
The blood transports (carries) substances around the body. The table below shows what the blood is made of and what each part does.

<table>
<thead>
<tr>
<th>Part of blood</th>
<th>What it does</th>
</tr>
</thead>
</table>
| PLASMA        | This is a pale yellow liquid in which the blood cells float. It carries:  
• waste carbon dioxide from the cells to the lungs;  
• dissolved food to the cells;  
• waste urea from the liver to the kidneys;  
• hormones from one part of the body to another. |
| RED CELLS     | They do not have a nucleus and there are lots of them. They carry oxygen from the lungs to the cells. |
| WHITE CELLS   | They do have a nucleus. They fight against germs that enter the blood. |
| PLATELETS     | These are small pieces of cells. They do not have a nucleus. They help blood to clot if the skin is cut. |

Exercise - Fill in the missing words in the passage below.

Blood is made of a pale yellow liquid called ................. and two different types of blood cell, white blood cells and ............... blood cells. Most of the chemicals in the blood are ................. in the plasma. ................. is carried by the red blood cells. The white blood cells help to destroy any ................. (bacteria and viruses) which may enter the body. There are also tiny pieces of cells in the blood called ................. These help to clot the blood if the skin is ................. If we could not make ................. we would be in danger of bleeding to death from even the smallest of cuts.

plasma cut scabs red dissolved germs oxygen platelets
**w.s.9. The blood system.**

The heart pumps the blood around the body. It travels inside tubes called blood vessels. Look at the diagram below and then try to complete the sentences at the bottom of this page.

![Diagram of the blood system](image)

**Exercise** - Complete the sentences below.

1) The blood travels around the body inside tubes called blood ............
2) The three types of blood vessel are arteries, ............... and capillaries.
3) The heart is a ............... that squeezes blood into the arteries.
4) The veins carry the blood back to the .................
5) The capillaries have very thin .................
6) The capillaries give useful chemicals to the body .................
7) The capillaries take ................. chemicals away from the body cells.

**vessels pump heart waste veins walls cells**
W.S.10. **Moving the body.**

In order to move the skeleton has JOINTS in between many of its parts. The movements are made by muscles which pull on the bones. **Muscles CONTRACT** (shorten) in order to pull. A muscle is made up of many thin fibres. Each fibre shortens when the muscle contracts.

![Diagram of muscle contraction](image)

**Relaxed muscle**  
Muscle fibres are resting and appear long and thin.

**Contracted muscle**  
Each muscle fibre has shortened and thickened.

A muscle cannot push, it can only pull. This is why a pair of muscles are needed at a joint. One muscle pulls the joint in one direction and the other pulls the joint back.

![Diagram of arm movement](image)

**Lowering arm**
- Biceps muscle relaxes
- Triceps muscle contracts
- Radius
- Ulna
- Humerus

**Raising arm**
- Biceps muscle contracts
- Triceps muscle relaxes

**Exercise** - Complete the sentences below.

1) A muscle is made up of many thin strands called ..................
2) When a muscle contracts each fibre ..................
3) Muscles are attached to bones by tough cords called ................
4) Muscles can only pull they cannot ..................
5) Muscles work in .................. to move a joint in both directions.
6) If we wish to lift a weight our .................... contracts.
7) To lower the arm the biceps relaxes and the .................... contracts.

**triceps shortens biceps fibres tendons push pairs**
Our lungs absorb oxygen from the air. They also excrete waste carbon dioxide gas when we breathe out. The diagram below shows the structure of the lungs.

Exercise - Fill in the missing words in the passage below.

The lungs absorb .................. gas and excrete waste carbon dioxide. The air is drawn in through the .................. (windpipe) which is kept open at all times by rings of a bony material called .................. The trachea divides into the right and left .................. which branch out into narrower tubes called bronchioles. The bronchioles end in tiny air sacs called .................. The alveoli have very thin walls and are surrounded by .................. Here oxygen is absorbed into the .................. and carbon dioxide passes into the alveoli.
The lungs are in the chest. They are separated from the lower part of the body by a sheet of muscle called the diaphragm. The diagrams below show how we **inhale** (breathe in) and **exhale** (breathe out).

**Inhaling (breathing in).**

Air is drawn into the lungs.

- **Muscles** between the ribs contract to pull the rib cage upwards and outwards.
- **INCREASE IN VOLUME CAUSES A DECREASE IN PRESSURE**
- The **diaphragm** contracts and it pulls downwards.

**Exhaling (breathing out).**

Air is forced out of the lungs.

- **DECREASE IN VOLUME CAUSES AN INCREASE IN PRESSURE**
- The muscles relax which causes the rib cage to fall.
- The **diaphragm** relaxes and it bulges upwards.

