7Ca FITNESS

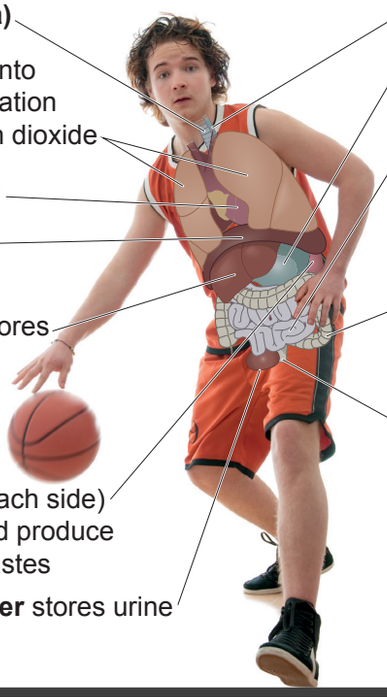
Being 'fit' means that your body is able to do the activities that your lifestyle demands. This includes things like being able to run upstairs without getting out of breath or being strong enough to lift things.

Fitness therefore means different things to different people, but we can think of fitness being made up of four S-factors: 'suppleness', 'strength', 'speed' and 'stamina'. A gymnast needs to be supple to bend and twist easily, a weight-lifter needs to have strength, a sprinter needs speed, and a long-distance runner needs to be able to keep going for a long time (stamina).

Just being able to do everyday things does not give you any idea of *how* fit you are. Scientists use **criteria** (standards) to work out how fit someone is. For example, how far you can run could be used as a criterion to judge fitness.

People exercise to develop different S-factors and keep their **organs** and **organ systems** working properly.

A | All these people are fit.



B | Working out helps to keep many different organs working properly.

1. Look at the photos above. For each activity write down which S-factor you think is the most important. Explain your reasoning in each case.
2. Arrange this list in order of size, starting with the smallest: cell, organ, organ system, tissue.
3. The breathing (or gas exchange) system is important for athletes. Name three parts of this system.
4. What organ system do each of the organs in photo B belong to? Use a table to show your answers.
5. A long-distance runner is training to increase her stamina. Suggest a criterion she could use to judge whether her training programme is working.

7Ca MUSCLES AND BREATHING

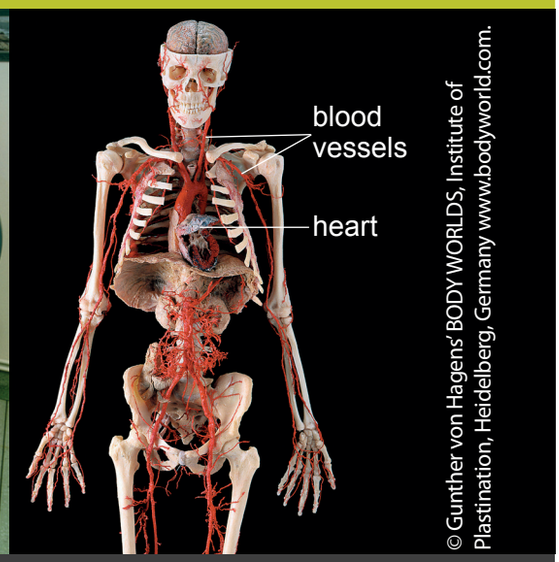
HOW DO MUSCLES HELP WITH GAS EXCHANGE?

About one-fifth or 20 per cent of the air is **oxygen**. The athlete in photo A is **breathing** 100 per cent oxygen. The idea is that this makes sure all his **cells** get all the oxygen they need, to help him recover quickly from an injury.

You need oxygen for your cells to respire and release **energy**. Energy is needed for everything your body does. Cells get the oxygen they need from your blood. Oxygen enters your blood in your lungs.

Respiration in cells produces **carbon dioxide** gas, which enters your blood. In your lungs, a lot of carbon dioxide leaves your blood and is removed from your body when you breathe out. The carbon dioxide is **excreted**.

A | 'Oxygen therapy' is becoming popular for injured athletes.



© Gunther von Hagens' BODY WORLDS, Institute of Plastination, Heidelberg, Germany www.bodyworld.com.

B | Your **circulatory system** carries blood around your body.

FACT

There is a lot of tubing in the lungs. There are about 2400 km of tubes carrying air and another 1600 km of tubes carrying blood!

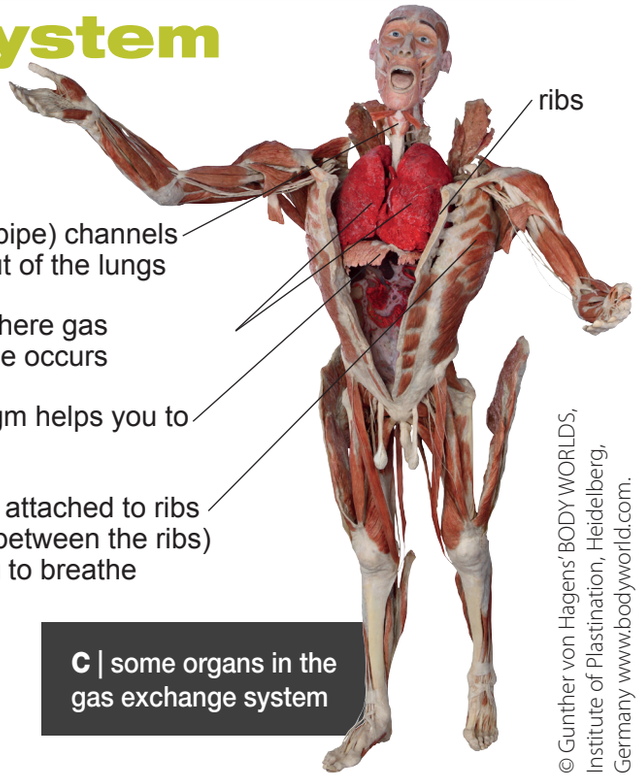
The gas exchange system

In your lungs, oxygen goes into the blood and carbon dioxide leaves the blood. One gas is exchanged for the other and so this is called **gas exchange**. The organs that help with gas exchange form the **breathing** or **gas exchange system**.

1 What does your body need oxygen for?

2 List two organs in the circulatory system.

3 a| List two gases that are carried around your body.
b| How are these gases carried?
c| What happens to each of these gases in the lungs?



