



E-learning Cardiovascular system

In the following pages, you will find information and images for an e-learning course for the cardiovascular system. This will enable you to create your own e-learning content using a digital tool available within your organization.

We also provide a link to our Nearpod platform where you can see all the interactive tools we have used:

[Nearpod - The cardiovascular system](#)

Good luck and fun creating your own e-learning courses!

Kind regards,

ROC Friese Poort (The Netherlands)



Note: this lesson can be followed student- and teacher paced. The original lesson is built with Nearpod and this is an example of where all the interactive activities can be implemented. Link to the lesson: https://app.nearpod.com/?pin=C82459713BFE9D090184C6B52E1F2B59-1&&utm_source=link

Summary of the lesson:

This e-learning explores the circulatory system, which includes the heart, blood vessels, and blood, responsible for transporting oxygen and nutrients throughout the body. Various cardiovascular diseases such as arteriosclerosis, heart failure, angina pectoris, heart attack, cardiomyopathy, and arrhythmia are discussed, along with their symptoms and risk factors. Management and prevention strategies through medical interventions and lifestyle changes are highlighted to address these heart conditions.

Cardiovascular system

Slide 1 Circulation



Slide 2 Important questions

- How does the heart pump blood through the body?
- What are the different types of blood vessels and their functions?
- What is the difference between systemic and pulmonary circulation?
- What are common cardiovascular diseases?

Slide 3 learning outcome, At the end of the lesson, you will be able to:

- Understand how the heart pumps blood through the body.
- Identify and describe the different types of blood vessels and their functions.
- Differentiate between the systemic and pulmonary circulation.
- Recognize and discuss common cardiovascular diseases.

The following terms will be covered, among others:

- aorta
- artery
- vein
- blood vessel
- capillaries



- cardiac muscle
- cardiovascular disease
- systole
- diastole
- pulmonary circulation
- systemic circulation
- pulmonary artery
- chambers
- atria
- inferior and superior vena cava
- heart valves

Slide 4 What are we going to do

1. We will explore the components of circulation.
2. Explanation of how the heart pumps blood through the body via various components and vessels.
3. In-depth analysis of different cardiovascular diseases.
4. Evaluation of the learning outcomes.

Slide 5 Poll

What do you already know about the blood circulation?

- A. I already have a lot of knowledge about it
- B. I know a little bit
- C. I actually don't know anything yet

Note: this is an interactive activity. Students fill in their answers and the answers are shown on the board where all the students can see. This way, the teachers know what the level of knowledge is of the students and can respond to this accordingly.

Slide 6 Web content 3D model of the blood circulation system

Note: this is an interactive activity. Students can follow the link on their own device and discover the blood circulation system on their own pace. It is also a possibility to end with a central evaluation and most interesting finds, this can be presented by the students. The site is in Dutch.

[Circulatie van het bloed | Corinth \(corinth3d.com\)](https://corinth3d.com)

Slide 7 Collaboration board

Note: this is an interactive activity. Students can add their own comments to each question which will be shown on the central board in class or the students device. Comments can be done by text, image, video, voice recording, GIF, etc.

Answer the following questions based on the model we just examined.

1. What are the main blood vessels that supply blood?
2. Where do you think the blood pressure is likely to be highest and why?
3. Where do you think the blood pressure is likely to be lowest and why?

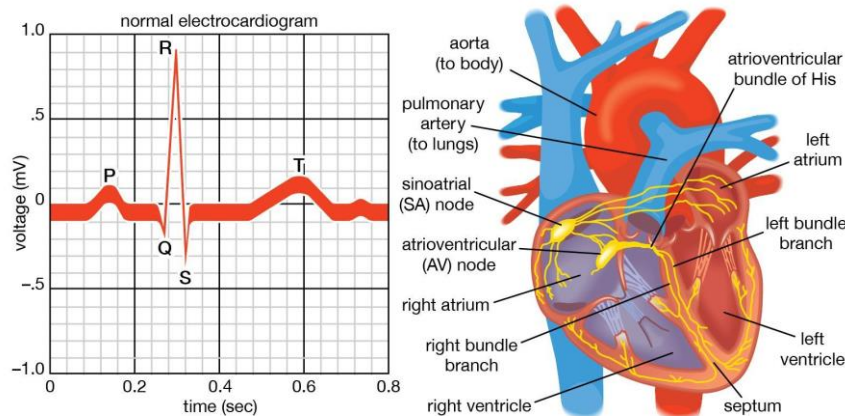
Side 11 Matching pairs

Note: this is an interactive activity. Students can match the different pairs like memory game. This can be done on their own devices, in groups or central on the board. The pairs are shown below.

