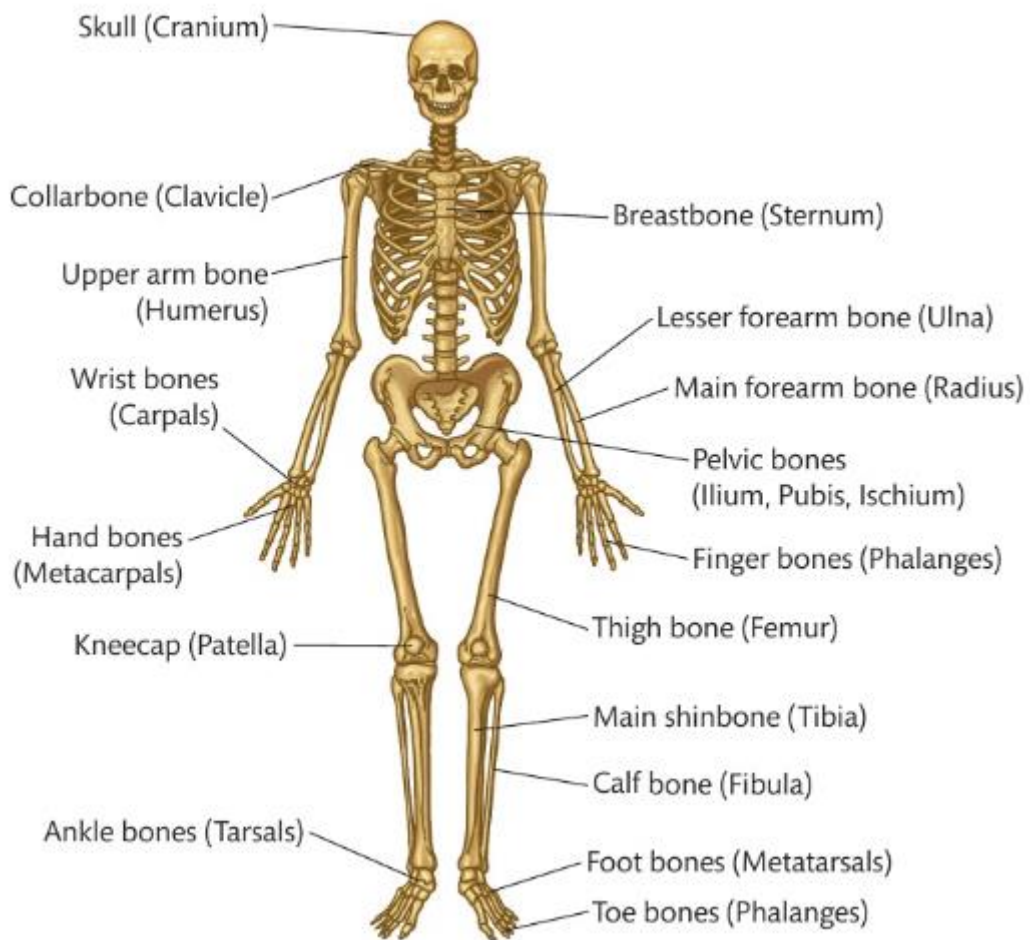


Musculo-skeletal L3 BTEC Revision

*Revise the content below and answer the past paper question after each section. This content will be in your exam!



Major bones of the skeletal system

The skeletal system includes the following bones.