C | some organs in the gas exchange system

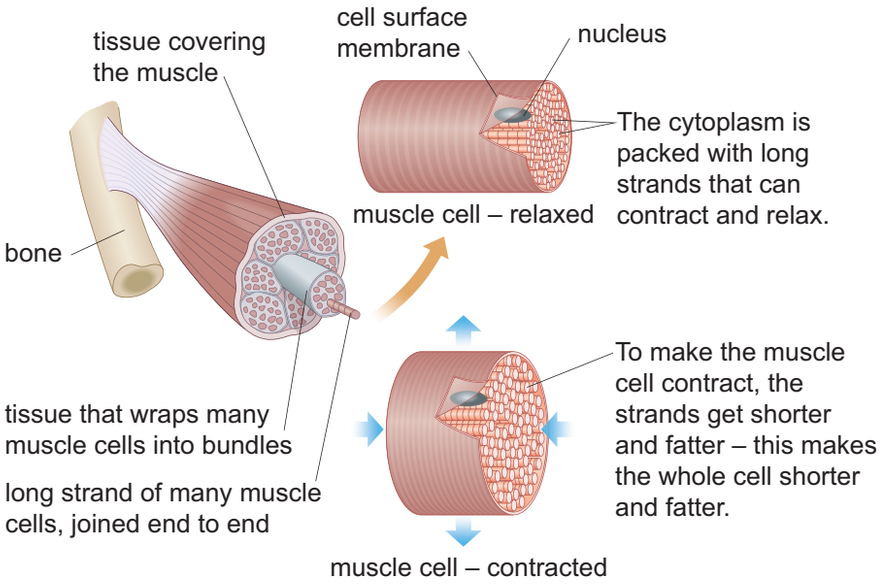
© Gunther von Hagens' BODY WORLDS, Institute of Plastination, Heidelberg, Germany www.bodyworld.com.

Breathing

Breathing is when muscles between the ribs and in the diaphragm change the size of the lungs. Muscles contain different types of **tissue**, including nerve tissue and **muscle tissue**. Muscle tissue is made of muscle cells, which can change shape.

A muscle cell can get short and fat. When it does this, we say that it **contracts**. When it goes back to its original shape and size, it **relaxes**.

Cells in a tissue all work together. So, all the muscle cells in muscle tissue contract and relax together, which means that the whole muscle contracts and relaxes.



D | Muscle cells are **adapted** to their **function** – they can change shape. These muscle cells are not branched (unlike those in the heart).

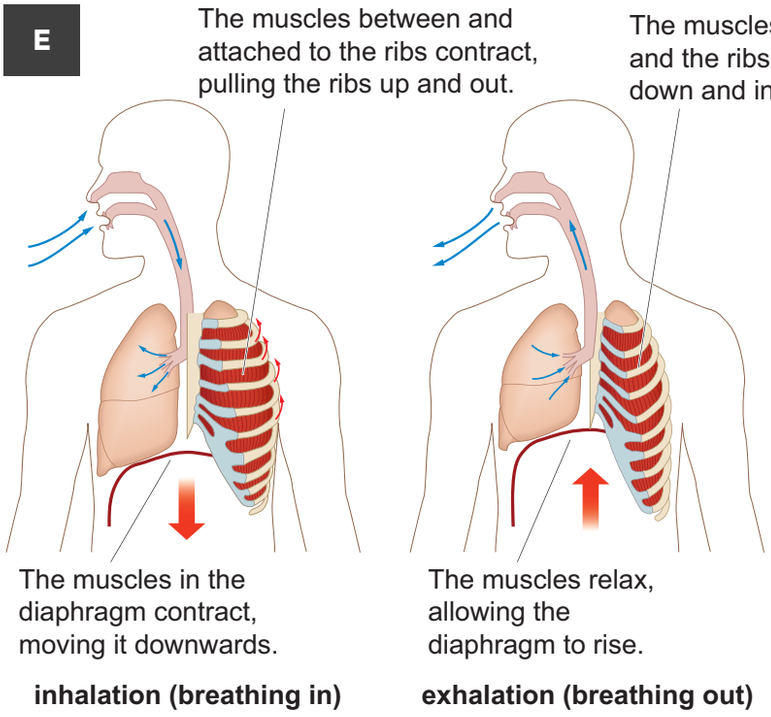
4 Why is a muscle an organ?

5 a| What is the function of muscle cells?
b| How are muscle cells adapted to their function?

When the muscles attached to your ribs contract, they pull the ribs outwards and upwards. When the muscles in your diaphragm contract, the diaphragm moves downwards and flattens out. Both these actions happen together and allow your lungs to increase in size. As they increase in size, air flows into them – you **inhale**.

When the rib and diaphragm muscles relax, the opposite happens. Air flows out of your lungs – you **exhale**. The movement of air into and out of your lungs is called **ventilation**. The number of times you inhale and exhale in one minute is your **breathing rate**.

E



6 Gavin breathes in and out seven times in 30 seconds. What is his breathing rate?

7 Guillain-Barré syndrome is a disease in which muscles become weak.
a| Explain why someone with this disease may find it difficult to breathe.
b| Explain why people with this disease may not get enough oxygen in their blood.
c| Suggest how a person with this condition might be helped.

8 The gas exchange system is also called the breathing, respiratory or ventilation system. Which of these terms do you think is the least good? Explain your reasoning.

I can ...

- describe how muscles in the gas exchange system allow ventilation
- describe what happens during gas exchange in the lungs.

7Cb MUSCLES AND BLOOD

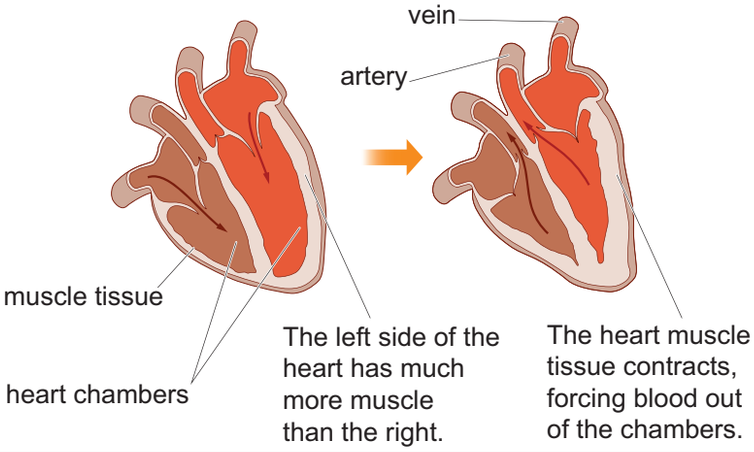
HOW DO MUSCLES HELP WITH THE CIRCULATION OF BLOOD CELLS?

