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Text

Phalanges

Metatarsals

Tarsals

Calcaneus

Quiz

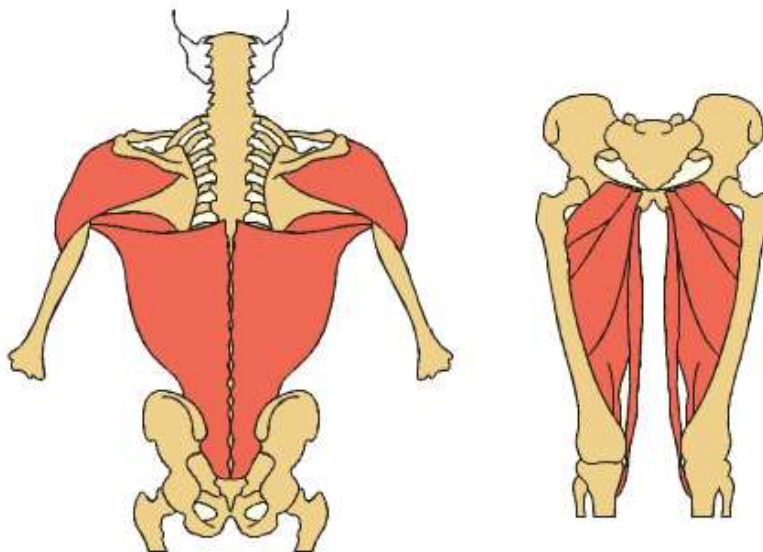
Now have a go at identifying the bones of the leg.

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Skeletal function

Support

Most of the body's tissues are soft and the skeleton provides a rigid but flexible **framework** and **support**. Many tissues such as muscles, ligaments and connective tissue are attached to the bones, providing a structure for the body and enabling movement.



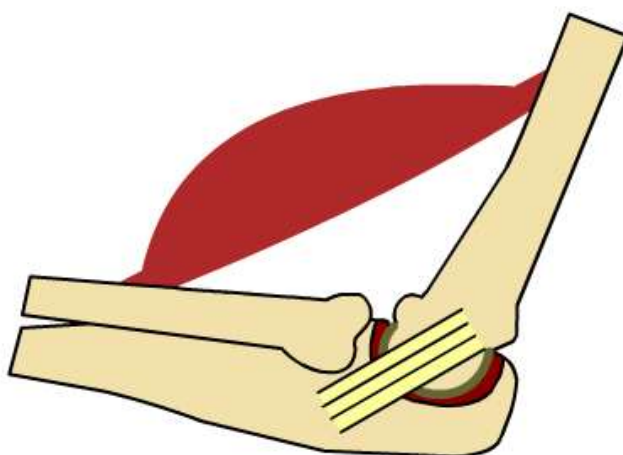
Muscles attached to skeleton

(files/images/muscles-attached-to-the-skeleton.jpg?1611847301901)

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Movement

The bones, along with the joints and muscles, provide the basis for human movement. The bone provides a **lever** on which a muscle can pull and, through control from the nervous system, a range of movements, from powerful pole-vaulting to intricate movements, such as speed-typing are carried out.



