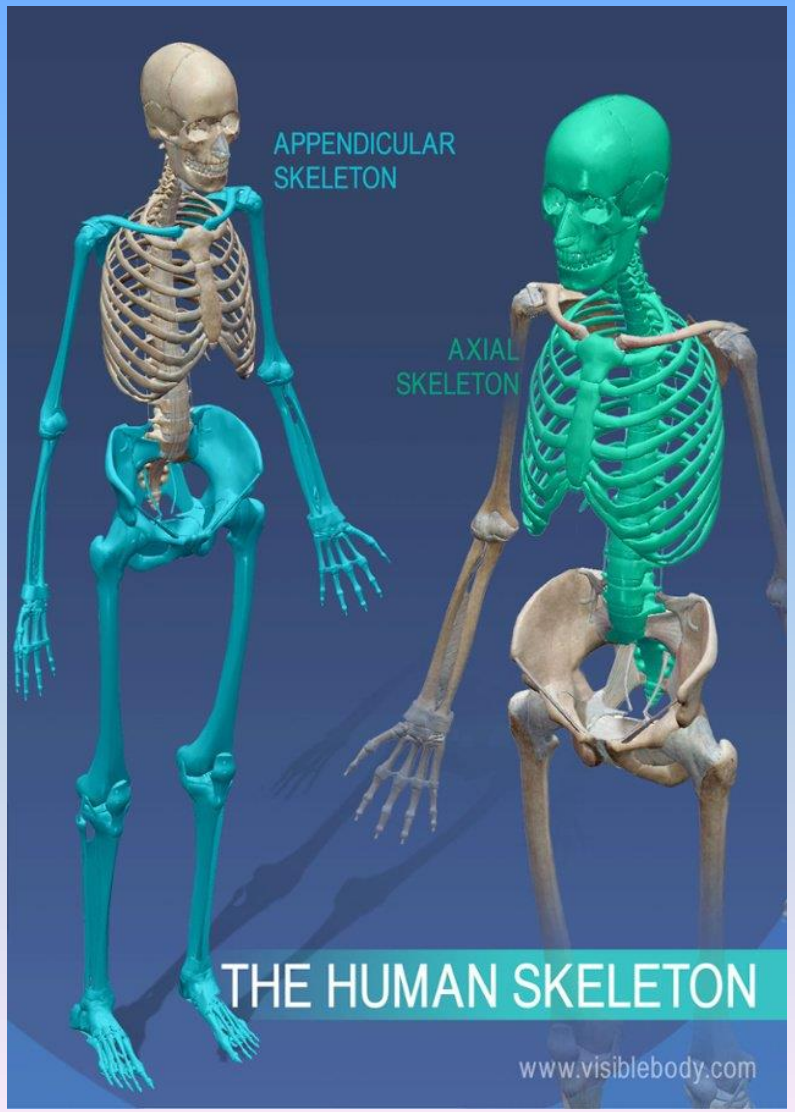
Teaching content Learners must be taught:
• radius • ulna • carpals • metacarpals • phalanges • ilium • ischium • pubis • femur • patella • tibia • fibula • tarsals • talus • metatarsals

28 bones in total

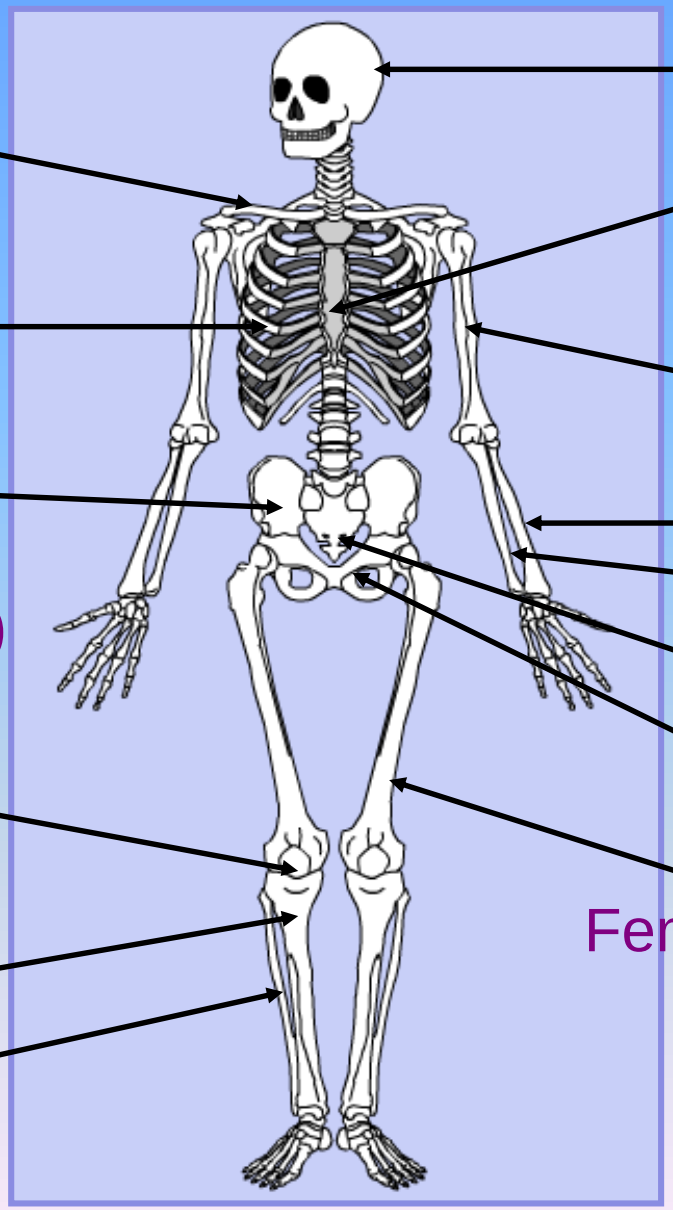
Video
https://www.youtube.com/watch?v=2k6H2Vnn3o4
https://www.youtube.com/watch?v=rDGqkMHPDqE

Axial Skeleton - is the part of the **skeleton** that consists of the bones of the head and trunk of a vertebrate.