- ▶ **Cranium** – this box-like cavity (space) consists of interlinking segments of bone that are fused together. The cranium contains and protects the brain.
- ▶ **Clavicles** – these are commonly known as the collar bones and are the long, slim bones that form the anterior part of the shoulder girdle. This provides a strong attachment for the arms.
- ▶ **Ribs** – there are 12 pairs of ribs and they form part of the **thoracic cage**. The first seven pairs are attached to the sternum (see below) and are known as true ribs; the remaining five pairs are known as false ribs as they do not attach to the sternum. The ribs are long, flat bones.
- ▶ **Sternum (breast bone)** – this is the elongated, flat bone that runs down the centre of the chest and forms the front of the thoracic cage. Seven pairs of ribs are attached to the sternum, which provides protection and muscular attachment.
- ▶ **Scapula** (plural: scapulae) – commonly known as the **shoulder blades**, these large, triangular, flat bones form the posterior part of the shoulder girdle.
- ▶ **Humerus** – this is the long bone of the upper arm and is the largest bone of the upper limbs. The head of the humerus articulates (joins) with the scapula to form the shoulder joint. The distal end articulates with the radius and ulna to form the elbow joint.
- ▶ **Radius and ulna** – the ulna is the longer of the two bones of the forearm. The ulna and radius articulate distally (see Table 1.2) with the wrist.
- ▶ **Carpals** – these are the eight small bones that make up the wrist. They are irregular, small bones arranged in two rows of four. They fit closely together and are kept in place by ligaments.

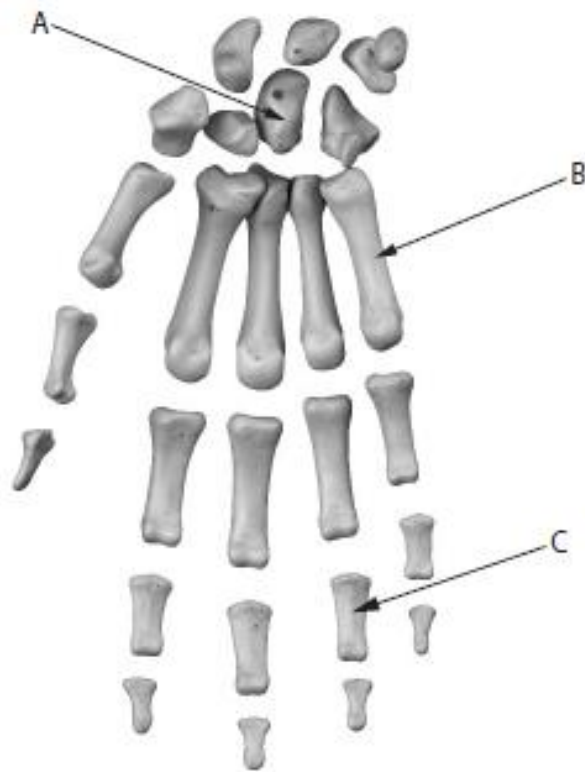
- ▶ **Metatarsals** – there are five metatarsals in each foot; they are located between the tarsals and the phalanges (toes). Each metatarsal has a similar structure, with a distal and proximal head joined by a thin shaft (body). The metatarsals are responsible for bearing a great deal of weight, and they balance pressure through the balls of the feet. The metatarsals are a common site of fracture in sport.

- ▶ **Metacarpals** – five long bones in the palm of the hand, one corresponding to each digit (finger or thumb). These run from the carpal bones of the wrist to the base of each digit in the hand.
- ▶ **Phalanges** – the bones that make up the thumbs, fingers and toes. Most fingers and toes have three phalanges, but the thumbs and big toes have two.
- ▶ **Pelvis** – the pelvis is made up of two hip bones which in turn consist of three sections (**ilium, ischium** and **pubis**) which fuse together during puberty to form one bone. The ilium structure provides the socket for the ball and socket joint (see Figure 1.8) of the femur, allowing the legs to be attached to the main skeleton.
- ▶ **Femur** – the longest and strongest bone in the body, sometimes referred to as the **thigh bone**. The head fits into the socket of the pelvis to form the hip joint; the lower end joins the tibia to form the knee joint.
- ▶ **Patella (kneecap)** – the large, triangular sesamoid bone found in the quadriceps femoris **tendon**. It protects the knee joint.
- ▶ **Tibia and fibula** – the long bones that form the lower leg. The tibia is the inner and thicker bone, also known as the **shin bone**. The upper end of the tibia joins the femur to form the knee joint, while the lower end forms part of the ankle joint. The fibula is the outer, thinner bone of the lower leg; it does not reach the knee, but its lower end does form part of the ankle joint.
- ▶ **Tarsals** – along with the tibia and fibula, seven bones known collectively as the tarsals form the ankle joint including the heel. The calcaneus, or heel bone, is the largest tarsal bone. It helps to support the weight of the body and provides attachment for the calf muscles via the Achilles tendon. The tarsals are short and irregular bones.

