Collins

Student Book

CAMBRIDGE
International Examinations

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CAMBRIDGE IGCSE® PHYSICAL EDUCATION

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Chapter 1

The skeletal and muscular system

Starting points

In this chapter, you are going to develop knowledge about the skeleton and the muscular system that you will apply during your Cambridge IGCSE® Physical Education course.

You will learn:

- the major bones of the body and what they do
- the major joints in the body and how they move
- the major muscles of the body and what they do
- how bones, muscles and joints work together to create movement.

Chapter contents

The activities you complete will relate primarily to theoretical work, but you will also be encouraged to think about the theoretical aspects in a practical setting.

You will:

- learn the major bones in the human body and practise naming them
- practise classifying bones according to their type by colouring in a skeleton template
- learn the three main types of joint in your body and practise naming them
- practise drawing and labelling internal diagrams of joints, such as the knee, elbow or wrist
- learn eight types of movement that happen at a joint and practise doing them all yourself
- memorise the names and locations of 12 voluntary muscles in the human body
- understand the importance and function of tendons within movement
- practise describing the action of the major muscles and link them to a physical activity
- understand how muscles work antagonistically in pairs to create movement
- practise drawing and labelling diagrams of the muscles and joints in the arms and legs
- explain how muscles work antagonistically to produce sporting movements
- memorise the features of slow twitch fibres and fast twitch fibres
- practise summarising the differences between slow and fast twitch fibres in terms of force created, fatigue tolerance and aerobic/anaerobic energy supply
- give examples of different sporting activities that rely on either slow or fast twitch fibres, or a combination of the two.

Bone marrow and blood cells under a microscope

The skeleton and its functions

LEARNING OBJECTIVES

- Outline the four main functions of the skeleton.
- Name and locate the main bones in the skeleton and classify them according to type.
- Describe the functions of different bones.

How does our skeleton work? What bones make it up and what roles do they play in ensuring our bodies work and perform to their potential?

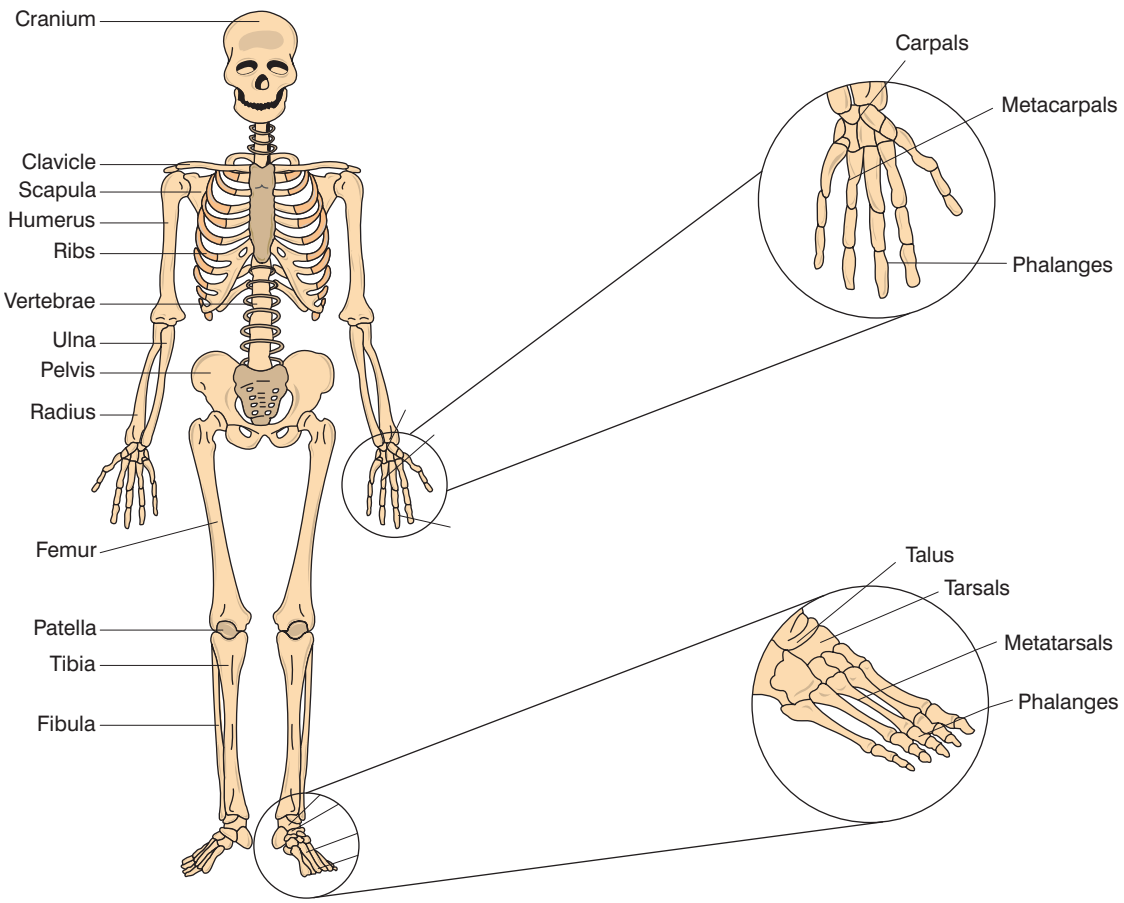
Starting point

The human **skeleton** is made up of 206 **bones** held together at the joints by ligaments. They vary in size from the longest (the femur) in your leg to the smallest found in the ear. The diagram shows the main bones in the human skeleton.