Appendicular - is the portion of the **skeleton** that consists of the girdles and the limbs.



Naming bones



Cranium (skull)

Clavicle (collar bone)

Sternum (breast bone)

Ribs

Humerus

Ilium (part of the pelvis)

Radius

Ulna

Pubis

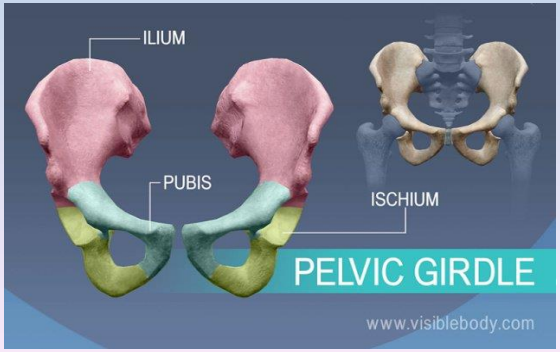
Ischium

Patella (knee cap)

Femur

Tibia

Fibula



The vertebral column

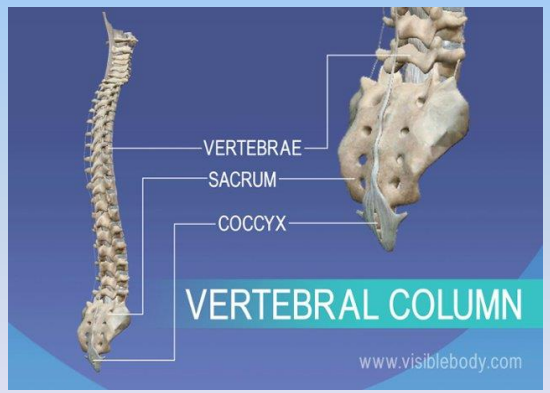
The spine is also known as the **vertebral column**.

It is made up of 33 irregularly shaped bones called **vertebrae**. Between each vertebra there is a pad of **cartilage** which allows movement and prevents the bones grinding together.

The vertebrae protect the **spinal cord**. This important nerve runs up the spine, through the centre of each vertebra.

The vertebral column is divided into **5 sections**.

The spine's inverted 's' shape gives it strength.



Task 1

Produce an information booklet describing the bones, remember to include:

The axial and appendicular skeleton and list the bones for each.

The location and names of all 28 bones using the specification sheet.

Name the 5 sections of the vertebral column and give a sporting example of when you might use it.

Function/Types Bones

What the specification says;

1.2 The functions of the skeleton and the link to types of bone, i.e. • functions, i.e. ○ shape ○ support ○ protection ○ movement ○ blood cell production ○ mineral storage	1.2 Learners will be expected to understand how the type of bone relates to the function it has.
• types of bone, i.e. ○ long ○ short ○ flat ○ irregular ○ sesamoid	

Video: https://www.youtube.com/watch?v=X8GuNvNnk40

Functions of the skeleton

The skeleton performs many functions in the body.

1. **Shape** – The skeleton gives us our shape and determines our size.
2. **Support** – The skeleton supports muscles and organs.
3. **Protection** – The skeleton protects delicate parts of the body like the brain and lungs.
4. **Movement** – The skeleton allows us to move. Muscles are attached to the bones and move them as levers.
5. **Blood cell production** – blood cells are made in the bone marrow.
6. **Mineral Storage**– **Our bones, they serve as storage areas for mineral salts, such as calcium and magnesium phosphate**

Shape and size

Your skeleton affects your body shape and size.

Bones play an important part in determining your **height** and **build**. People with long, light bones are usually tall and thin, whilst people with short, thick bones are likely to be short and more heavily built.

Some sports are more suited to people of a particular size or body shape. This means that your skeleton and bone size can affect your **performance** in different sports.

For example, weightlifting favours individuals with strong, heavy bones.

Support

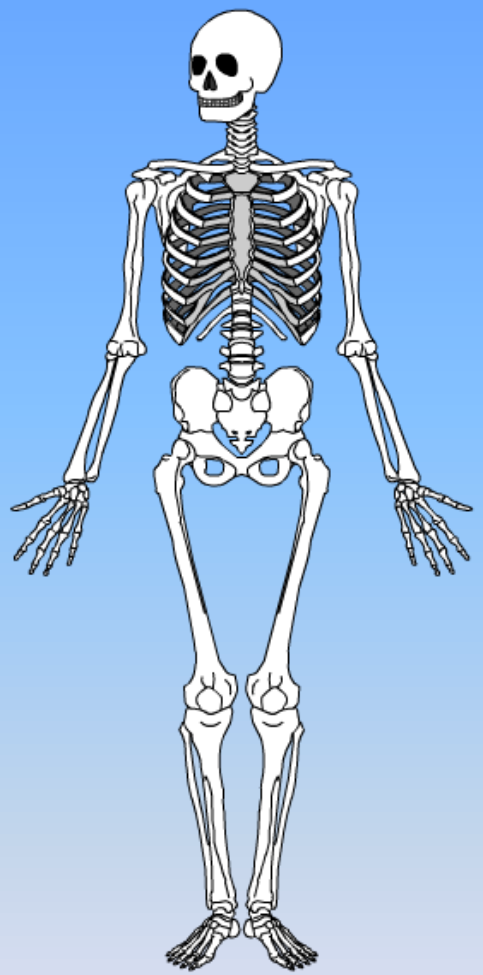
The skeleton acts as a framework.

It gives the body **support**, enabling us to stand and walk upright.

The bones of the back and chest support internal organs and help to keep them in place.

The bones of the body are held together by **ligaments**.