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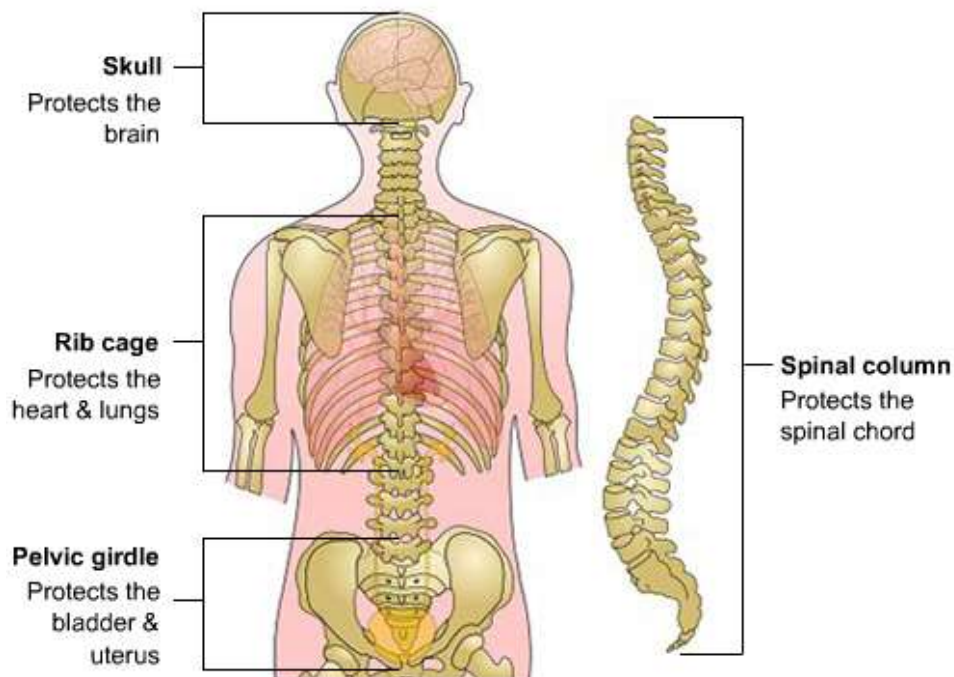
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Text

Muscle is attached to bone by tendons, ligament attaches two bones at the joint, joint is protected by cartilage in a joint capsule.

Protection

The skeleton creates a number of **protective enclosures** around the most sensitive of our organs providing a strong protective barrier. The skull almost completely covers the brain, the spinal column protects the full length of the spinal cord, the spine and ribs encase the heart and lungs, and the pelvic girdle helps to protect the bladder and uterus.



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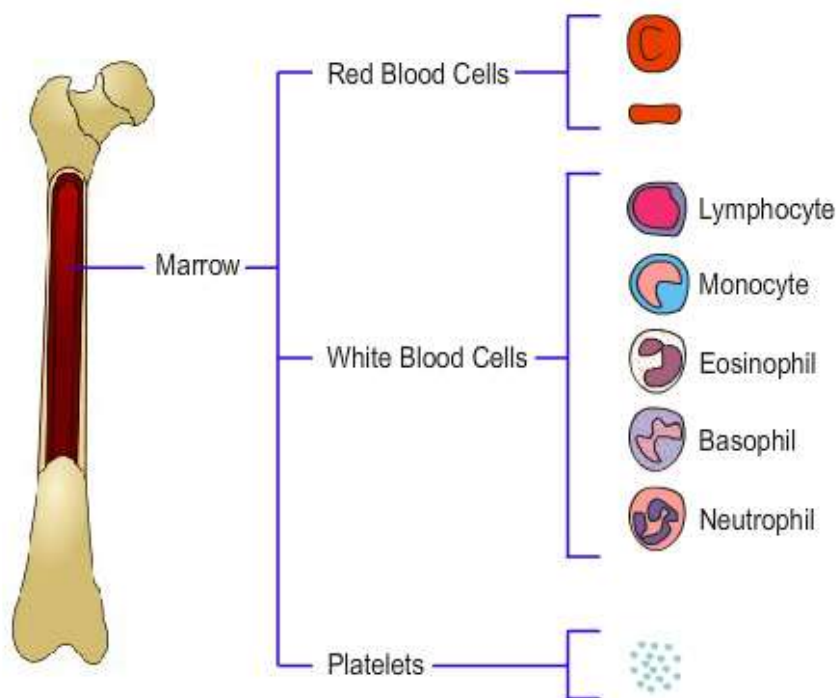
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Text

- Skull - Protects the brain.
- Rib cage - Protects the heart and lungs.
- Pelvic girdle - Protects the bladder and uterus.
- Spinal column - Protects the spinal cord.

Blood cell production

Red blood cells and some white blood cells are formed in **bone marrow**, which is found within the inside of the bone shaft. Red blood cells are used to transport oxygen around the body and to carry waste products such as carbon dioxide back to the lungs. White blood cells assist as a defence mechanism against infection as part of our immune system.