Sports scientists use machines to measure how well an athlete's body copes with exercise. The machines record things like breathing rate and **pulse rate**. The **data** helps the scientists to see if training programmes are working.

Each time your heart pumps blood, it causes a **pulse** that you can feel in places like your wrist. Your pulse rate is the number of pulse beats you can feel in a minute.

Inside the heart there are **chambers** that fill with blood. When the chambers are full, the muscle tissue in the wall of the heart contracts. This makes the chambers smaller, pumping the blood out of them.

A | a sports scientist at work



B | Muscle tissue in the heart contracts to push blood through the heart and into blood vessels called arteries.

1 Suggest two measurements that are being taken from the athlete in photo A.

2 a| What is a pulse caused by?

b| Hattie counts 16 pulses in her wrist in 15 seconds. What is her pulse rate?

3 After blood has left the heart, what must the muscle tissue do so that the chambers can fill with blood again?

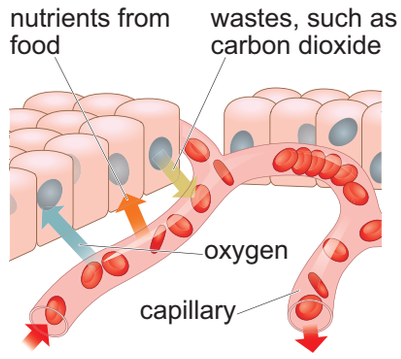
FACT

Fitter people have lower pulse rates than unfit people when resting. Most people have a pulse rate of 60–100 beats per minute. Athletes' pulse rates are often below 50 beats per minute.

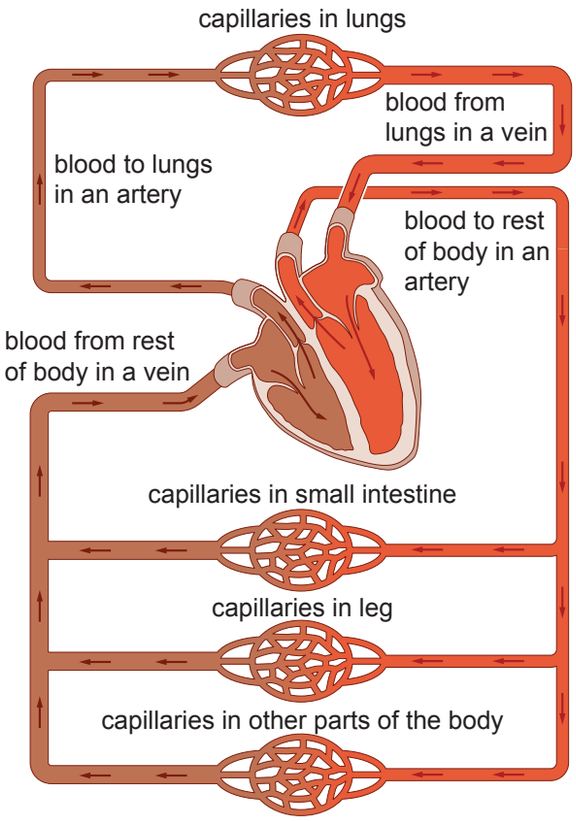
Blood vessels

The blood that is pumped out of the heart enters **blood vessels** called **arteries**. Arteries lead into tiny blood vessels called **capillaries**. Capillaries have very thin walls so that nutrients (from food) and oxygen can leave the blood and get to the cells in all the tissues in the body. Cells use these substances for respiration and to produce new materials for growth and repair.

The blood also picks up waste materials from cells as it travels through capillaries. It then flows into **veins**, which are wider tubes carrying blood back to the heart.



C | Substances can move into and out of capillaries.



D | There are many branches in the circulatory system but only a few are shown in this model. The bright red blood is carrying more oxygen than the dark red blood.

Red blood cells are made inside your bones, in a tissue called **bone marrow**. Blood contains other cells too. **White blood cells**, which are used to fight infections and keep you healthy, are also made in bone marrow.

FACT

A red blood cell only lasts for about 120 days. We need so many of them that an adult produces about 200 000 000 000 (200 billion) red blood cells every day.

7 Why are bones and the blood considered to be organs?

8 Suggest why bone marrow has many capillaries in it.

9 a| List three main parts of the blood.
b| What does each part do?
c| Where are blood cells made?
d| How are red blood cells adapted to their function?

4 Name one waste produced by cells.

5 a| What are the functions of arteries, capillaries and veins?
b| How are capillaries adapted to their function?

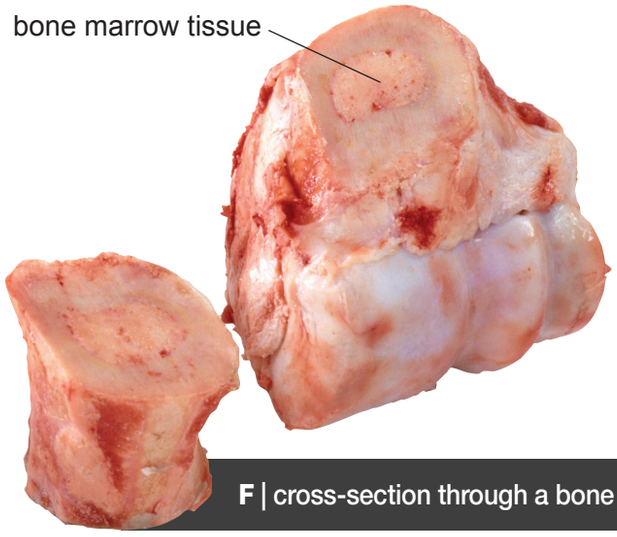
6 Look carefully at diagrams B and D. Suggest why the left-hand side of the heart has more muscle tissue.

Blood

Blood is mainly a liquid called **plasma**. Nutrients and waste materials are carried by blood dissolved in the plasma.

Oxygen is carried in cells called **red blood cells**. These cells lack **nuclei**, which allows the **cytoplasm** to be packed full of a substance called **haemoglobin** (*hee-mow-**glow**-bin*). The haemoglobin carries the oxygen. The cells have a curved disc shape, which gives them a large **surface area**. This means that oxygen can quickly get into and out of the cells.

E | red blood cells (magnification ×6000)



F | cross-section through a bone

I can ...

- describe the role of muscles in the heart
- describe the functions of the different parts of blood and where the different parts are made.