**Exercise** - Complete the sentences below.

1) The diaphragm is a sheet of **M_____**

2) The word I_____ means to breathe in.

3) The word E_____ means to breathe out.

4) The diaphragm and rib muscles both C_____ during inhaling.

5) The **V_____** of the chest increases when we inhale.

6) Air is drawn into the lungs due to a **D_____** in pressure.

7) The diaphragm and rib muscles both **R_____** during exhaling.

8) Air is forced out of the lungs due to an **I_____** in pressure.
Keeping the lungs clean.

Your nose, trachea (wind pipe) and the air tubes inside the lungs are lined with special cleaning cells and a thick, sticky liquid called MUCUS. This traps dirt and germs in the air you breathe. The cleaning cells have tiny hairs called CILIUM on their surface. These hairs waft the dirty mucus up to your throat where it is swallowed. Any germs are killed by the acid in the stomach. The diagram below shows how this cleaning system works.

The effects of smoking on the lungs. Cigarette smoke stops the cilia beating and then dirty mucus builds up in the air tubes. This can lead to chest infections and people who smoke often develop a nasty cough. The air tubes can become swollen and sore. This is called BRONCHITIS. Cigarette smoke also contains a poisonous gas called carbon monoxide which stops the blood carrying as much oxygen around the body. Cigarette smoke also contains tar which collects in the lungs. Tar contains many chemicals that cause cancer.

Exercise - Complete the sentences below.

1) Dirt and germs in the air you breathe are trapped by M__ __
2) Ciliated cells have tiny H__ __ to waft up the dirty mucus.
3) Any germs that are swallowed are killed by the A__ __ in the stomach.
4) Cigarette smoke stops the cilia B__ __
5) A smoker may have less O__ __ in their blood.
6) Tar from cigarette smoke causes C__ __
We need energy for movement, warmth and to keep all of the body parts working. We get our energy by reacting glucose and oxygen together in our cells. This chemical reaction is called RESPIRATION and it can be shown with a word equation.

\[
\text{FOOD} + \text{OXYGEN} \rightarrow \text{ENERGY} + \text{WATER} + \text{CARBON DIOXIDE}
\]

Respiration is similar to burning food but it releases the energy much more slowly inside our cells.

**Exercise 1** - Complete the missing labels on the diagram below.

![Diagram](image)

**Exercise 2** - Complete the sentences below.

1) Respiration produces useful ___ ___ ___ in the cells.

2) We need energy to ___ ___ and to keep warm.

3) The main food substance that is used in respiration is ___ ___ ___ ___

4) ___ ___ ___ ___ is a similar process to respiration but it happens much more quickly.

5) The waste gas produced by respiration is C ___ ___ D ___ ___ ___

6) We get rid of carbon dioxide by ___ ___ ___ ___ it out.

7) If plants did not make ___ ___ ___ gas we would soon use it all up.
Drugs affect the way the body works. Some drugs are used by doctors to treat sick people. These can be very useful but they must be taken in the correct amounts. It is illegal (against the law) to take certain drugs because they are so dangerous to health. Even legal drugs such as alcohol can be very harmful if too much is taken. Some drugs are ADDICTIVE. This means that a person can become dependent on them and if they do not have the drug they may develop WITHDRAWAL SYMPTOMS such as shaking and sickness. The table below gives information about the effects of various drugs on health.

<table>
<thead>
<tr>
<th>Type of drug</th>
<th>How it affects the body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>Alcohol slows down the speed at which the brain and nervous system works. A little alcohol makes people feel happy and relaxed. More alcohol makes a person feel dizzy and affects their judgement. Large amounts may make a person unconscious and they may even die. An alcoholic is a person who is addicted to alcohol. Heavy drinking over several years causes damage to the brain, liver, and heart.</td>
</tr>
<tr>
<td>Tobacco</td>
<td>Tobacco smoke is very poisonous. A person can become addicted to smoking because of a chemical called nicotine in the smoke. Smoking causes cancers, heart disease, bronchitis, and damaged lungs. Smoking also makes a person short of breath and more tense.</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Cannabis or ‘pot’ causes hallucinations. This is when a person thinks that they are seeing or hearing something that does not exist. They can then become confused and do dangerous things and may have a fatal accident.</td>
</tr>
<tr>
<td>Solvents</td>
<td>Some people like to breathe in the fumes from substances such as glue and paint (glue sniffing). This makes them feel dizzy and they may have hallucinations. The fumes get into the blood and damage the heart. Many people have died as a result of breathing in solvents.</td>
</tr>
</tbody>
</table>

Exercise - Fill in the missing words in the passage below.