The skeleton provides a framework for the muscles, which are attached to bones by **tendons**.



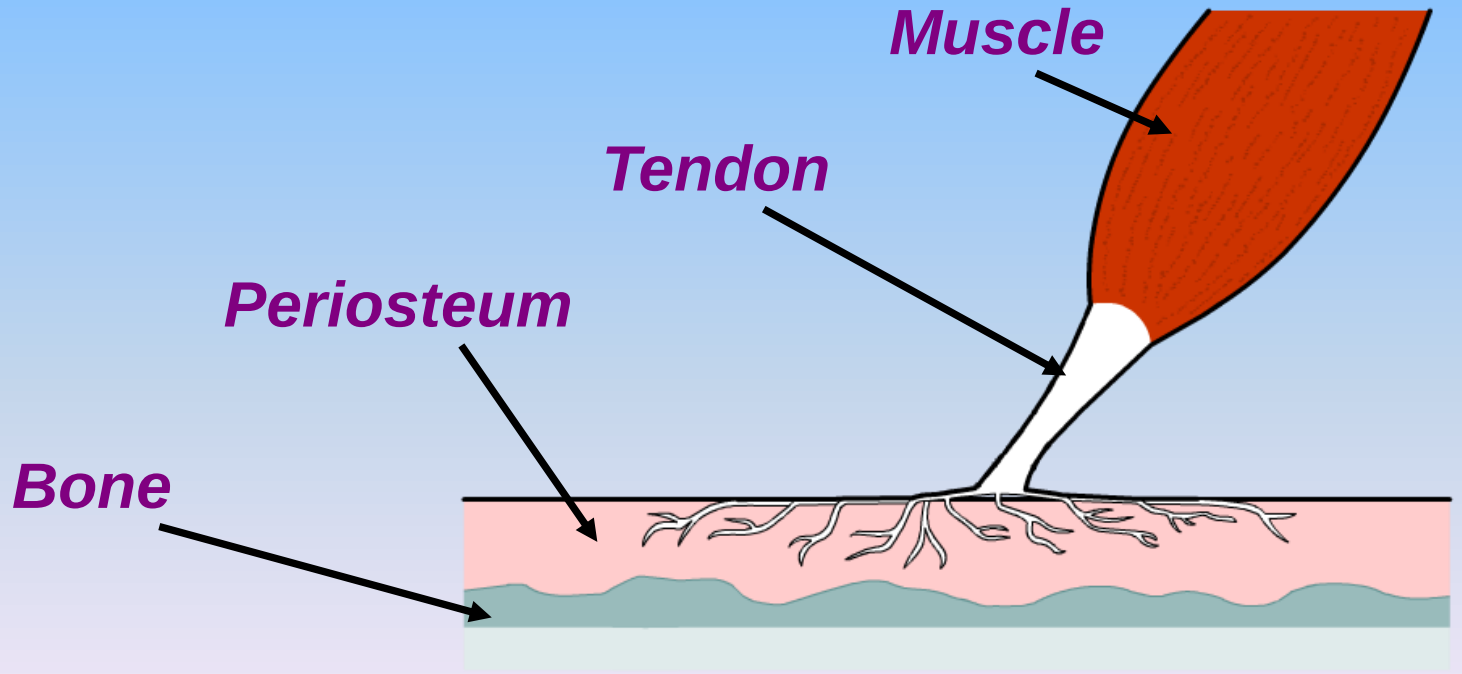
Can you imagine what humans would look like if they didn't have bones to support them?

Movement

Bones work with muscles to produce movement.

Muscles are attached to bones by **tendons**.

Bones have surfaces that allow for strong attachment. Tendons fuse with the tough Periosteum membrane on the outside of the bone.



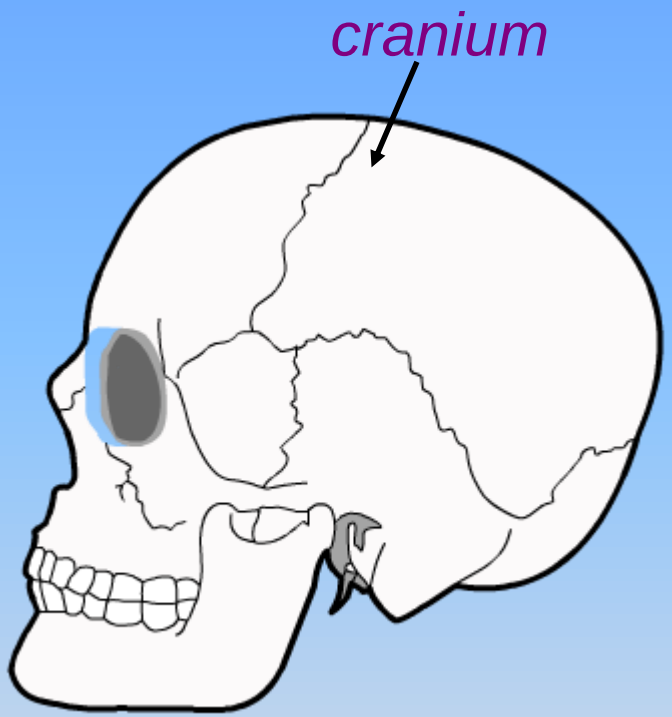
Protection

Some of our body parts, such as the brain, are very delicate and need **protection** from external forces.

Bones can protect body parts from **impacts** and **injuries**.

The **cranium** protects the brain. It encloses the brain entirely in a shell of bone.

The **rib cage** protects the delicate organs of the chest.



Can you think of two reasons why the rib cage has gaps in it rather than being a solid shell of bone?

