

# Introduction to bones in the body



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TAQ1

Bone is made up of specialised cells consisting of protein fibres, calcium, water and minerals. Bones structure is a living material, containing living tissue, blood vessels and nerves. This enables the bones to repair themselves if damaged or broken. Calcium within the bone makes it very hard and strong, without calcium bones may become soft a rubbery. The structure of a bone appears in sections or layers. The main shaft of bone is called the Diaphysis and is made up of densely compacted bone; at the end of each bone is the epiphysis this is where the bone develops or grows as we mature, constantly changing shape and size. The epiphysis consists mainly of cartilage, the epiphysis layer divides, making new cartilage which then hardens and turns to bone (ossified). The thin layer of cartilage which covers the epiphysis is a living structure containing cells, it is located between the join of another bone. Cartilage is a soft material which acts as a shock absorber within the skeleton and prevents the bones from rubbing on each other as we move. The whole bone is surrounded by a tough fibrous membrane called the Periosteum, this contains nerves which signal pain and blood vessels which supply nutrients, and it also acts as a point of attachment for ligaments and tendons. Within the centre of the bone is the marrow cavity, the yellow bone marrow consist of fat cells and blood cells which are made within red marrow. The entire skeleton grows at the same rate as the organism its self; it is distinguished into two categories. The axial skeleton consists of the central bones and the appendicular skeleton is made up of our limb bones. The whole skeleton works together to provide support for our body allowing us to keep our shape and form while permitting

movement and flexibility throughout our joints. While providing blood cells made within our bones the skeleton also provides protection for our soft organs within our body.

### TAQ2

Joint	Joint type	Movement range
<ul style="list-style-type: none"> <li>• Hip joint</li> <li>• Shoulder joint</li> </ul>	<ul style="list-style-type: none"> <li>• Ball and socket</li> <li>• Synovial joint (due to the joint cavity between the articulating surface, the shape of the articulating cartilage and the way in which</li> </ul>	<p>This is constructed of a round head of one bone which fits into a cup cavity of another. This joint provides the greatest range of movement circumducting on, internal and external rotation.</p>

Due to our  
 they fit tension of  
 together ligaments  
 determine our  
 the joints movement  
 movement can be  
 ) limited in  
 these joints.

- Elbow
  - Jaw
  - Knee
  - Hinge joint These move only in one plane as the convex surface of one bone fits into the concave surface of another allowing flexion or extension.
  - Synovial joint
- Although the movement is

predominantly hinged they are also capable of limited rotation.

The joint also aids in the rotary movements of the forearms, radius including Pronation and supination.

However movement is limited due to apposition of soft parts between the muscles

surrounding  
the specific  
bone.

Movement  
within this  
joint is  
limited due  
to the bone  
fitting

- Neck
- Pivot joint within the socket of another bone. This allowing the movement side to side.

- Skull
- Fibrous joint or Fused joint
- Once the skull is fully developed the bony plates become fixed together by
- Membrane between the ulna and radius or tibia and

sutures  
forming an  
immovable  
suture joint.

fibular.

The  
ligaments  
joining the  
ulna and  
radius, tibia  
and fibular  
allow only a  
small  
amount of  
movement.

- Discs in between the vertebrae
- Cartilaginous joints provide limited movement (determines degree of movement)
- Facet joints while working with our cartilage to stand force and our
- Ribs

ligaments  
stabilize our  
movement  
both  
providing  
flexibility.

### TAQ3

1. To enable our body to move and interact actively our skeleton and muscles work together. Having the ability to run from place to place is distinguished through locomotion. Running means our muscles have to depend upon our skeleton for support while contracting to aid in movement from our joints. Our muscles are specialised tissue which respond to motor neurons to inform the muscle when to contract or relax dependant on the movement required. Locomotion uses predominantly skeleton muscles attached to bone so we have voluntary control. Running uses the primary muscles for motion movements located around our hip and knee joints. The ball and socket joint located in our hip allows maximum movement, circumduction as well as rotation. Our hip joint works with the antagonistic pairing muscle group quadriceps and hamstrings; it allows the hinge joint of the knee to flex the limb and extensors muscle to extend the leg. Our gluteus Maximus also aids in the hip movement during running to maintain our posture and extend the hips forward. Running also causes a lot of rotation in our spin; developing good abdominal muscles can help to support and stabilize during activity.