7Cb SCIENTIFIC QUESTIONS

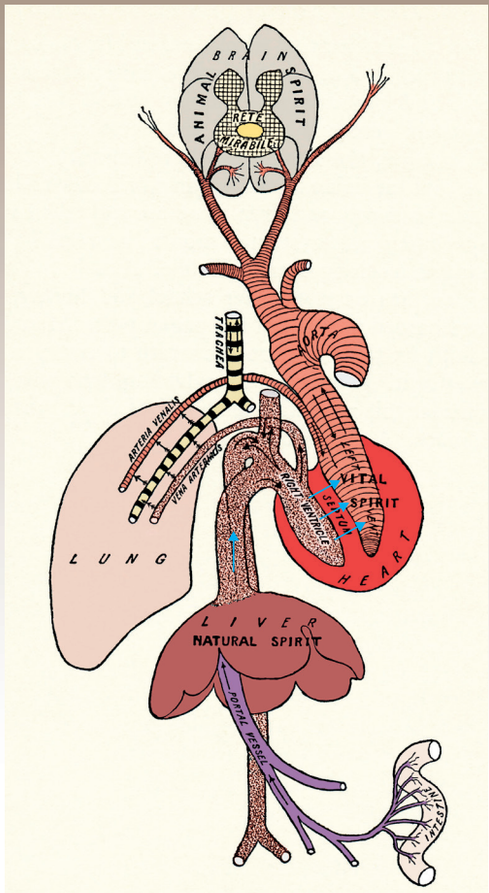
WHAT ARE SCIENTIFIC QUESTIONS?

A Roman doctor called Galen (129–200 CE) said that the liver looked like blood and so blood must be made in the liver. He also thought that the body used up blood and that the heart had to beat in order to 'attract' blood into it. Blood in the heart then mixed with oxygen from the lungs and formed a different type of blood that travelled to all the parts of the body, where it was used up. Galen didn't know about capillaries because they are too small to see without magnifying them. Galen was so famous that people believed him for another 1500 years! Believing what someone says is one way to gain knowledge but it's not how modern scientists work.

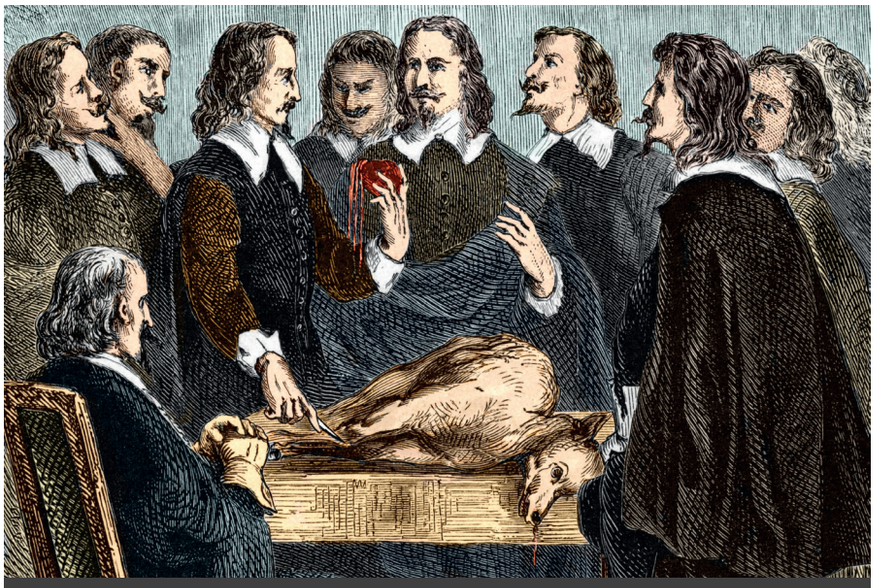
Scientists often use the **scientific method** to gain knowledge (see pages 24–25). They ask questions and come up with ideas (**hypotheses**). They keep testing those hypotheses to see if they are correct or whether they need changing.

Scientists often start by thinking up questions about **observations** they have made. Galen observed hearts moving and asked 'Why do hearts beat?'

William Harvey (1578–1657) asked the same question but he thought that the heart was a pump. Unlike Galen, he tested his idea. His experiments included cutting into live animals to watch their hearts. He also squashed an animal heart with his hand and made it pump some water. He then did a famous calculation, shown in the Method opposite.



A | Galen's ideas



B | the English doctor William Harvey holding a dissected heart

So much blood comes out of the heart each day that it would be impossible for the liver to make it all! Harvey's work led him to the **theory** that blood was not used up but flowed away from the heart in arteries and then back towards it in veins. This theory of blood circulation predicted the existence of other tubes connecting arteries to veins. Capillaries were later discovered in 1661 by Marcello Malpighi (1628–1694).

1 Where are blood cells actually made?

WORKING SCIENTIFICALLY

Method

A | Hold two fingers firmly on your wrist, as shown in photo C. You should feel your pulse.

C

B | Count the pulse beats you feel in 15 seconds. Multiply this by four and this gives you your pulse rate in beats per minute.

C | Harvey measured the volume of the big left-hand chamber of the heart in dead bodies. The volume of this chamber in you is about 130 cm^3. This volume falls to about half that when your heart muscle contracts. Use this information to work out the volume of blood your heart pumps each minute.

D | Now work out the volume of blood your heart pumps each day.

Types of question

The question 'Why do hearts beat?' is a scientific question. However, of the two doctors mentioned here, only Harvey answered it in a scientific way. A scientific question is one that can be answered again and again using information from experiments and investigations.

Some scientific questions have not been answered because we don't yet have the right technology or because we haven't done enough experiments. For example, 'What do the newly discovered MSC cells do in the heart?'

Other questions are not scientific because they cannot be answered using investigations or experiments. These include **ethical questions**, which are questions about what people think is fair or right or wrong.

D | different types of questions

2 Jo's pulse rate is 65 beats per minute. Using the information in step C in the Method above, work out the volume of blood her heart pumps each hour. Show your working.

3 What prediction did Harvey make using his theory about circulation?

4 In what way did Harvey act more scientifically than Galen?

5 Think up a scientific question about the liver.

6 Say whether each of these questions is a scientific, non-scientific and/or an ethical question.

A| Are parts of a taxi driver's brain bigger than average?

B| Should William Harvey have cut open live animals?

C| Do older people generally have lower pulse rates than younger people?

D| Do roses smell nicer than freesia flowers?

E| Does exercise affect your pulse rate?

I can ...

- describe the role of scientific questions in the scientific method
- identify scientific, non-scientific and ethical questions.