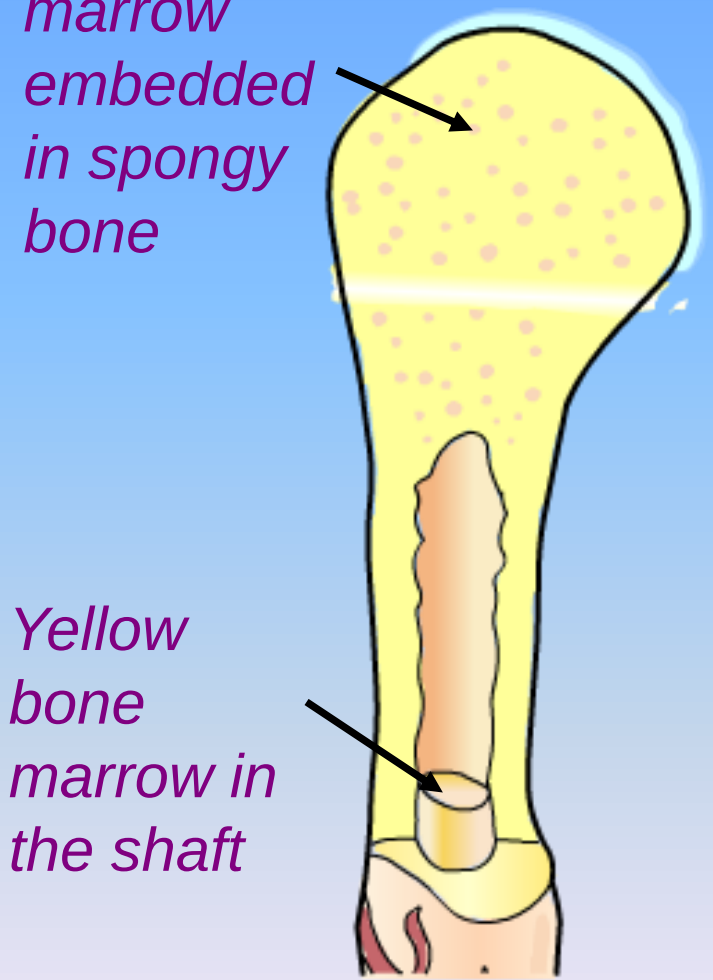
Blood cell production

Red and white blood cells and platelets are made in the bones.

The ends of long bones and some other bones including the ribs, humerus, femur and even vertebrae bones, contain **red bone marrow**.

This is where the blood cells are produced.

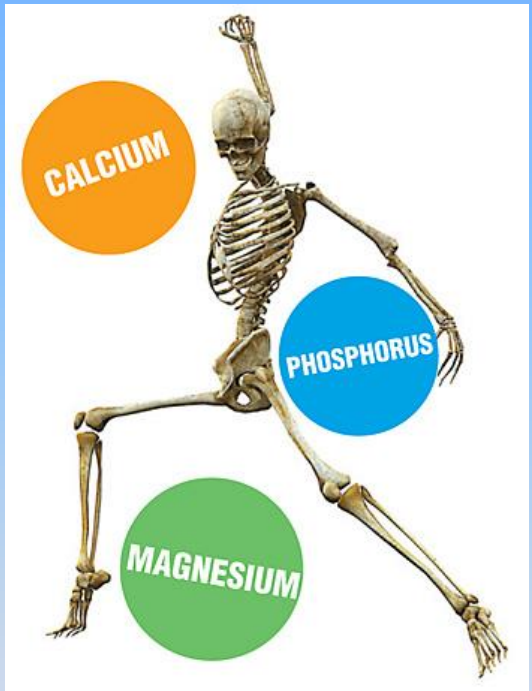
The shaft of long bones is filled with yellow bone marrow which does not produce blood cells.



Mineral Storage

Our bones, they serve as storage areas for mineral salts, such as **calcium and magnesium phosphate**, both of which are essential for growth and good health.

The bone owes the structure hardness and compression strength to these mineral deposits which are placed inside the bone.



Classification of bones – long bones

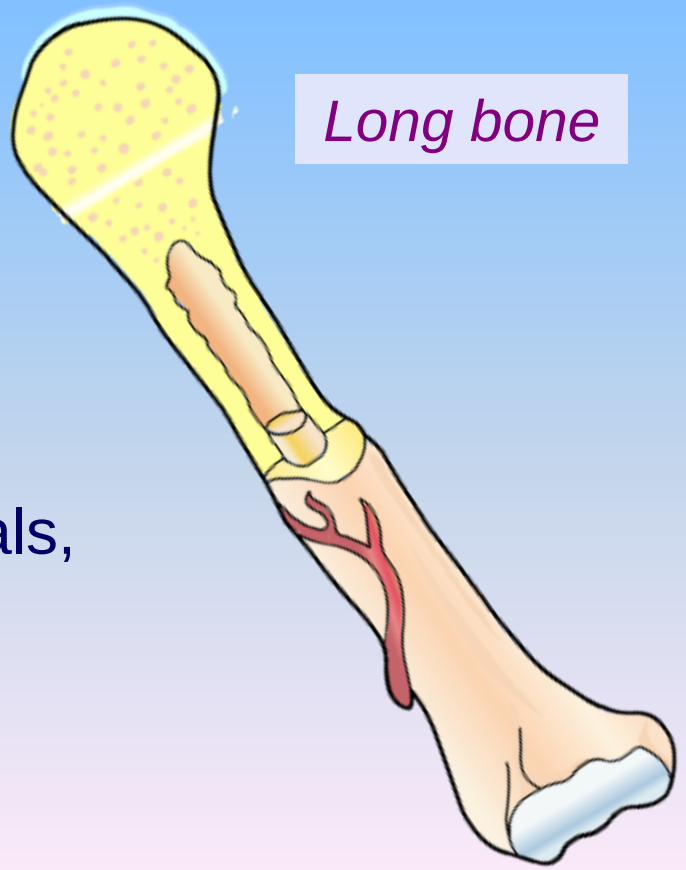
Bones are divided into a number of different categories. So far we have mainly dealt with **long bones**.