Figure 1 shows the bones of the hand.

1 (a) Name the bones labelled A–C in **Figure 1**.

(3)



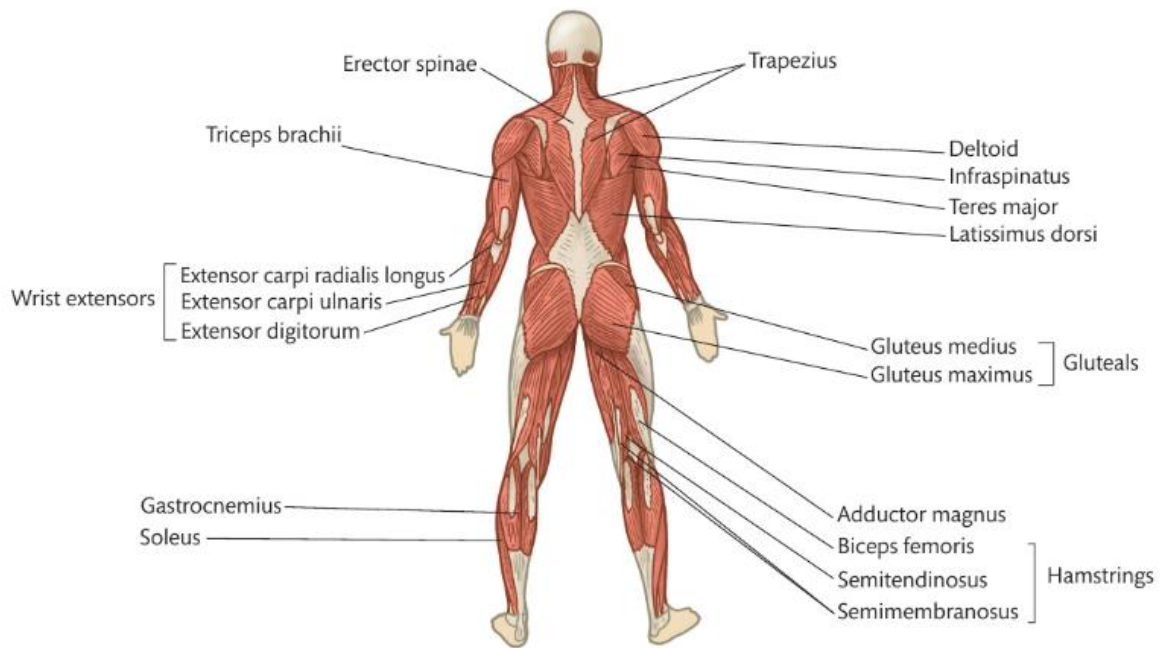
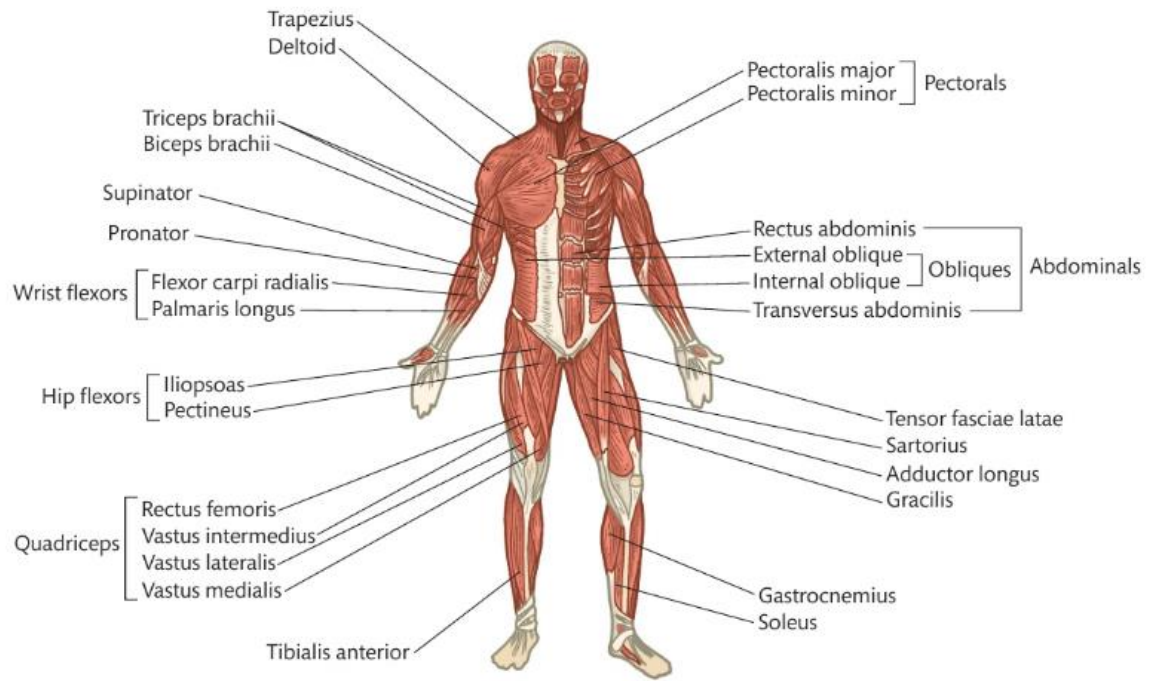
(Source: © Sebastian Kaulitzki/Shutterstock)