Term	Description
Circulatory system.	The organ system responsible for the transportation of oxygen and nutrients throughout the body is the circulatory system.
Heart valves	Structures in the heart that open and close to control blood flow.
Heart	A vital organ that pumps blood throughout the body to supply oxygen and nutrients to the cells.
Red blood cell	Round cells in the blood that bind oxygen to the protein Hemoglobin.
White blood cell	Cells in the blood that defend the body against pathogens.
Atria	Two upper chambers of the heart.
Ventricles	Two lower chambers of the heart.
Veins	Blood vessels that carry deoxygenated blood back to the heart and have thinner walls, as well as containing valves to prevent backflow of blood.
Arteries	Blood vessels that carry oxygenated blood away from the heart to the body tissues.
Pulmonary artery	A blood vessel that carries deoxygenated blood from the heart to the lungs for oxygenation.
Capillaries	Tiny blood vessels where red blood cells release or take up oxygen and carbon dioxide.
Left ventricle	Pumps oxygenated blood into the aorta.

Slide 12 The heart

On the next slide, we will explore a 3D model of the heart again. As we examine the heart, let's try to identify the differences between the diastolic (resting) phase and the systolic (action) phase.



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Slide 13 Web content 3D model of the heart

Note: this is an interactive activity. Students can follow the link on their own device and discover the blood circulation system on their own pace. It is also a possibility to end with a central evaluation and most interesting finds, this can be presented by the students. The site is in Dutch.

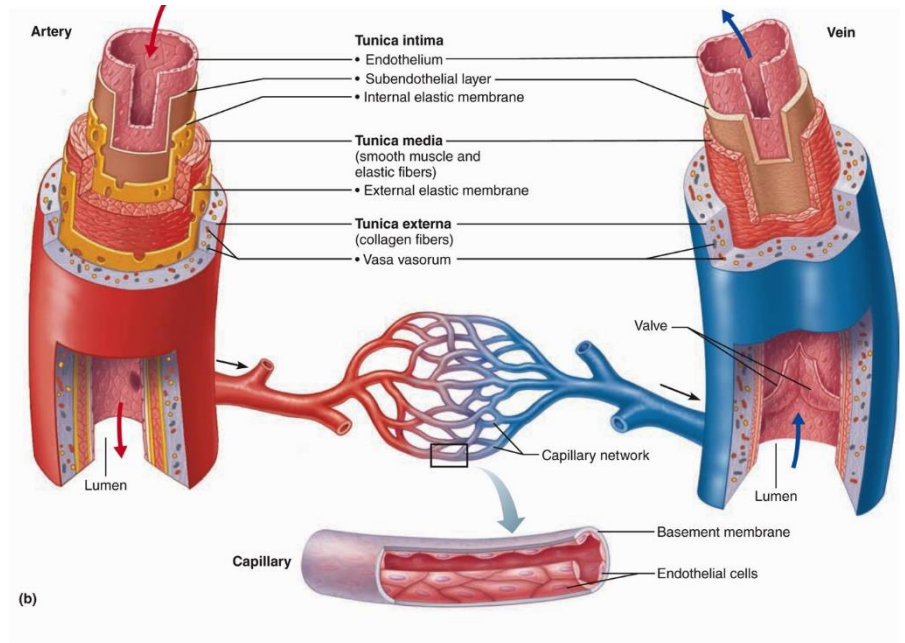
<https://online.corinth3d.com/partner/HucbJu>

Slide 14 Artery

Arteries transport oxygenated blood from the heart to the organs and tissues.

