



How does your heart work?



Laboratory Notebook

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Table of Contents	Page Number
Section 1	
Your Cardiovascular System	2
Different Cardiovascular Systems	3
Pulse and Pressure	4
Quiz 1	5
Section 2	
Your Heart	6
Your Blood Vessels	7
Quiz 2	8
Section 3	
How your heart beats	9
How your blood flows	10
Healthy Lifestyles	11
Quiz 3	12
Word Search	13

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Your Cardiovascular System

What makes up your cardiovascular system?

Your cardiovascular system is made up of:

The heart - a pump

The blood - delivers oxygen and nutrients to the body, and removes waste

Blood vessels - a system of tubes to carry the blood

What does your cardiovascular system do?

Your heart pumps blood through blood vessels to your body.

What does your blood do?

Your blood is made up of many different parts:

Red blood cells carry oxygen from your lungs to your organs, and carbon

dioxide from your organs to your lungs.

White blood cells are a part of the body's immune system.

Platelets help blood clot when you have a cut.



Different Cardiovascular Systems

There are different types of cardiovascular systems that all work a bit differently!

Insects have a simple cardiovascular system with a tube heart.

• They have an **open circulation**, where the **liquid** in their system can **flow freely** around the **body** instead of staying in blood vessels.

Fish have a simple cardiovascular system with a single-chambered heart.

• The heart pumps blood to the gills where it collects oxygen before it travels to the rest of the body.

Amphibians have a three-chambered heart.

 The heart pumps blood to the lungs where it collects oxygen before it mixes with blood from the rest of the body. They can also get oxygen through their skin!

Mammals have a four-chambered heart.

 The heart pumps blood to the lungs where it collects oxygen, and to the body where it uses oxygen at the same time!









Pulse and Pressure

Does my heart beat stay the same through the day?

Your heart rate changes depending on what you're doing! We can measure

how fast the heart beats per minute (BPM) to see how much it changes.

When you are exercising, your heart beats faster to deliver enough oxygen
 and nutrients to your working muscles!

Different animals have different heart rates! Humans have a heart rate of about 70 BPM. Elephants have a heart rate of about 30 BPM! Mice have a heart rate over 600 BPM!





Blood pressure is the pressure that your blood has on your blood vessels. Blood pressure is different for every person, and depends on body size and health!

Blood pressure varies between animals, with larger animals having higher blood pressure.

The giraffe has the highest blood pressure of mammals. This is because blood has to flow its long neck to the brain.

There are **special valves** in the giraffe's blood vessels **to keep too much blood rushing**

to its head when it is drinking!



Can you measure your HEART RATE with the stethoscope?



1. Can you name two parts of your cardiovascular system?

2. What does your heart do?

3. How many chambers are in your heart?

4. What does your blood do?

5. How are insect cardiovascular systems different from fish, amphibians and mammals?

6. How are amphibian cardiovascular systems the same as mammals?

7. What do you think would happen if your heart didn't work properly?



Find the answers on page 14

Your Heart

What is your heart made of?

Your heart is a **muscle**! Your heart muscle **contracts**, just like other muscles.

This means that your heart squeezes & pumps blood out of the left and right ventricle.

What is a ventricle?

Your heart has two **ventricles**, or **hollow chambers**, in the bottom part of the heart. These are divided by the **septum**.

- The right ventricle pumps blood through the pulmonary artery to the lungs to pick up oxygen, oxygenating the blood.
- The left ventricle pumps blood that carries oxygen through the aorta to the body. The body uses oxygen, deoxygenating the blood.



The left side of the heart has thicker muscle because it needs to pump blood at a higher pressure than the right side.

What is a valve?

Valves act like doors. They prevent blood from going backwards!



Did you know... the sound of the HEART BEAT comes from the valves opening

and closing? BA-BOM! BA-BOM!



Your Blood Vessels

Blood vessels are a system of tubes that carry blood. Some vessels carry blood to the body, and others carry blood to the heart.

Veins carry blood towards the heart.

- Veins carry deoxygenated blood from the body to the heart.
- But the pulmonary vein carries oxygenated blood from lungs to the heart.

Arteries carry blood away from the heart.

- Arteries carry oxygenated blood from the heart to the body.
- But the pulmonary artery carries deoxygenated blood from the heart to lungs.



Do veins and arteries look different?

Veins	Arteries
Thin, floppy walls	Thick, muscular walls
Blood under low pressure	Blood under high pressure

Capillaries are between veins and arteries.

- Capillary walls are one cell thick!
- Thin walls allow oxygen to pass from the blood into the tissues, and carbon dioxide to pass from tissues into the blood.



Just remember:

Arteries carry blood Away from the heart! VeINs carry blood INto the heart!



1. What does your heart do to push blood out of the ventricles?

2. How are the right and left ventricles divided?

3. Which ventricle pumps blood to the lungs, and which to the body?

4. How are veins and arteries different?

5. How are the pulmonary artery and vein different from other arteries and veins?

5. What are capillaries? What happens to the blood while it is travelling through the capillaries?



How your heart beats

Your heart...

- Beats more than 100,000 times a day, and 2.5 billion times in a lifetime!
- Pumps blood to your toes and back in 15 seconds!
- Changes the speed of contraction to match the music you're listening to.
- Has a pacemaker, which sends an electrical signal to the heart muscle cells.
 This starts the heartbeat, making them contract at the right time!

What happens if the pacemaker doesn't work properly?

If the pacemaker doesn't make heart cells contract at the right time, the **cells contract on their own**! This is called **fibrillation**.

