



What should I already know?

Movement

Humans and some other animals have a skeleton to support and protect them.

Animals with a backbone are called vertebrates.

Body systems

We can think of a human body as being made up of different systems.

Each system has a specific purpose in the body.

We have a circulatory system that pumps blood around, a skeletal system that supports us and a digestive system that provides energy from the food we eat.

What will I know by the end of the unit?

The skeleton

The skeleton allows movement at the joints.

The skeleton also protects some organs.

Most blood cells are made inside bones.

Muscles

Muscles contract to move bones at the joints.

Muscles can only contract and relax – they cannot push.

Many muscles interact and work in pairs to bring about opposite movements

Cells

Cells are the building blocks of life. They contain structures called organelles, which all have specific jobs.

Microscopes can be used to observe cells and other structures.

Some organisms, such as bacteria and protozoa, consist of only a single cell. They can, nevertheless, carry out all necessary life processes.

How cells work for an organism

A human body has a highly organised set of organ systems, organs, tissues and cells.

Many cells, such as muscle cells and nerve cells, are specialised, enabling them to carry out a specific task more effectively.

Body systems can be affected by certain drugs and by damage to other organs.

Vocabulary found in this unit

Antagonistic muscle	Muscle that opposes the action of the other. They work in pairs called antagonistic muscle pairs . For example, the bicep and tricep muscles
Arthritis	painful disease of the joints
Bacteria	(singular: bacterium) simple unicellular (single-celled) organisms, some of which can cause illness
Bone Marrow	tissue found inside some bones where new blood cells are made
Calcium	hard mineral found in bone
Cartilage	smooth tissue found at the end of bones, which reduces friction between them
Cell	the smallest structural and functional unit of an organism, which is typically microscopic and consists of cytoplasm and a nucleus enclosed in a membrane.
Cell membrane	the semipermeable membrane surrounding the cytoplasm of a cell.
Cell wall	a rigid layer lying outside the membrane of the cells of plants, fungi, and bacteria
Chloroplast	In plant cells which contains chlorophyll and in which photosynthesis takes place.
Cytoplasm	Chemical reactions take place here.
Diffusion	a physical process that refers to the net movement of molecules from a region of high concentration to one of lower concentration.
Digestive system	The group of organs that together enable digestion of food, by breakdown and absorption of food molecules



Euglena	A green single-celled freshwater organism with a flagellum.
Eukaryote	one of a group of unicellular organisms that have a nucleus
Flagellum	a slender threadlike structure, a microscopic appendage that enables many protozoa, bacteria, spermatozoa, etc. to swim.
Force	Force is measured in Newtons
Fracture	broken bone
Gas exchange	The primary function of the lungs involving the transfer of oxygen from inhaled air into the blood and the transfer of carbon dioxide from the blood
Immune system	the parts of the body that protect it against infections by pathogens such as viruses and bacteria; includes the white blood cells
Joint	The area where two bones are attached for the purpose of permitting body parts to move.
Ligament	connects bone to bone; made of stretchy fibres called collagen
Magnification	a measure of how many times bigger an image is than the object
Microscope	an optical instrument used for viewing very small objects, typically magnified several hundred times
Mitochondria	found in large numbers in most cells, in which respiration and energy production occur.
Multicellular	consisting of many cells.
Muscle	soft tissue with filaments that slide past each other, contracting to produce force, e.g. motion, heartbeat or peristalsis to move partly digested food
Muscular skeletal system	soft tissue with filaments that slide past each other, contracting to produce force, e.g. motion, heartbeat or peristalsis to move partly digested food
Nervous system	network of nerve cells and fibres in the body that carry electrical impulses around the body
Nucleus	Controls everything in a cell.
Skeleton	all the bones in the body
Structural adaptation	special features, for example of a cell, to enable specific functions to be carried out
Specialist cell	cells that have adapted to fulfil a specific function
Organ	An organ is a self-contained group of tissues that performs a specific function in the body. The heart, liver, and stomach are examples of organs in humans.
Organ system	An organ system is a group of organs that work together to perform a certain function in an organism's body. Most animals and plants have organs e.g. nervous system, digestive system
Organism	An organism refers to a living thing that has an organized structure
Osteoporosis	cells that have adapted to fulfil a specific function
Prokaryote	one of a group of unicellular organisms that have no nucleus
Recreational drugs	use of drugs by a person to alter their emotions, perceptions or feelings for recreational purposes
Reproductive system	organs in a male or female organism involved in producing offspring; in humans it is where sperm or eggs are produced
respiration	a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide.
Tendon	connects muscle to bone; made of stretchy fibres called collagen
Tissue	Tissues are groups of cells that have a similar structure and act together to perform a specific function

Unicellular	living thing made up of just one cell
Vacuole	part of a cell that contains liquid, and can be used by plants to keep the cell rigid and store substances