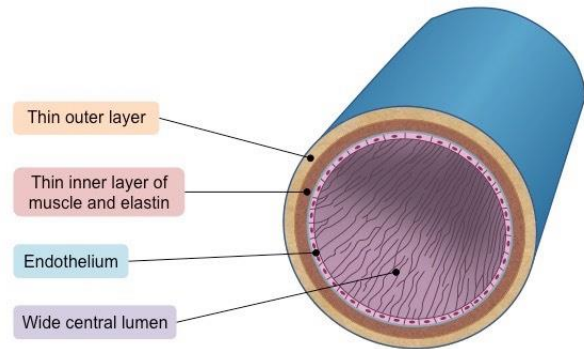
Arteries have a strong, elastic wall. They propel the blood, which is pumped out of the heart under high pressure, throughout the body.

Unlike veins, arteries do not have valves.



Slide 15 Veins

A vein is a blood vessel that carries deoxygenated blood back to the heart, typically characterized by thin walls and the presence of valves to ensure one-way blood flow.



Slide 16 Differences between an artery and a vein

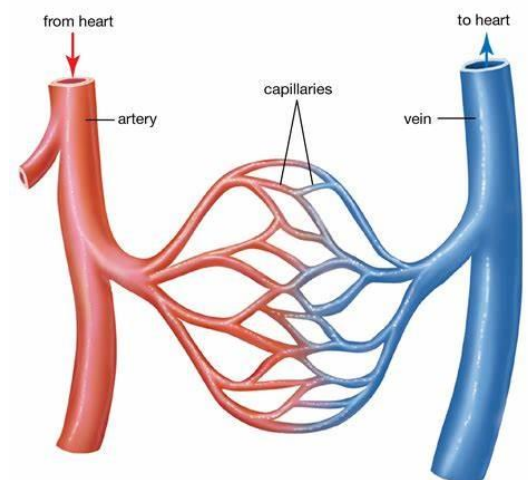
Artery	Vein
Carries oxygenated blood	Carries deoxygenated blood
Thicker walls	Thinner walls
Elastic and muscular	Less elastic and muscular
Carries blood away from the heart	Carries blood towards the heart
Higher pressure	Lower pressure
No valves	Valves to prevent backflow

Note: this can be made into an interactive activity. Students can fill in a blank table with for instance a few hints or categories such as: carries, walls, pressure, etc.

Slide 17 Capillaries

Capillaries are the smallest blood vessels in the body that allow for the exchange of oxygen, nutrients, and waste products between the blood and surrounding tissues.

Note: this is can be made into an interactive activity. When you delete the descriptions in this or other drawings (for instance the vein or arteries) the students can fill in the blanks on the board, in groups or at home. This can be done in groups or individually.



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Slide 18 1Web content 3D models of arteries and veins

Note: this is an interactive activity. Students can follow the link on their own device and discover the blood circulation system on their own pace. It is also a possibility to end with a central evaluation and most interesting finds, this can be presented by the students. The site is in Dutch.

<https://online.corinth3d.com/partner/8DQEpz>

Slide 19 The lymphatic system

Note: this is an interactive activity. Students see a video (link: [Lymphatic System: Crash Course Anatomy & Physiology #44 - YouTube](#)) about the lymphatic system and on certain times questions are displayed and the video paused. The students can't continue watching the video until they have answered the questions correctly. The answers are provided in the video, so by listening and paying attention the student can succeed. The minute, second, type of question and question are provided below.



1. 00:10 Open ended question: What do you already know about the lymphatic system?
2. 1:58 Open ended question: Which other body systems does your lymphatic system support, and how does it help your body maintain homeostasis?
3. 2:57 Multiple choice question: Which of the following is NOT a part of the lymphatic system?
 - a. Spleen
 - b. Adenoids
 - c. Thymus
 - d. Liver (correct answer)
4. 4:50 Multiple choice question: Where does the right lymphatic duct dump its lymph?
 - a. Superior vena cava
 - b. Subclavian vein
 - c. Internal jugular vein (correct answer)
 - d. External carotid artery
5. 5:22 Multiple choice question: How much blood fluid does the lymphatic system recover every day?
 - a. 1.5 liters
 - b. 2.5 liters
 - c. 3 liters (correct answer)
 - d. 5 liters
6. 6:25 Open ended question: How do lymphocytes deal with pathogens?
7. 7:16 Open ended question: What are MALTs?
8. 7:51 Open ended question: What role does the appendix play in your lymphatic system?
9. 8:26 Open ended question:

Slide 20 Open ended question

Note: this is an interactive activity. Students can answer the question individually or in groups.