If the heart is **fibrillating**, blood isn't being pumped properly! This means that the **body isn't getting enough oxygen and nutrients**.



Normal heart beats

Fibrillation

If the heart's pacemaker doesn't work properly, can it be fixed?

Doctors can put an artificial pacemaker next to the heart!



A chest X-ray with a pacemaker

What does an artificial pacemaker do?

It does what the heart's pacemaker should. It sends an **electrical signal** to the heart **muscle cells**, making them **contract** at the right time!



How your blood flows

Your blood...

- Makes up around 7% of the weight of your body!
- Can be separated into fluid, plasma, red and white blood cells and platelets.
- Flows through 60,000 miles of blood vessels! This is the same as going around the earth 2.5 times!
- Is pumped to the heart muscle through blood vessels called coronary arteries.
 These arteries supply oxygen and nutrients to the heart muscle

What happens if coronary arteries don't work properly?

Coronary arteries can become **blocked** by fatty build-up called **plaque**.

This is called coronary heart disease. If enough blood can't get through

narrowed arteries, or if a blood clot forms, this can cause a heart attack.



Healthy Lifestyles

Can I get heart disease?

Although heart disease usually happens when you're older, starting heart-healthy habits now can reduce your chance of getting it later in life!

Exercise helps you stay fit and healthy,

and is great for your heart! Exercising an hour a day hard enough to feel a bit breathless will help keep your heart healthy. Do lots of different activities that you enjoy for your hour!





A healthy balanced diet will give you enough energy to stay active! Eat at least five servings of fruit and vegetables a day, and a diet low in fat, sugar and salt to help keep you heart-healthy! It is never too soon to start heart-healthy eating habits!

Smoking is bad for your heart. Smoking can make the fat in your blood stick to Blood vessel walls, leading to a heart attack! Smoking makes it difficult to get enough oxygen to your body, and makes it harder to exercise! To keep heart-healthy it's best not to start smoking, but there are many ways to quit









1. How many times does your heart beat every day?

2. What does your heart's pacemaker do?

3. How can arteries become blocked? What can a artery blockage cause?

4. How much exercise do you need to do each day to keep heart-healthy? What kind of exercise should you do?

5. What is a heart-healthy diet?

6. How can smoking harm heart health?



Find the answers on page 16

Wordsearch

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AORTA ARTERY ATRIUM BLOOD CAPILLARY CAROTID CLOT CORONARY DIASTOLE ELECTROCARDIOGRAM HAEMOGLOBIN HEART INFARCTION IRON MUSCLE OXYGEN PACEMAKER PLAQUE PLASMA PRESSURE PULSE PUMP SEPTUM STETHOSCOPE STROKE SYSTOLE VALVE VEIN VENTRICLE



1. Can you name two parts of your cardiovascular system?

Heart, blood and blood vessels.

2. What does your heart do?

Pumps blood through blood vessels to the body.

3. How many chambers are in your heart?

Four

4. What does your blood do?

Carries oxygen, immune cells and platelets to the body.

5. How are insect cardiovascular systems different from fish, amphibians and mammals?

Insects have a tube heart and an open system where fluid moves freely through the body.

6. How are amphibian cardiovascular systems the same as mammals?

Both have a heart that pumps blood to the lungs to collect oxygen.

7. What do you think would happen if your heart didn't work properly?

Your heart wouldn't pump blood through your blood vessels properly!



Answers from page 5

1. What does your heart do to push blood out of the ventricles?

The heart muscle contracts, or squeezes, which forces blood out of the chambers.

2. How are the right and left ventricles divided?

The septum divides the heart into the right and left ventricles.

3. Which ventricle pumps blood to the lungs, and which to the body?

The right ventricle pumps blood to the lungs to pick up oxygen, and the left ventricle pumps blood to the body to deliver oxygen.

4. How are veins and arteries different?

Veins have thin floppy walls and carry deoxygenated blood from the body to the heart. Arteries have thick muscular walls and carry oxygenated blood from the heart to the body.

5. How are the pulmonary artery and vein different from other arteries and veins?

The pulmonary artery carries deoxygenated blood from the heart to the lungs. The pulmonary vein carries oxygenated blood from the lungs to the heart.

6. What are capillaries? What happens to the blood while it is travelling through the capillaries?

Capillaries are the section of blood vessel between arteries and veins.

The capillary wall is one cell thick. This allows oxygen to pass from the

blood to the tissues, and carbon dioxide from the tissues to the blood.



Answers from page 8

1. How many times does your heart beat every day?

More than 100,000 times.

2. What does your heart's pacemaker do?

Sends an electrical signal to the heart muscle to make it contract and pump blood through blood vessels to the body.

3. How can arteries become blocked? What can a artery blockage cause?

When plaque or a clot forms, this can cause a heart attack.

4. How much exercise do you need to do each day to keep heart-healthy? What kind of exercise should you do?

An hour a day! Any kind of exercise that makes me a bit breathless, it doesn't have to be all in one go.

5. What is a heart-healthy diet?

A heart-healthy diet includes at least five servings of fruit and vegetables, and is low in fat, sugar and salt.

6. How can smoking harm heart health?

Smoking can make the fat in my blood vessels stick to the blood vessel

walls, and can lead to a heart attack! Smoking also makes it difficult

To get enough oxygen to my body, making it harder to exercise!





Contact us

Cambridge Cardiovascular University of Cambridge ACCI, Level 6, Box 110 Addenbrooke's Hospital Hills Road Cambridge CB2 0QQ www.cardiovascular.cam.ac.uk



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