Long bones have a **long shaft** containing yellow bone marrow.

They are responsible for a lot of **movement** and often act as levers.

Long bones include the femur, humerus, tibia, fibula, the metatarsals, metacarpals and phalanges.

Long bones contain **red bone marrow** for producing blood cells.

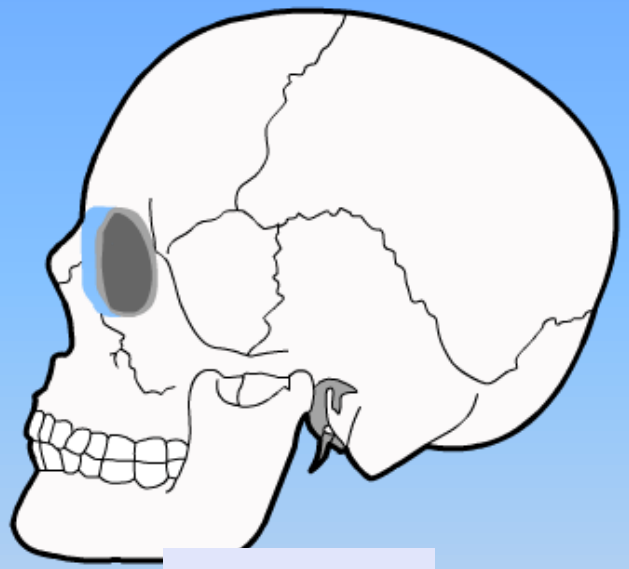


Long bone

Classification of bones – flat bones

Flat bones perform a variety of functions. These include:

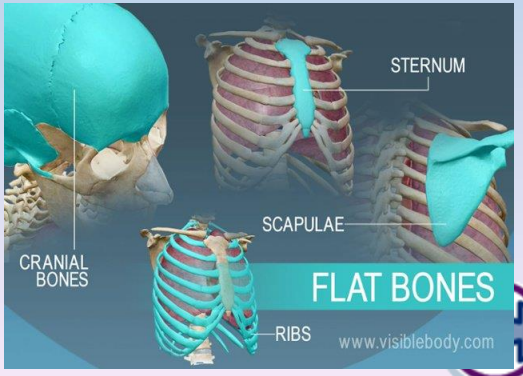
- **protection** for delicate areas, for example, the cranium protects the brain.
- areas for **muscle attachment**, for example, many of the muscles of the lower back and legs attach to the wide flat bone of the pelvis.



Cranium

They are made up of spongy bone between two layers of hard compact bone.

They have a **large surface area**.



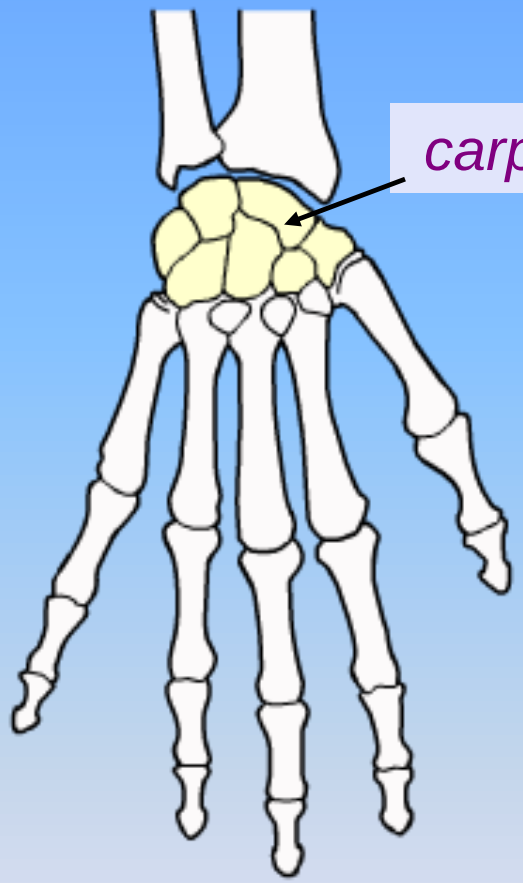
Classification of bones – short bones

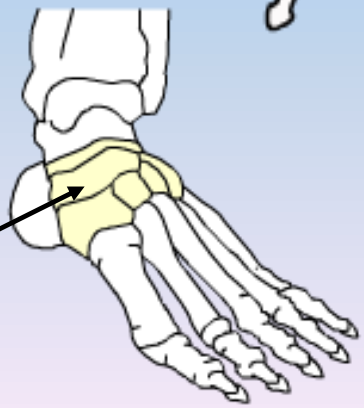
Short bones are very light and very strong.

They are small and **squat** in shape.

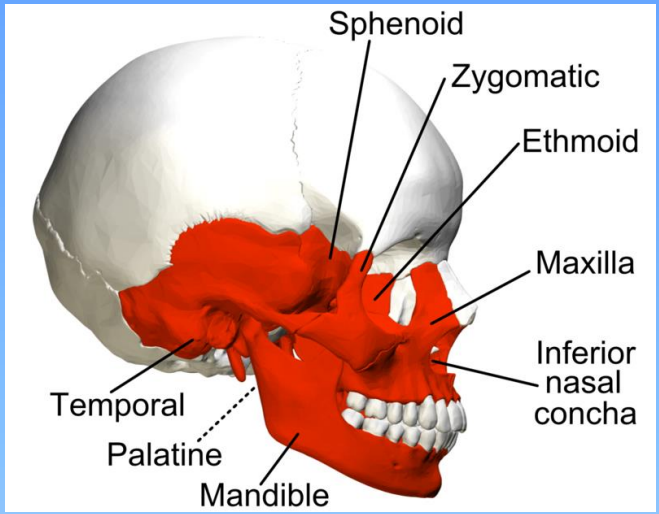
They are composed of spongy bone with a thin layer of compact bone on the outside.