7Cc THE SKELETON

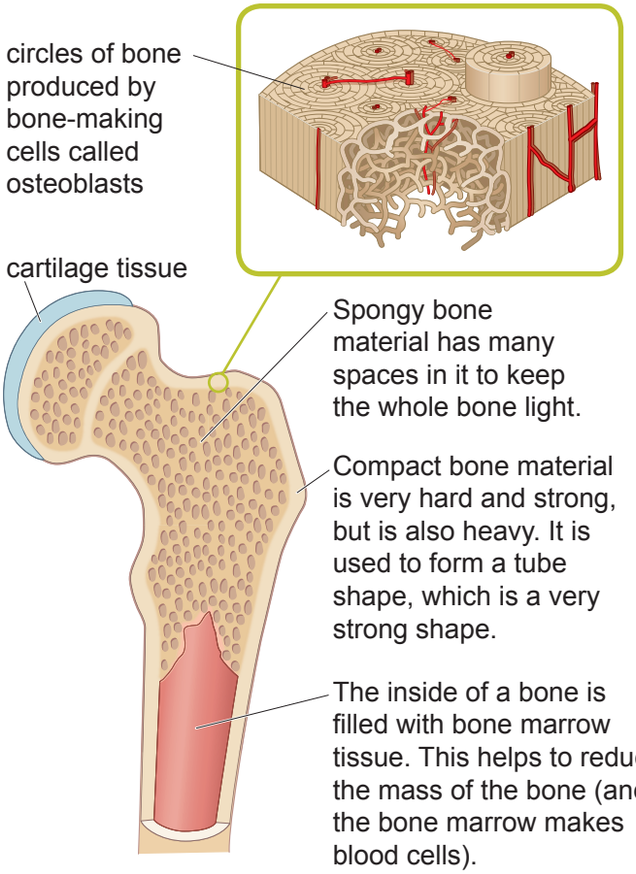
WHAT ARE THE FUNCTIONS OF THE SKELETON?

People who do sport for a living need to get treatment quickly if they are injured. Big football clubs spend millions on building specialist treatment centres to ensure their players get the best possible treatment.

A | Common footballing injuries include broken bones and damage to cartilage, tendons and ligaments.

Bones

Many people think that bones are not living, but bones *are* living organs. They grow as you grow and repair themselves if they **fracture** (break). Bones are hard and strong so that they can stand up to hard knocks and **pressure**. They are also light so they can be moved easily.



B | Bone-making cells (osteoblasts) can produce bone material in different ways, forming compact bone and spongy bone.

FACT

Babies are born with about 270 bones but some of them fuse together as they grow. An adult has 206 bones.

1 a| State two things that osteoblasts need to stay alive.

b| What process do osteoblasts need these things for?

2 Explain why a large bone can be both strong and light.

3 How can you tell that the bone in diagram B is an organ?

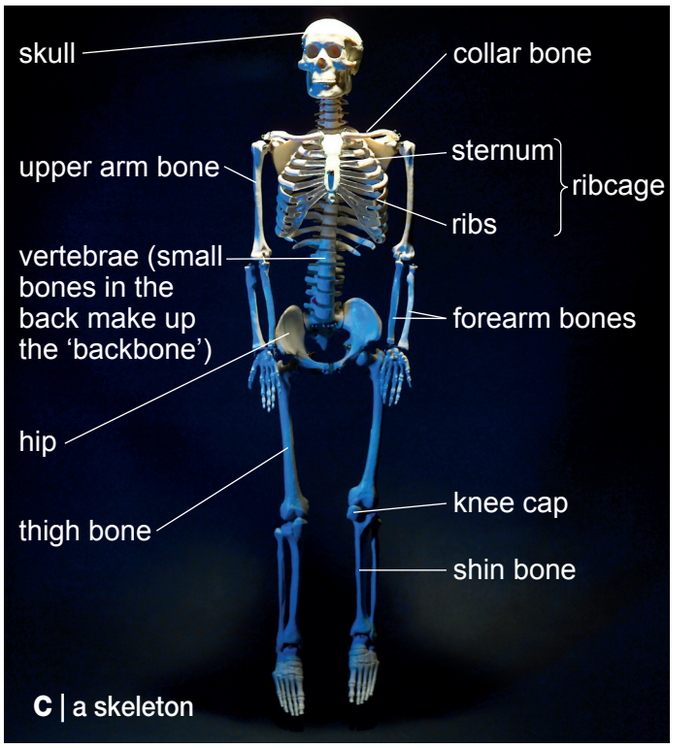
Support

The bones in your body form your **skeleton**, shown in photo C. Your skeleton makes sure that your body keeps its shape and also supports your body. The **backbone** is made up of smaller bones called **vertebrae** and is the human body's main support.

Some bones help to support organs. For example, your lungs would collapse without your ribs.

4 What do your ribs and sternum form?

5 Give one function of the backbone.

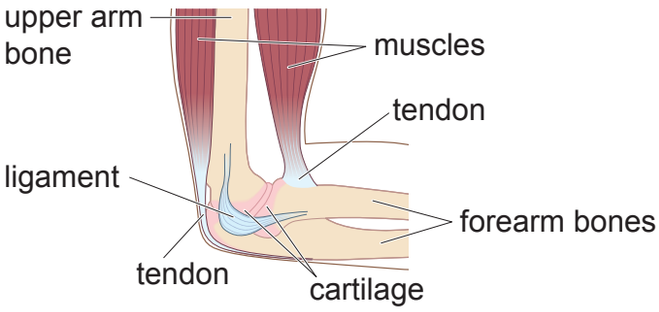


C | a skeleton

Movement

Two bones next to each other can form a **flexible joint**. The bones in a flexible joint are moved by muscles, which are attached to the bones by **tendons**. **Ligaments** hold the bones in a flexible joint together. The ends of bones in a flexible joint are often covered in a slippery tissue called **cartilage**, which helps them slide past each other.

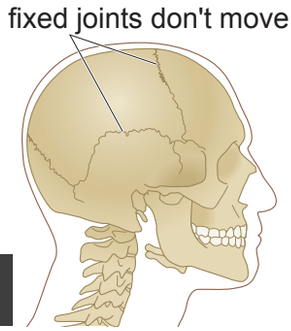
Flexible joints can be damaged when playing sports. A sprain occurs when a ligament is stretched or torn. Sprains can cause dislocations, in which bones in a joint move out of line so that the joint doesn't work. When people 'pull muscles', either a muscle or the tendon that connects the muscle to a bone gets a small tear in it.



F | An elbow is a type of flexible joint called a 'hinge joint'.