An ....................... is a person who has become dependent on a certain drug. It is very dangerous to drink alcohol and then drive because the ....................... are slowed down. An ....................... is a person who is addicted to alcohol. They may damage their brain, ....................... and heart. People who smoke are usually more tense and ....................... as a result of the nicotine in their blood. The risk of developing ....................... cancer is much greater in smokers. Drugs such as cannabis make a person ....................... This can make them behave ....................... The fumes from ....................... may damage the heart and even cause death.

hallucinate addict reactions liver lung nervous dangerously solvents alcoholic
Germs are MICROBES that can live inside our bodies. The two main types of germ are BACTERIA and VIRUSES. Only some types of bacteria are germs. They cause us harm by attacking our cells or by producing waste poisonous chemicals. Viruses are much smaller than bacteria and they can only exist inside living cells. A virus injects its DNA (instructions) into a cell. The virus DNA tells the cell to make more viruses. The cell then bursts open to release the new viruses.

**A typical bacterium**

- Some have a slimy coating
- Simple nucleus
- Cell wall
- Cell membrane
- Cytoplasm
- Some have hairs for movement

**Types of bacteria**

- **COCCI** (round)  
  e.g. cause sore throat.
- **BACILLI** (rod)  
  e.g. cause typhoid.

**A typical virus**

- Outer coat
- DNA (instructions) is injected into the cell it is attacking.
- Feet attach to a cell

**Exercise** - Complete the sentences below.

1) Germs are microbes that live ____ ____ ____ our bodies.

2) Bacteria and viruses are too ____ ____ ____ to see.

3) Bacteria may cause disease by attacking body ____ ____

4) Bacteria may produce ____ ____ ____ ____ waste chemicals.

5) ____ ____ ____ are much smaller than bacteria.

6) Viruses can only live and multiply inside ____ ____ ____ cells.

7) A virus injects its ____ ____ into the cell it is attacking.
There are huge numbers of microbes in the air, soil and water. Some of these are germs. Therefore our bodies need a defence system. The skin helps to stop germs entering the body. The breathing system is lined with a sticky liquid called mucus which traps the dirt and germs that we breathe in. Tiny hairs called CILIA gradually waft the dirty mucus up to the throat where it is swallowed. The germs are then killed by hydrochloric acid in the stomach. Germs sometimes get into the bloodstream through wounds. If this happens white blood cells attack them. The diagrams below show how they do this.

**Phagocyte**

- Bacteria are taken in and digested.

**Lymphocyte**

- The lymphocyte sends out chemicals called ANTIBODIES to destroy bacteria.

**Exercise** - Complete the missing words in the passage below.

Most microbes are........................ but some are germs that can live inside our bodies. The body needs to....................... itself from invading germs. The....................... forms a barrier that stops germs getting into the body. Any germs that are......................... in are trapped by sticky mucus in the nose,................... and lungs. Eventually dirty mucus is......................... and the hydrochloric acid inside the ................. destroys the germs. The two types of white blood cell that kill germs are......................... and lymphocytes. Phagocytes......................... germs and lymphocytes make.........................

A......................... contains dead or harmless germs. It allows antibodies to build up in the body.......................... are chemicals that can also be used to help us fight germs.

defend phagocytes medicines harmless skin antibodies eat breathed trachea vaccine stomach swallowed
W.S.33. **Changing habitats.**

The conditions in a habitat are always changing from day to night and from one season to the next. Light and temperature increase after sunrise and usually reach a peak at midday. In dry deserts the days are very hot but the nights are cold. Lizards and snakes need to absorb heat from their surroundings to keep their bodies working quickly.

![Lizard](image)

Early morning the lizard basks in the sun to warm its body so that it can move more quickly.

Later in the morning the lizard is very active and hunts for food.

At midday the temperature in the desert is too high and the lizard hides in the shade.

The lizard's behaviour is an adaptation to help it to survive. Many desert animals are **NOCTURNAL** (only active at night) when it is cooler.

The British winter is very cold and there is little food. Many animals grow a thicker fur coat to reduce heat loss. Some animals **HIBERNATE**. This is like a deep sleep. The body temperature falls and the heart and breathing almost stop. The body needs less energy and the animal can use its stored fat reserves over the winter.

Many birds **MIGRATE** during the winter months. This means that they fly to warmer countries where they can find enough food.