The carpals in the wrist and the tarsals in the foot are examples of short bones.





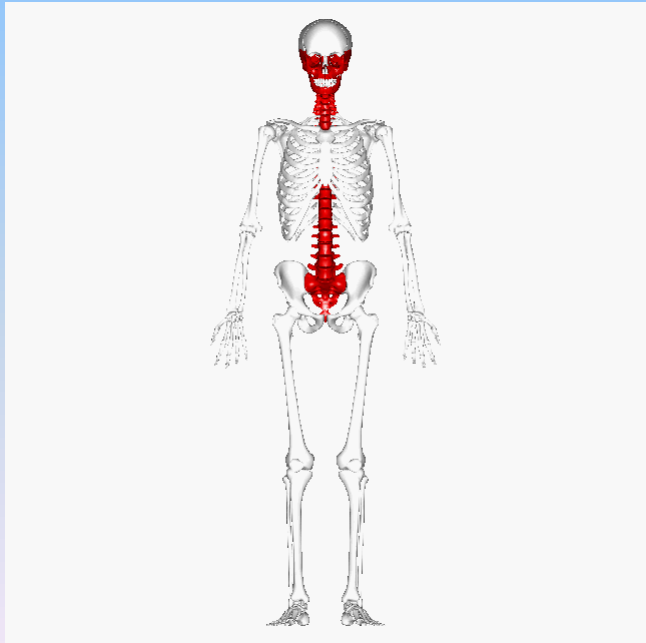
Classification of bones – irregular bones



Irregular bones are specially shaped to perform a **particular function**.

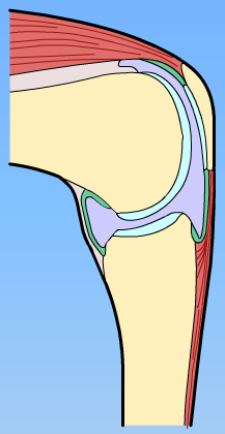
They are composed of spongy bone on the inside and compact bone on the outside.

Examples include the vertebrae and the mandible.



Sesamoid Bones

In anatomy, a **sesamoid bone** (/ˈsɛsəmɔɪd/[1][2]) is a bone embedded within a tendon or a muscle.[3] It is derived from the Latin word *sesamum* ("sesame seed"), due to the small size of most sesamoids.
Often, these bones form in response to strain,[4] or can be present as a normal variant. The kneecap is the largest sesamoid bone in the body. Sesamoids act like pulleys, providing a smooth surface for tendons to slide over, increasing the tendon's ability to transmit muscular forces.



Task 2: Complete the tables, providing as much information as possible, support your work with diagrams.

Function	Description
Shape	
Support	
Protection	
Movement	
Blood Cell Production	
Mineral Storage	

Type of Bone	Example	Example of Sport Activity
Long		
Short		
Flat		
Irregular		
Sesamoid		

Task 3: How the types of bones relate to its function

In your own words write one sentence as to why each type of bone may perform it's function. Provide an example for each. (10 Marks)

You may wish to discuss;

It's size and shape

Where is it in the body

Try to discuss all of the different functions if possible

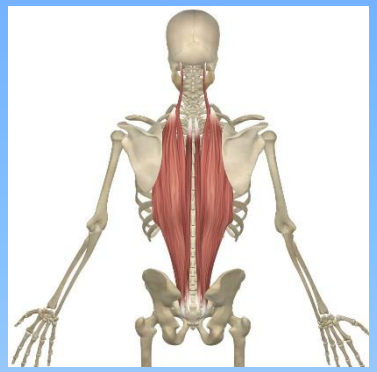
Types of Bones: Seasmoid, Long, Short, Irregular, flat

Functions: Blood Cell Production, Movement, Mineral Storage, Protection, Shape, Support

Muscular System

Knee	Rectus Femoris
	Vastus Medialis
	Vastus Intermedius
	Vastus Lateralis
	Biceps Femoris
	Semimembranous
	Semitendinousus

Hip	Iliopsoas
	Gluteus Maximus
	Gluteus Medius
	Gluteus Minimus
	Adductor Longus
	Adductor Brevis
	Adductor Magnus



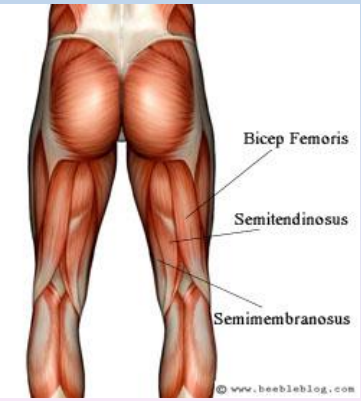
Ankle	Tibialis Anterior
	Gastrocnemius
	Soleus

Shoulder	Deltoid
	Latissimus Dorsi
	Pectoralis Major
	Trapezius
	Teres Major

Wrist	Wrist Flexors
	Wrist Extensors

Elbow	Biceps Brachii
	Triceps Brachii

Radio-Ulnar	Pronator Teres
	Supinator Muscle



Vertebral Column	Rectus Abdominus
	Erector Spinae Group
	Internal Obliques
	External Obliques

Task 4: Research and produce a poster identifying the location of all the muscles on this page and give a practical example of when they would be used. Test yourself!