Protection

Some bones protect organs in the body. For example, the **skull** protects the **brain**. The skull is actually made of 22 bones that are joined by **fixed joints**.



D

6 The nervous system includes the brain and the spinal cord. Your spinal cord is a large bundle of important nerves that runs down your back. Which bones protect:

a| your brain b| your spinal cord?

7 Which organs are protected by your ribcage?

FACT

The smallest bone in the body is the stapes or stirrup bone in the ear. It's about the size of a grain of rice, and its function is to transfer sound waves into the inner ear.

E | X-rays allow us to see bones inside the body. This is an X-ray of a hip, which is a type of flexible joint called a 'ball and socket' joint.

8 a| List three different types of joint.

b| Which of these joints allows movement in the most directions?

c| What causes the bones to move?

9 Describe the different functions of bones.

10 Look at X-ray E.

a| What bone forms the 'ball' in this joint?

b| The joint on the right of the X-ray is normal. What has happened to the joint on the left?

c| Suggest how this has occurred.

I can ...

- describe the functions of different bones in the skeleton
- describe some different types of joint.

7Cc SENTENCES

WHAT ARE THE WAYS IN WHICH SENTENCES ARE BUILT?

Scientists write about their experiments. The reports they write are called **scientific papers**. Scientific papers are published in scientific magazines called **journals**. Other scientists read journals. They learn about new discoveries. They also learn about how those new discoveries were made.

Most scientific journals are published in English, so it is useful for scientists to learn to write good English. However, if they struggle with English, there are people who can help by translating scientific papers into good English.

There is a convention for how a scientific report is set out (see pages 10–11). Scientists also need to follow grammatical rules when they write. This makes sure that their papers are easily understood.

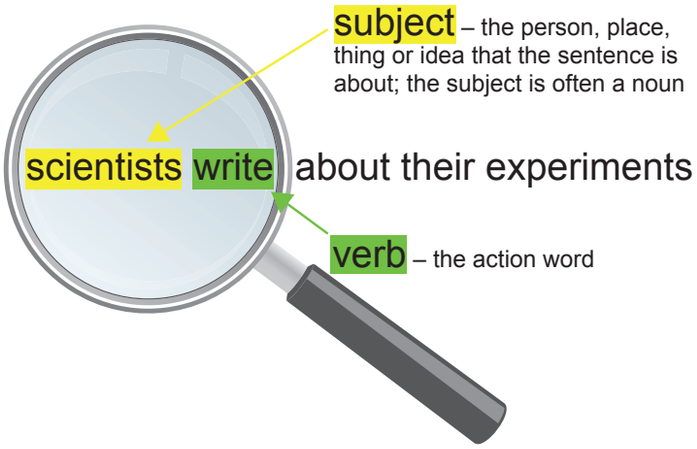
A | Papers are published in journals, which are mainly published in English.

Scientific information needs to be written in clear, accurate sentences. A sentence is made up of **clauses**. A clause contains a **subject** and a verb, as shown in diagram B.

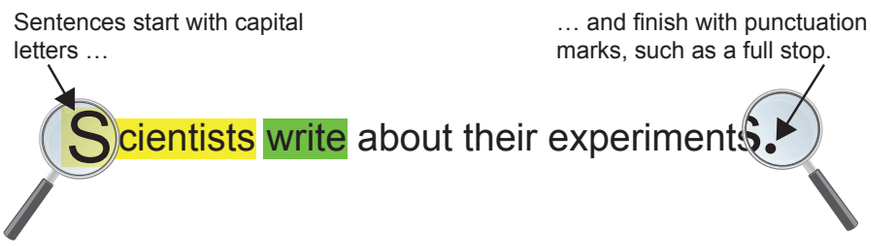
A clause that makes sense on its own is called a main clause. Adding a capital letter and a full stop turns it into a simple sentence, as shown in diagram C.

Short, single-clause sentences are particularly good for writing **topic sentences**, starting and ending reports, and writing a **method**.

B



C



LITERACY & COMMUNICATION

1 How do you start and finish all sentences?

2 What are the subjects and verbs in the following simple sentences?

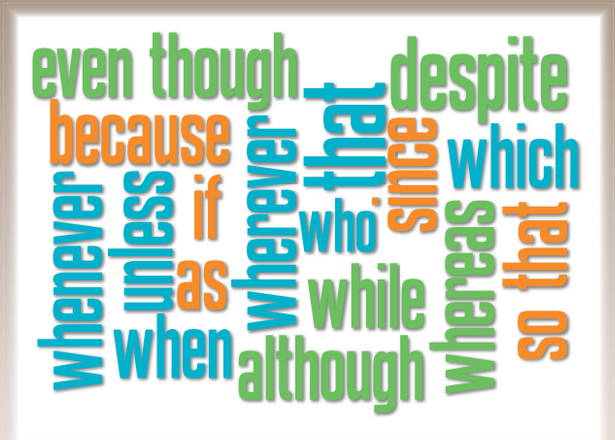
A| The ribs protect the lungs.

B| Muscles move bones.

3 Rearrange the words below to make two simple sentences.

A| pumps heart blood the

B| cells oxygen need your all



D | common subordinating conjunctions used to make complex sentences

Complex sentences

A subordinate clause gives extra information about the main clause. When linked to a main clause a subordinate clause forms a **complex sentence**. Subordinate clauses can be placed in different positions in the sentence. In the following examples, the subordinate clauses are shown in italic type.

Muscle cells get shorter and fatter *as they contract*.

As they contract, muscle cells get shorter and fatter.

Muscles cells, *as they contract*, get shorter and fatter.

To join the clauses together, you use subordinating conjunctions.

4 Read the sentences below. Identify the main clause, subordinate clause and subordinating conjunction in each sentence.

A| Blood from the capillaries enters the veins, which carry it back to the heart.

B| Capillaries, so that nutrients and oxygen can get to the cells in all the tissues in the body, have very thin walls.

C| When the diaphragm and rib muscles contract, you inhale.

Slang

Scientists need to explain their work to people all over the world and so they must use both grammatically correct sentences as well as words that all English speakers understand. You may use words in school in ways that give them different meanings from usual. You may also use new, made-up words. You should avoid using words in these ways when writing scientific reports.

I can ...

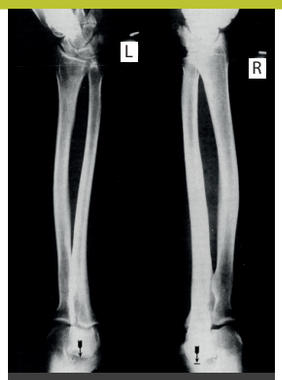
- write using a variety of appropriate sentence types
- use subordinating conjunctions.