Figure 1

A

B

C



Muscle	Function	Location	Origin	Insertion	Exercise/activity
Abdominals	Flex and rotate lumbar region of vertebral column	'Six-pack' muscle running down abdomen	Pubic crest and symphysis	Xiphoid process	Sit-ups
Hip flexors	Flex hip joint (lifting thigh at hip)	Lumbar region of spine to top of thigh (femur)	Lumbar vertebrae	Femur	Knee raises, lunges, squat activation
Quadriceps <ul style="list-style-type: none"> • rectus femoris • vastus lateralis • vastus medialis • vastus intermedius 	Extends lower leg and flexes thigh	Front of thigh	Ilium and femur	Tibia and fibula	Squats, knee bends
Hamstrings <ul style="list-style-type: none"> • semimembranosus • semitendinosus • biceps femoris 	Flexes lower leg and extends thigh	Back of thigh	Ischium and femur	Tibia and fibula	Leg curls, straight leg deadlift
Gastrocnemius	Plantar flexion, flexes knee	Large calf muscle	Femur	Calcaneus	Running, jumping and standing on tip-toe
Soleus	Plantar flexion	Back of lower leg	Fibula and tibia	Calcaneus	Running and jumping
Tibialis anterior	Dorsiflexion of foot	Front of tibia on lower leg	Lateral condyle	By tendon to surface of medial cuneiform	All running and jumping exercises

Erector spinae	Extension of spine	Long muscle running either side of spine	Cervical, thoracic and lumbar vertebrae	Cervical, thoracic and lumbar vertebrae	Prime mover of back extension
Teres major	Rotates and abducts humerus	Between scapula and humerus	Posterior surface of scapula	Intertubercular sulcus of humerus	All rowing and pulling movements, face pulls, bent over rows
Trapezius	Elevates and depresses scapula	Large triangular muscle at top of back	Continuous insertion along acromion	Occipital bone and all thoracic vertebrae	Shrugging and overhead lifting
Latissimus dorsi	Extends and adducts lower arm	Large muscle covering back of lower ribs	Vertebrae and iliac crest	Humerus	Pull-ups, rowing movements
Obliques	Lateral flexion of trunk	Waist	Pubic crest and iliac crest	Fleshy strips to lower eight ribs	Oblique curls
Gluteals	Extends thigh	Large muscle on buttocks	Ilium, sacrum and coccyx	Femur	Knee-bending movements, cycling, squatting

Figure 2 shows the muscles in the human arm.



Figure 2

2 Name the muscles labelled A and B in **Figure 2**.

A.....

B.....