Muscles and Movement

Muscles fall into separate categories that relate to specific movements;

Flexors – the muscles that bend a limb at a joint by contracting

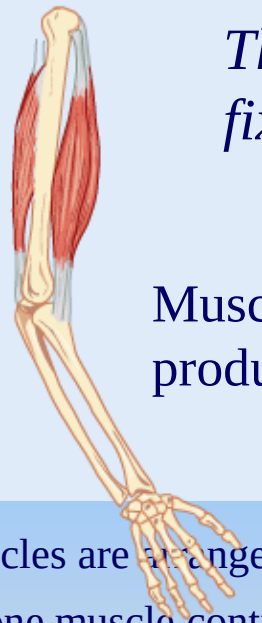
Extensors – the muscles that work with and against the flexors and that straighten a limb at a joint by contracting

Adductors – the muscles that move a limb towards the body

Abductors – the paired muscles for adductors, which move a limb away from the body

Understanding muscle action

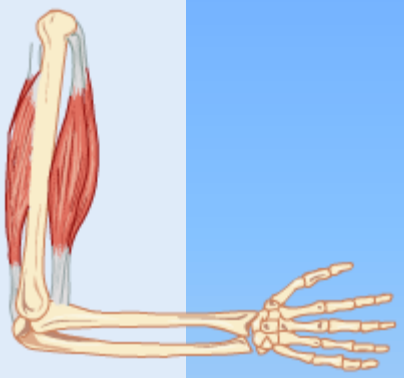
Muscles are attached to bones by tendons.



*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.

Upper arm Muscles

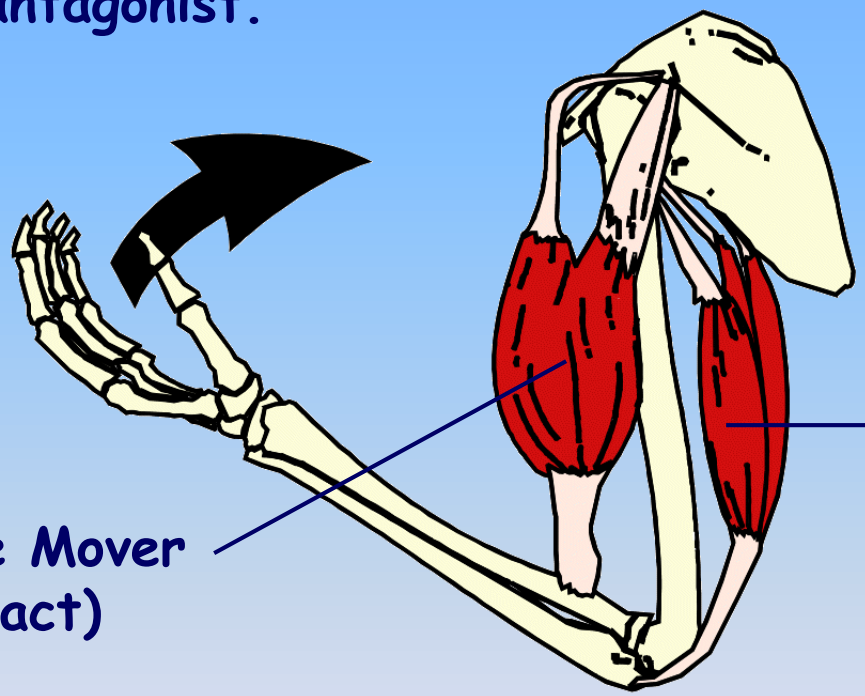
The **biceps** and **triceps** work together as an antagonistic pair to move the elbow joint.

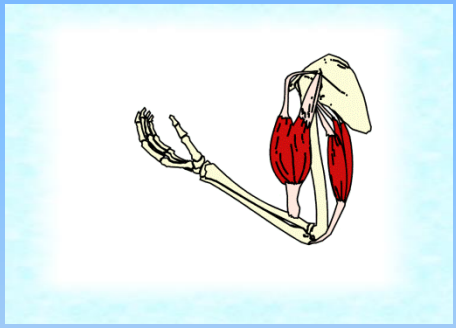
To **flex** the elbow, the biceps (the flexor) contracts and the triceps (the extensor) relaxes.

To **extend** the elbow, the actions are reversed so that the triceps contracts and the biceps relaxes.

Flexion (Bending) of the Arm

- The muscle doing the work (contracting) and creating the movement is called the **agonist** or **prime mover.**
- The muscle which is relaxing and letting the movement take place is called the **antagonist.**