Key information	Key information
<p>Animal cell</p> <p>Plant cell</p> <p>Microscopes have been used for years to observe objects that are too small to see with the naked eye.</p> <p>Over time, the magnification of microscopes has significantly improved due to developments in technology. We now have microscopes that can examine specimens at an atomic level.</p> <p>We have made many important scientific discoveries thanks to microscopes.</p> <p>Specialised Plant and Animal Cells</p> <p>Antagonistic muscles</p> <p>Human Body Systems</p>	<p>Cells</p> <p>Cells are the basic building blocks of all animals and plants. They are so small, you need to use a light microscope to see them.</p> <p>Specialised cells</p> <ul style="list-style-type: none"> Specialised cells are designed to carry out a particular function, because of this they have specific features and adaptations to allow them to carry this out Both plant and animal cells can be specialised, with these specialised cells working together to help the organism to survive <p>Total magnification</p> <p>The magnification of each lens is shown next to the lens:</p> <p>Total magnification = eyepiece lens magnification × objective lens magnification</p> <p>For example, if the eyepiece magnification is ×10 and the objective lens magnification is ×40:</p> <p>Total magnification = 10 × 40 = ×400 (400 times).</p>

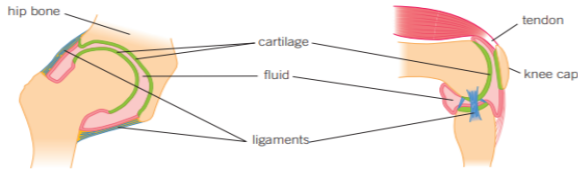
Movement

Joints occur between bones and allow movement, there are three main types of joints

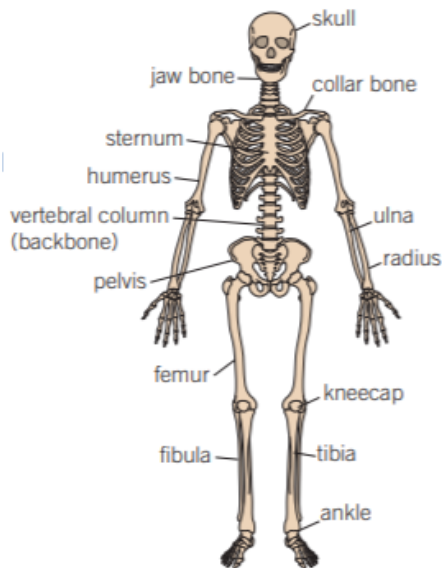
Hinge	Ball and socket	Fixed
For back and forward movement, e.g. knees	For movement in all directions, e.g. hips	Do not allow movement, e.g. skull

Joints have three main types of tissue:

Ligaments	Cartilage	Tendons
Connect bone to bone	Coats the end of bones as a protection	Connects bone to muscle



The skeleton



(Left) X-ray of compound fractures of tibia and fibula. (Right) A rod has been placed down the center of the tibia to hold the bone fragments in place.

Comparison of animal and plant cells.

Part

Cell membrane

Cytoplasm

Nucleus

Mitochondria

Vacuole

Cell wall

Antagonistic muscles

Muscles can only pull and cannot push. This would be a problem if a joint were controlled by just one muscle. As soon as the muscle had contracted and pulled on a bone, that would be it, with no way to move the bone back again. This problem is solved by having muscles in pairs, called **antagonistic muscles**.

For example, your elbow joint has two muscles that move your forearm up or down. These are the biceps on the front of the upper arm and the triceps on the back of the upper arm:

- to raise the forearm, the biceps contracts and the triceps relaxes
- to lower the forearm again, the triceps contracts and the biceps relaxes

Found in

Plant and animal cells

Plant and animal cells

Plant and animal cells

Plant and animal cells

Plant cells only

Plant cells only



Movement

Different types of synovial joint allow different types of movement. The table describes two types of joint:

Type of joint	Examples	Movement allowed
Hinge joint	Knee, elbow	The same as opening and closing a door, with no rotation (turning)
Ball and socket	Hip, shoulder	Back and forth in all directions, and rotation

The bones cannot move on their own - they need muscles for this to happen.

The skeleton

- The **skeleton** is made up of 206 **bones** which are a type of **tissue**
- Bones have a blood supply and are a living tissue
- The skeleton is part of the **muscular-skeletal system**
- The four main functions of the skeleton are:
 - To support the body – to keep you upright and hold **organs** in place
 - Protect organs – such as the skull protecting the brain
 - Movement – by working with muscles to allow you to move
 - Making blood cells – the **bone marrow** produces red and white blood cells

Useful Websites

Skeletal and muscular systems	https://www.bbc.co.uk/bitesize/guides/zpkq7ty/revision/1
Cells to systems	https://www.bbc.co.uk/bitesize/guides/z9hyvcw/revision/2
	https://www.bbc.co.uk/bitesize/guides/z9hyvcw/revision/6
Unicellular organisms	https://www.youtube.com/watch?v=EcqKXm6X7eI
Cells	https://www.s-cool.co.uk/gcse/biology/cells/revise-it/plant-and-animal-cells
Microscopes	https://www.youtube.com/watch?v=4TbQTmatV2k