Running is more efficient when we use our muscles and joints located in our elbow and shoulder to keep them flexed and free for movement when required. 219

2. During a stationary activity our body is still performing specified muscle contractions and joint movement along with our skeleton to enable it to perform the task in hand. To enable us to sit at a computer we have to maintain our posture and sit correctly to avoid injury. Bending the hinge joint in our knee and using the ball and socket joint to sit enables our muscles to contract using our voluntary muscle tonic fibres which sustain muscular contractions to maintain our posture. During computer activity we also use the pivot joint in our neck for the ability to move from side to side when looking at the computer screen. The muscle located at the back of our neck acts as a lever between the base of our skull and our spine allowing us to move our head in the directions required for computer use. Cartilage joints located in our vertebrae provide us with limited movement to alter our back posture when sitting for long periods of time. The gliding joints between our tarsals and metatarsals slide over each other allowing limited movement around semi-moveable joints, however working with the tendons connected to skeletal muscles extended up the arm allows the fast twitch fibres to provide fast voluntary movement during typing.

#### TAQ4

Muscles are specialised tissue which makes up nearly half our body mass. They respond to stimulation by contracting and providing force that enables

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that body to move. Muscles stretch across joints linking bone to bone while being elastic and have the ability to be stretched due to weight but return back to normal. Each muscle is connected to the Skelton via a tendon at each end, the tendon is tough and does not stretch, this preventing the muscle from lengthening but allowing contraction through nerve stimulus and voluntary control. Skeleton muscles are tissue attached to the bone; they have a striped appearance and are made up of numerous elongated cells called muscle fibres. These muscle fibres are densely compacted into groups called fasciculi which are held together by the connective tissue endomysium, these are then surrounded by a stronger sheath of connective tissue perimysium. To enable the muscle to contract numerous capillaries, nerves and blood vessels penetrate the tissue supplying simulation and nutrients by allowing oxygen and glucose to fuel the contractions performed by the muscle. Inside the muscles and joints are receptors which inform the body of its position and activity required by triggering a reflex in specific muscles. Some Muscles are required to work together in pairs to produce movement these are called antagonistic pairs; one muscle will relax as the other one contracts allowing motion movement in a specific direction. Muscles which perform this type of movement are known as flexors and extensors and use fast twitch fibres to aid in the functioning of the muscle and skeleton during motion movement. Slow Tonic fibres located in our muscles have the ability to sustain contraction allowing us to maintain our body's posture. This anti-gravity function means our muscles are in constant contraction in order to maintain the position required. During specific activity our body's temperature can fluctuate this means our muscles also use heat production to determine our overall body temperature.

TAQ5

‘ Movement requires muscles and all muscles have antagonist pairs’

Muscles are specialised tissues which work with our skeleton providing voluntary movement throughout our body. Muscle is made up of elongated cells called muscle fibres; within these fibres fine threads called myofilaments are located. These fine threads are what enable our muscle to contract; they are made up of thick and thin threads slightly overlapping each other at each end. When our motor neurons signal the muscle to contract, the thick fibres move between the thin fibres causing the muscle to shorten and thicken for greater contraction for movement. Voluntary muscles fibres can be either tonic (slow) fibres which sustain contraction for balance and posture or fast twitch fibres which are used in locomotion. Muscles within our body work as antagonistic pairs to produce precise movement. The contracting muscle during movement is called the agonist and the opposite muscle relaxes called the antagonist. Working in pairs enables the body to perform movement continually throughout activities, altering muscle contraction as we move producing the opposite movement but on the same bone. The muscles which aid in bending a limb are called flexors and the muscles which straighten a limb are called extensors each counteracting each other when signalled. Muscles located around these pair’s aid in stabilising the muscle action by holding the specific origin stable and co-ordinating our actions.