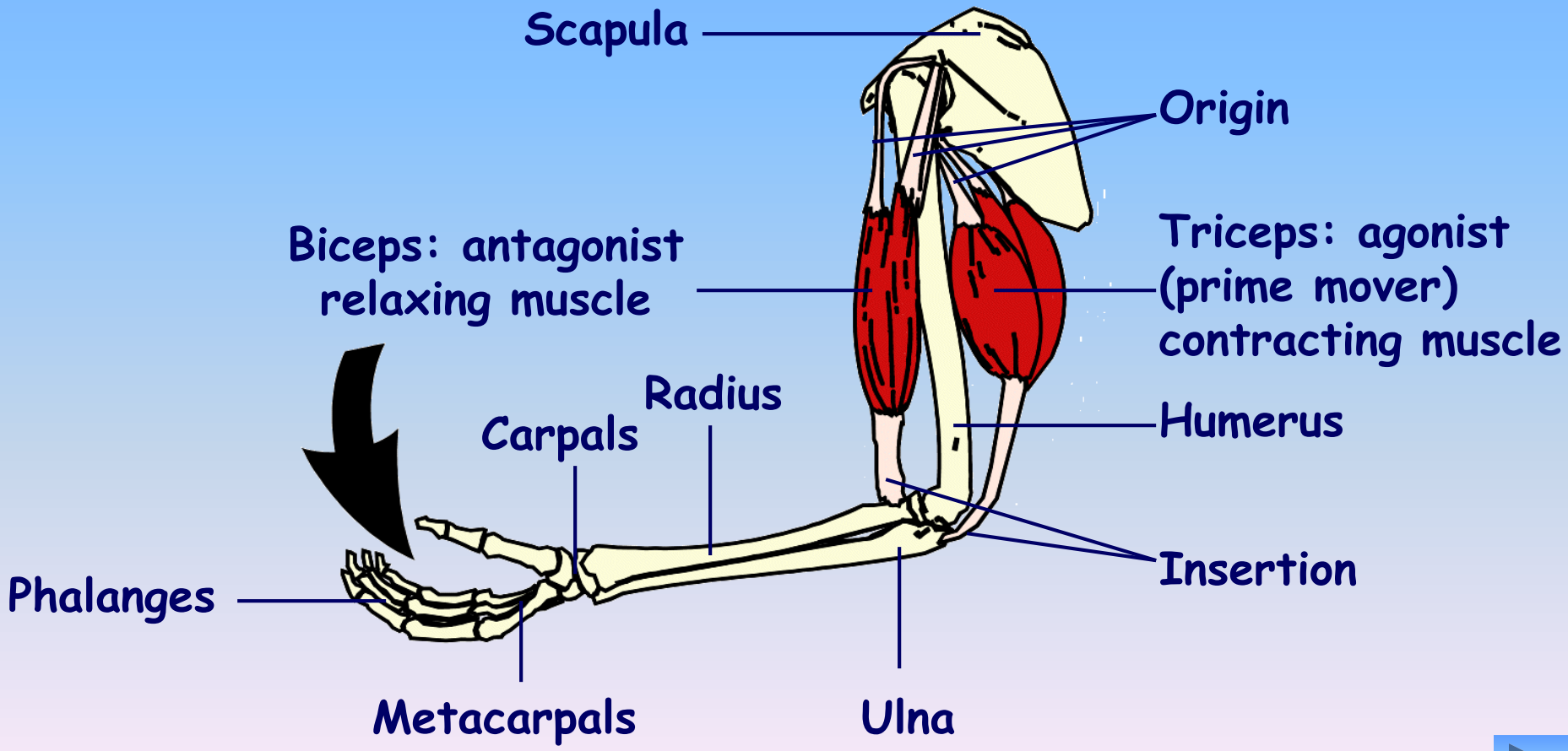


- Other muscles support the prime mover (agonist) in creating movement and these are called **synergists.**

Extension (Straightening) of the Arm

Locate and name the following parts involved in the extension of the arm:

- Agonist (prime mover)
- Origin
- Any Bones
- Antagonist
- Insertion



Quadriceps / hamstring muscle action

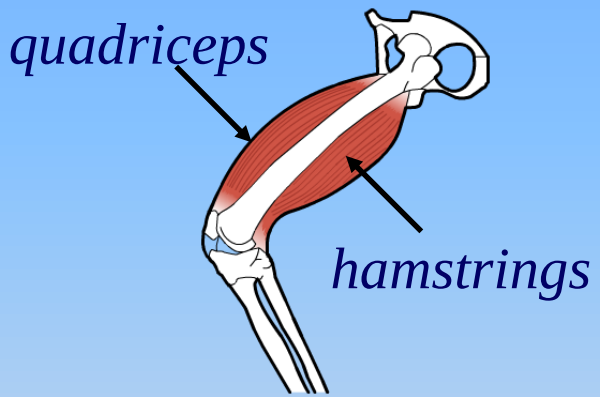
The **quadriceps** and **hamstrings** in the legs are another antagonistic pair. Can you answer the following questions?

Which joint do they move?

What types of movement are produced?

Which is the flexor and which is the extensor?

Identify the origin and insertion of each muscle.



Task 5
Produce a detailed report describing and explaining antagonistic muscle action. Use the following questions as guidance.

Transition Baseline Assessment Test

Answer **all** the questions. Put a tick (✓) in the box next to the **one** correct answer for each question.

1 Which of the following bones form the ankle joint?

(a) Femur, tibia and fibula ☐

(b) Talus, tarsals and metatarsals ☐

(c) Talus, tibia and fibula ☐

(d) Tibia, talus and tarsals ☐

[1]

2 Which of the following types of bone are the phalanges?

(a) Long ☐

(b) Short ☐

(c) Irregular ☐

(d) Sesamoid ☐

[1]

14 **Fig. 14** shows the performance of a squat.

Fig. 14

(a) Identify **one** agonist and **one** antagonist at the hip and knee during the upward phase of the squat.

Hip Agonist .....

Hip Antagonist .....

Knee Agonist .....

Knee Antagonist .....

[4]

(b) Explain the role of fixator muscles during the squat.

.....

.....

.....

.....**[2]**

Section B

Answer **all** the questions.

11 Identify **three** functions of the skeleton, other than shape and movement.

1 .....

2 .....

3 .....

[3]

12 **Fig. 12.1** shows some major muscles in the body.

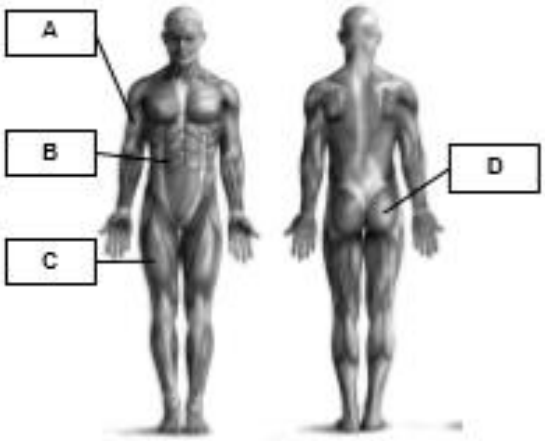


Fig. 12.1

Identify the muscles labelled A, B, C and D.

A.....

B .....

C .....

D.....

[4]

14 **Fig. 14.1** shows a table tennis player performing a shot with top spin.

Fig. 14.1

Explain how the muscles acting at the radio-ulnar joint work together to move the forearm into the position shown in the picture in order to produce top spin on the ball.

.....

.....

.....

.....

.....

.....

4marks

21* Explain the structures and functions of the vertebral column. Your answer should include:

- The different sections of the vertebral column
- Types of joint
- Joint movements with practical examples
- Functions of the vertebral column

[10]

The End!

(Jan2019)