7Cd MUSCLES AND MOVING

HOW ARE MUSCLES USED IN THE LOCOMOTOR SYSTEM?

Skeletons are always changing, and athletes' training programmes are designed to change both their muscles and their bones. These changes help the athletes become better at their particular sports. This doesn't just apply to athletes, though. People who do a lot of manual work develop thicker arm bones than people who work in offices. The thicker bones are needed to support bigger muscles.

Amir Khan has boxed in the lightweight class (59–61.2 kg) and in the light welterweight class (61.3–63.5 kg).



C | an X-ray of the forearm bones of a professional tennis player showing that playing tennis has changed the bones

The muscles and bones in your body form an organ system called the **locomotor system**. It is this system that allows you to move all the parts of your body. The study of how muscles and bones work together is called **biomechanics**.

FACT

The smallest muscle in your body is attached to the smallest bone. The stapedius muscle is attached to the stapes bone in the ear. The muscle is about 1 mm long.

1 a| Match photos A and B to the different boxing classes.
b| How did Amir Khan put on extra mass to fight in the heavier class?

2 Look at photo C. In which hand do you think the tennis player holds the racquet? Explain your reasoning.

3 Make a fist and tighten your fingers.
a| Where are the muscles that let you tighten your fingers?
b| What happens to them when you tighten your fingers?

Antagonistic muscles

Muscles are organs that can contract. When they contract they get shorter and fatter. So, if a muscle is attached to a bone, it will pull on the bone when it contracts. The muscle will generate a **force** that can be measured, in **newtons (N)**.

D | The force from a muscle or a group of muscles can be measured in newtons using a type of newtonmeter.

4 Name two organs in the locomotor system.

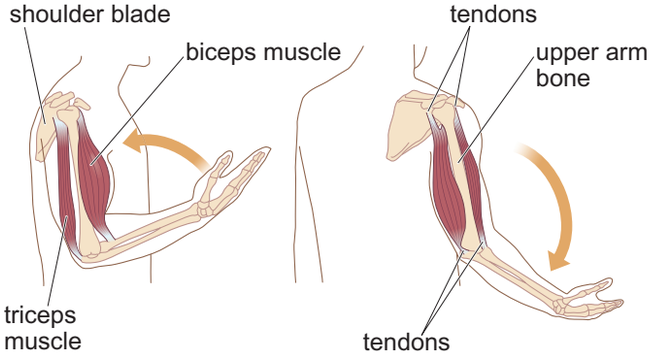
When a muscle stops contracting, it relaxes. This means that it returns to its original size and shape. Muscles do not generate a force when they relax, which means that muscles cannot push on bones – they can only pull them.

For a bone in a joint to be moved in two different directions, it needs to be pulled by two different muscles. Pairs of muscles like this are called **antagonistic pairs**. The **biceps** and **triceps** are an antagonistic pair of muscles in the upper arm, shown in diagram F.

F

When you lift your arm, the biceps muscle contracts.

When you put your arm down, the biceps muscle is stretched.



When you lift your arm, the triceps muscle is stretched.

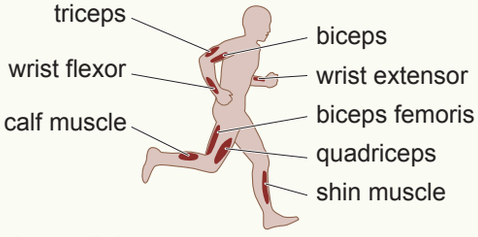
When you put your arm down, the triceps muscle contracts.

5 When the biceps muscle contracts, what happens to the triceps muscle?

6 Why do muscles work in antagonistic pairs?

7 Look at drawing G. It shows some muscles in the body. You don't need to remember all their names!

G



a| Write down all the antagonistic pairs you can see.

b| If you point your toes to the ground, which muscle contracts?

c| If you raise your toes, which muscle contracts?

d| Describe fully what happens just before and during contraction of the biceps femoris muscle.

E | the bite force of a crocodile being measured

FACT

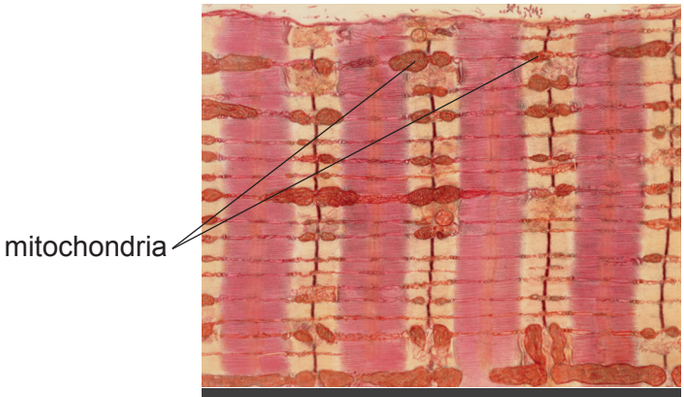
The human muscle that can exert the most force is the masseter or jaw muscle. The maximum force of a human bite is about 2500 N. In dogs it is about 6900 N. Crocodiles have 16 500 N of bite force!

Muscle control

To make a muscle contract, the brain sends electrical messages down the **spinal cord** into **nerves** attached to the muscle. These electrical messages are called **impulses**.

Energy needs

Muscles have to work hard and so their cells need a lot of energy. Respiration releases energy and occurs in tiny structures in cells called **mitochondria**. So, it is no surprise to find that muscle cells usually contain more mitochondria than other cells do.



H | Muscle cells are packed with mitochondria (magnification ×4750).

I can ...

- explain how antagonistic pairs of muscles operate and are controlled, to allow movement.

7Ce DRUGS

HOW DO DRUGS AFFECT OUR BODIES?