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Text

Marrow:

- Red blood cells
- White blood cells
 - Lymphocyte
 - Monocyte
 - Eosinophil
 - Basophil
 - Neutrophil
- Platelets

Mineral storage and calcium balance

Mineral Storage

Our bones store **minerals** such as **calcium**, **phosphate** and **magnesium** and these form part of the bone structure. Bone stores over 99% of the calcium found in the body and blood calcium levels are closely regulated as they heart beat, nerve control, muscle function, blood clotting, blood sugar regulation and many enzymes need it as a co-factor. Calcium is needed for bone and teeth formation, and contributes to the inorganic structure of the skeleton as calcium phosphate, forming a substance called **hydroxyapatite**.



(files/images/spongybone.jpg?1611848201775)

Section through the head of the bone, showing the spongy bone, the cortex, the red marrow and a spot of yellow bone marrow

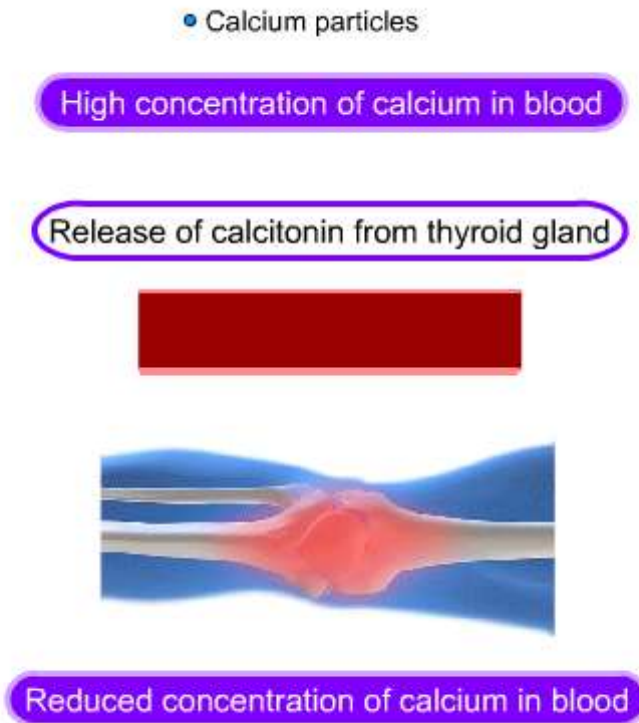
OpenStax (https://commons.wikimedia.org/wiki/File:2205_Bone_Marrow.jpg) / CC BY 4.0
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Calcium Balance

Bone calcium buffers blood calcium levels, providing it when it is needed and re-absorbing it when blood levels are too high. This is known as **calcium homeostasis**.

The amount of calcium in the bloodstream and the bones is closely controlled by three hormones.

A higher than normal blood calcium level stimulates the parafollicular cells of the thyroid gland to release **calcitonin**. This hormone increases the amount of calcium deposited in bone, resulting in lower blood calcium levels.



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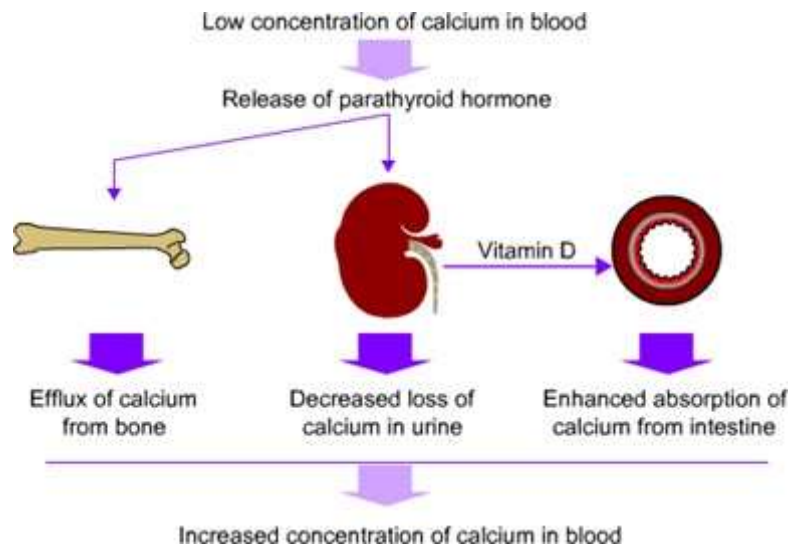
Text