Key terms

skeleton: the internal framework of the body made up of 206 bones

bone: a hard, whitish, living tissue that makes up the skeleton; bones are lightweight but strong and perform many functions



1 For your first task use a copy of this diagram with the labels removed (or a blank template provided by your teacher). Close this book and label each of the bones identified above. Label as many of the bones as you can remember. Compare your version with the one here and take care to add in (and learn) all the ones you didn't include. (Keep your annotated diagram – you will need it for other tasks in this chapter.)

2 Many of the bones in our body have more common, everyday names. For example, the cranium is commonly called the skull. What are the proper names of the bones commonly known as:

a) the kneecap **b)** the shoulder blade

c) the collarbone **d)** the anklebone?

Exploring the skills

The skeleton has four functions.

- It gives the human body shape and support.
- It allows the body to create movement.
- It produces blood.
- It protects vital organs, such as the brain, heart and lungs.

Each of these functions relies on different bones located in the skeleton. The table below summarises how they perform these functions.

Function	How it does this	Example
Shape and support	The skeleton provides shape and support for the body. It forms the frame to which our muscles can attach and in which our organs can sit.	The backbone enables us to stay upright.
Muscle attachment for movement	Muscles are attached to the skeleton. Movement occurs when muscles contract and pull on bones making them move about a joint.	The biceps muscle connects the shoulder and elbow and helps with lifting.
Protection for vital organs	Internal organs are soft, delicate and easily damaged. These vital organs are protected by the skeleton.	The cranium protects the brain. The ribs help protect the heart and lungs.
Blood production	The centre of some large bones contains red bone marrow, which creates red blood cells.	The pelvis and femur are both important in blood production.

3 Add more notes to your skeleton diagram indicating the key functions of the bones mentioned in the table above.

Developing the skills

You can now connect the functions of the skeleton with some specific bones located within in it. In fact, bones come in many different shapes and sizes. The table below identifies the four different types of bone and the roles each type plays.

Types of bone	Function	Examples
Long bones  *Femur*	These act as levers to produce a large range of movement.	Femur, tibia, fibula Humerus, ulna, radius Phalanges Clavicle
Short bones  *Tarsal*	These are small and squat bones that enable movement. They can provide movement in lots of directions and also give strength.	Carpals Tarsals
Flat bones  *Scapula*	These provide a large surface area for muscles to attach to. They also provide protection for organs.	Pelvis Cranium Scapula
Irregular bones  *Vertebra*	These bones provide protection and support. They are shaped to suit the specific job they have to do.	Vertebrae

4 Shade the bones on your skeletal template using the colours shown in this table. Create a key to identify which type of bone each colour indicates.

5 Look at the picture of the skeleton and discuss with a partner which bones protect:

a) the heart **b)** the brain

c) the lungs **d)** the spinal column.

6 Then copy and complete this table.

Bone	Type	Function
Phalange		
Radius		
Scapula		
Pelvis		
Patella		
Metatarsal		

Applying the skills

During different sports or activities the skeleton is put under pressure to ensure that all of its various functions can operate. The different bones help our body during sport: for example, long bones act as levers to help you move fast, while short bones take impact and bear the body's weight.

7 Look at the photo on the previous page of a triple jumper in action. Which bones are involved in this sport?

REFLECTIVE LOG

Identify a sport or activity that you have participated in and make notes to answer the following questions: Which bones are involved? What types of bones are these? How do they protect the body during the activity?

Checklist for success

- ✔ Learn the different bones in your body and practise naming them.
- ✔ With a partner, quiz each other by pointing to a bone and asking your partner to name the bone and describe its function.
- ✔ Makes notes about bones in different parts of the body: for example, how many bones are there in the hand, what are they called and what are their functions?
- ✔ Practise classifying bones according to their type by colouring in a blank skeleton template several times.

Sound progress

- I can identify each of the skeleton's four functions.
- I can locate and name the main bones in the skeleton.
- I can describe the four different bone types (short, long, flat, irregular).

Excellent progress

- I can explain the four functions of the skeleton, giving an example of each function.
- I can locate and name the main bones in the skeleton, giving examples of how different bones are involved in various sporting activities.
- I can describe the four different bone types (short, long, flat, irregular) and explain the function of each type.