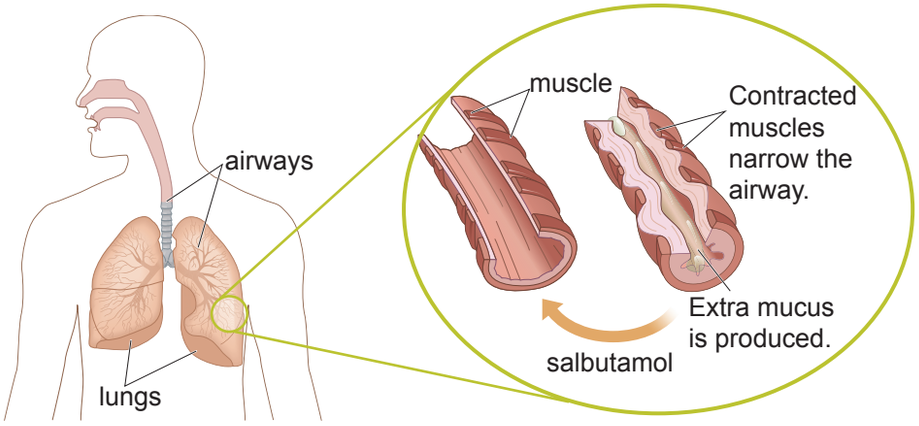
Many professional athletes avoid certain substances because of the effects that they have on their bodies. For example, many athletes do not drink alcohol because it can interfere with the way in which muscles grow and recover after exercise.

A **drug** is a substance that affects the way your body works. Alcohol is a drug. Some drugs are **medicines**, which help people recover from illness or injury. For example:

- paracetamol reduces pain
- ibuprofen reduces pain and swelling
- decongestants in cold medicines help you breathe more easily.

A | These are all drugs.

During an asthma attack, the muscles surrounding the tubes carrying air contract hard. This makes it difficult to breathe, but a medicine can make the muscles relax.



B | Medicines like salbutamol are used to treat asthma attacks.

1 a| Suggest a sports injury that you might take medicine(s) for.

b| What medicine(s) would you take and why?

2 In an asthma attack, why is it hard to breathe?

3 a| What is the useful effect of paracetamol?

b| What is its side-effect?

Although many drugs are useful, they can have harmful or unpleasant **side-effects**. For example, paracetamol can damage the liver. Drugs often damage the liver because this organ breaks drugs down.

Substance misuse

Some drugs (such as alcohol and **nicotine**) can become **addictive**, which means that people feel they can't cope without them. Addicts often continue using a drug even though they can see the damage it's causing. The harmful use of any substance is called **substance misuse**. Misusing alcohol can cause brain and liver damage.

FACT

In the 1890s, heroin was a major ingredient in a cough syrup.

Recreational drugs

Recreational drugs are drugs taken for pleasure. **Caffeine**, nicotine and alcohol are legal recreational drugs. Others are illegal because of their side-effects. **Cannabis** can cause memory loss and mental illness. **Ecstasy** can cause mental illness, kidney problems, and even death. **Cocaine** is addictive and can cause blocked arteries. **Heroin** is also addictive. It can cause collapsed veins, vomiting and severe headaches.

C | damage caused by cocaine

D | The man in this advert had his legs removed because of a disease caused by smoking.

Stimulants

Drugs often affect the **nervous system**, which controls your body using electrical signals called impulses. Drugs that cause the nervous system to carry impulses faster are **stimulants**. They can decrease your **reaction time**, which is the time it takes you to respond to things happening around you. Caffeine, cocaine and ecstasy are all stimulants.

4 Why do people continue to misuse cocaine even when they see it harming them?

5 Look at photo A. Which substances are:

a| harmful
b| legal to buy at any age
c| only legal to buy above a certain age
d| illegal?

Depressants

Drugs that cause the nervous system to carry impulses more slowly are **depressants**. Heroin and the **solvents** found in glues and paints are dangerous depressants. Solvents can stop the heart and lungs working and cause severe brain damage.

Alcohol is a depressant and large quantities can change a person's behaviour. People become loud and aggressive because alcohol stops parts of the brain working. Too much alcohol causes vomiting. In very large amounts it can cause death, because it stops the brain sending impulses to the breathing muscles and so breathing stops.

E | The amount of alcohol in drinks is measured in units. To avoid damaging their bodies, adult men are advised not to drink more than 21 units per week and women no more than 14 units per week.

6 Explain why some people feel more awake after drinking coffee.

7 Complete a table to describe four drugs of your choice. Use the headings 'Name of drug', 'Stimulant or depressant?' and 'Side-effects'.

8 a| Where are the muscles for breathing found?
b| Explain how alcohol can stop these muscles working.

I can ...

- recall how different drugs affect the body.

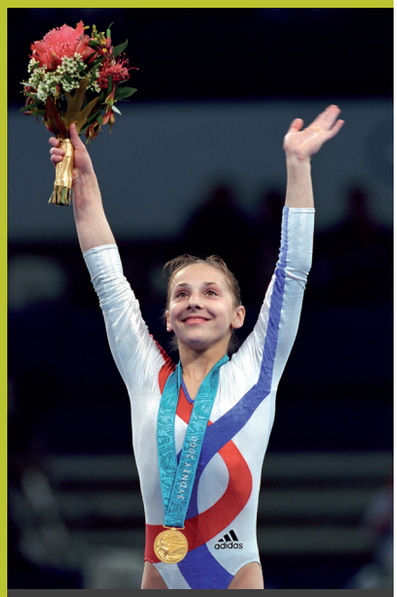
7Ce DRUGS AND SPORT

HOW DO ATHLETES TRY TO IMPROVE THEIR CHANCES OF WINNING?

Sports competitors are regularly tested for drugs to try to stop the use of drugs to improve performance. It can, though, be difficult to decide what is cheating and what is not.

In 1964, the Finnish cross-country skier Eero Mäntyranta won two Olympic gold medals. He could ski faster than his rivals because he had more red blood cells than them. His body naturally produced more of a chemical, nicknamed 'epo', which causes red blood cell production. In 1989, a drugs company started making artificial epo to help people with AIDS, but some athletes were soon using it.

A | Frankie Sheahan got a two-year ban from rugby after salbutamol was found in his body. The ban was lifted after he proved he needed the drug for asthma.



B | The gymnast Andreea Răducan lost her Olympic gold medal when a drugs test found a decongestant in her body. She said she had only taken two tablets for a cold.

Some athletes take steroids, such as testosterone, to increase muscle growth. Testosterone is a steroid **sex hormone** made in the **testes** and **ovaries**. Some people naturally produce more than others but it can also be made artificially. A side-effect is increased aggression (so-called 'roid rage').

C | Lance Armstrong won the Tour de France seven times. He was stripped of all his medals when it was found he had used epo and testosterone.

1 a| Why are steroids classified as drugs?
b| Suggest a drawback of developing new steroid medicines.

2 Suggest why salbutamol is a banned drug in sports competitions.

3 Why would using epo give an athlete an advantage?

4 Bones can develop 'stress fractures' during exercise. Why are athletes who abuse testosterone more likely to get stress fractures?

HAVE YOUR SAY

Should *all* drugs be banned in sport?