Calcium particles
 High concentration of calcium in blood
 Release of calcitonin from thyroid gland
 Reduced concentration of calcium in blood

Calcium homeostasis in the body

Parathyroid hormone (PTH) is secreted from the **parathyroid glands** when blood calcium is low. It increases calcium and magnesium resorption from urine in the kidneys, which increases blood calcium. PTH also promotes the formation of **calcitriol** in the kidneys (synthesised from vitamin D) which increases dietary absorption of calcium in the gut.

If blood calcium levels are still low, parathyroid hormone stimulates **osteoclasts** (bone cells) to break down bone, resulting in more calcium being released into the bloodstream.



(files/images/Calcium Homeostasis in the Body.jpg?1611848709018)

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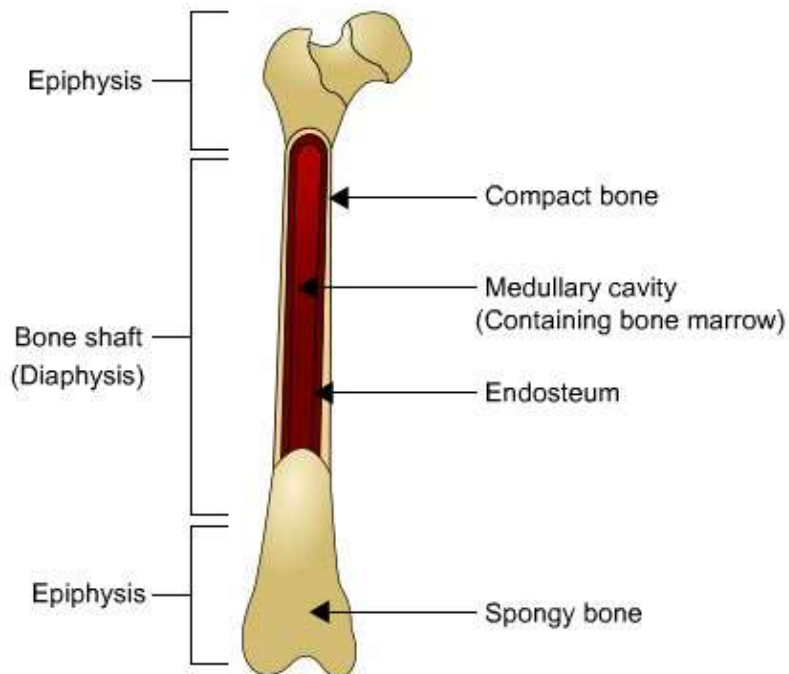
Low concentration of calcium in the blood leads to a release of the parathyroid hormone. In bones, this causes an efflux of calcium from the bone. In the bladder, a decreased loss of calcium in urine and production of vitamin D which enhances the absorption of calcium from the intestine. Combined, these processes increase the concentration of calcium in the blood.

Types of skeletal bones

Bones are normally classified according to their shape and size and may be, long bones, short bones, flat bones or irregular bones.

Long bones

Long bones are longer than they are wide, creating effective levers for movement. Examples of **long bones** include the humerus, the femur, the tibia and fibula. They consist of a **long shaft (diaphysis)** with two **bulky ends (epiphyses)**. The epiphyses are the **articulating surfaces** (surfaces which interact with other joints or bones). Long bones contain some **spongy bone**, but are primarily made of **compact bone**, particularly in the middle of the **bone shaft** where stress is at its highest. Long bones typically have a cavity in the centre of the long shaft called the medullary cavity. This is where bone marrow is stored and it is encapsulated by a layer of connective tissue called an endosteum.



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Text

Epiphysis

Bone shaft (Diaphysis)

Epiphysis

Compact bone

Medullary cavity (containing bone marrow)

Endosteum

Spongy bone

Short bones

Short bones are usually **cube-shaped** and are resistant to compression forces. Examples of these bones are the small tarsal bones of the foot (collectively known as the **tarsus**) and the small bones of the hand and wrist (**carpus**).