**Exercise 1** - Write down the correct words beside their meanings.

<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOCTURNAL</td>
<td>Only active at night.</td>
</tr>
<tr>
<td>HIBERNATE</td>
<td>A deep sleep to save energy.</td>
</tr>
<tr>
<td>MIGRATE</td>
<td>Fly to a warmer country.</td>
</tr>
</tbody>
</table>

**Exercise 2** - Complete the missing words in the passage below.

The conditions in a habitat are always **C______** from day to night. In a desert it may be very hot during the day and **C______** at night. Many desert animals are **N______**. The British winter is very cold and there is not much **F______** for animals. Some animals adapt to cold winters by growing a **T______** fur coat. Most animals store **F______** under the skin during autumn. Animals hibernate to save **E______**.
Green plants make food by PHOTOSYNTHESIS. Animals must feed on plants or other animals. The food is passed along a FOOD CHAIN.

Grass → woodmouse → fox

Food chains always begin with plants. Animals that eat plants are called HERBIVORES. Animals that eat other animals are called CARNIVORES. Carnivores are also called PREDATORS and the animals that they hunt are called the PREY. In most habitats there are more plants than herbivores and more herbivores than carnivores. This can be shown with a PYRAMID OF NUMBERS.

Pyramids of numbers are usually large at the bottom and small at the top. Sometimes they have a different shape because of the different sizes of the organisms in them. Two examples of this are shown below.

Exercise - Fill in the missing words in the passage below.

In habitats there is a mixture of .................. herbivores and carnivores. Carnivores are animals that eat other .................. Herbivores eat plants and are .................. by carnivores. Another name for carnivores is .................. and the animals that they hunt are called the ..................

The amount of plants in a habitat must be .................. than the amount of herbivores or else the herbivores would run out of .................. In the same way there must be .................. carnivores than herbivores.

predators animals food fewer eaten plants prey greater
W.S.35. Food webs.

Food chains can be connected together to make FOOD WEBS. The diagram below shows a food web in a lake.

Exercise - Complete the food chains and sentences below.

**Food Web Diagram:**
- **Pondweed** → **Water Snail** → **Algae** → **Tadpole** → **Water Beetle** → **Grebe** → **Large Fish**
- **Leaf** → **Water Louse** → **Tadpole** → **Water Beetle** → **Grebe**

1) The predators of small fish are _______ and _______

2) The prey of water beetles are _______

3) The prey of grebes are _______ and _______

4) The animal that **only** eats dead tree leaves is the _______

5) The 3 herbivores are _______ _______ and _______

6) The 2 top predators are the _______ and _______
Farmers often spray their crops with PESTICIDES to kill pests such as insects and weeds. Pesticides may stay in the environment (surroundings) a long time and poison animals higher up the food chains. Pesticides can also be washed into streams and ponds. The diagram below shows how pesticides can build up along food chains.

If the pesticide is passed on from the caterpillars into small birds and then into the hawk we can see how it would quickly build up in the hawk's body. Scientists are now trying to make pesticides that only affect the pest and break down a short time after they have been used. They are also trying to find other ways of controlling pests by using their natural enemies. This is called BIOLOGICAL CONTROL.

**Exercise** - Complete the sentences below.

1) P ________ are poisons that kill pests.

2) Pesticides can get into food C _______ and poison other animals.

3) Small B _______ eat many insects which may have pesticides in them.

4) Hawks may be P ________ by eating birds that contain pesticides.

5) Pesticides can also be washed into S _______ and P _______

6) B _______ control means using a pest's natural enemy to destroy it.
A population is a number of organisms of the same species (type) living in one place. For example, there may be a population of one thousand tadpoles living in a pond, or a population of five hundred oak trees in a wood. The graph below shows how a population of rabbits grew when scientists placed one hundred of them onto an island where rabbits had never lived before.

![Graph showing rabbit population growth over time.]

The population grew slowly at first as the rabbits were getting used to their new habitat. The population then grew very quickly as the rabbits had plenty of food and space and they were reproducing. The growth rate of the population then slowed down until it reached a fairly steady level of about 260 rabbits. At this point competition between the rabbits for food and space had increased and predators were finding and killing the rabbits more easily. When the balance between the number of births and deaths becomes equal the population stops growing.

**Exercise** - Complete the missing words in the passage below.

A ________________ is a number of organisms of the same species living in one place. There are a number of factors that control how big a population of animals can _________________. Competition for ________________ and space is important. As the population grows there will be ________________ competition and so more animals will _________________. Predators are also important in controlling the numbers of ________________ animals. If the number of predators increases more prey will be _________________. If the number of predators decreases more prey will _________________. In the same way, the ________________ of a predator’s population is controlled by the numbers of its prey. If there are more prey there will be more predators. A population stays steady when the number of births equals the number of _________________.

size greater prey population deaths killed grow survive food die