1. **What is the pulmonary circulation? What is the systemic circulation? Provide a brief description of both types of circulation.**

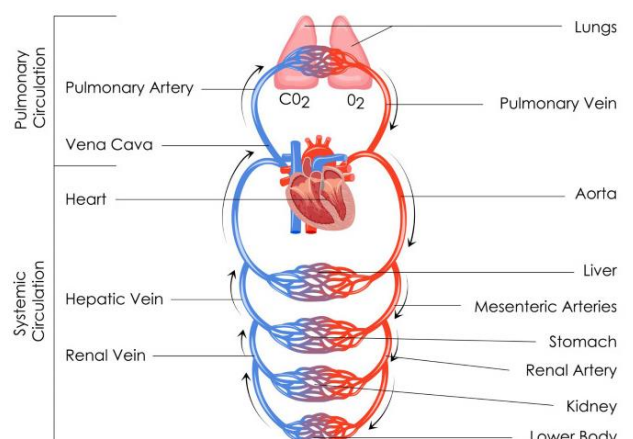
Example of a correct answer:

What is the pulmonary circulation?

Pulmonary circulation refers to the circulation of blood between the heart and the lungs. Deoxygenated blood is pumped from the right ventricle to the lungs through the pulmonary artery, where it picks up oxygen and releases carbon dioxide. Oxygenated blood then returns to the left atrium of the heart via the pulmonary veins. The pulmonary circulation ensures oxygenation of the blood.

What is the systemic circulation?

Systemic circulation refers to the circulation of blood between the heart and the rest of the body. Oxygenated blood is pumped from the left ventricle to the aorta, the largest artery in the body. From there, the aorta branches into smaller arteries that transport blood to all organs and tissues in the body. Capillaries facilitate the exchange of oxygen, nutrients, and waste products. Deoxygenated blood then





returns to the heart through veins and is pumped to the right ventricle to start the cycle again. Systemic circulation supplies the body with oxygen and nutrients while removing waste products.

Slide 21 Collaboration board

Note: this is an interactive activity. Students can add their own comments to each question which will be shown on the central board in class or the students device. Comments can be done by text, image, video, voice recording, GIF, etc.

Why do you think it is important to understand the components and functions of the circulatory system?

Example of a correct answer: Understanding the components and functions of the circulatory system is important as it provides insights into how blood is circulated throughout the body, ensuring oxygen and nutrient delivery to organs and tissues. It also helps in identifying potential issues or diseases that can arise within the circulatory system, allowing for early detection and appropriate medical intervention.

Slide 22 Collaboration board

Note: this is an interactive activity. Students can add their own comments to each question which will be shown on the central board in class or the students device. Comments can be done by text, image, video, voice recording, GIF, etc.

In what ways can cardiovascular diseases affect other organ systems?

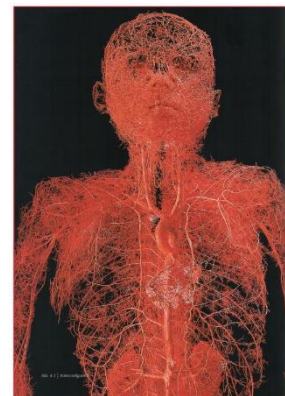
Example of a correct answer: Cardiovascular diseases can have a significant impact on other organ systems by impairing blood flow and oxygen delivery. This can lead to organ dysfunction or damage, affecting their overall function and health.

Slide 23 Open ended question

Note: this is an interactive activity. Students can answer the question individually or in groups.

- 1. Try to describe in your own words the function of the circulatory system and mention as many components and their functions as possible.**

Example of a correct answer: The circulatory system, consisting of the heart, blood vessels, and blood, has the vital function of transporting oxygen, nutrients, hormones, and waste products throughout the body. The heart pumps oxygenated blood to the body through arteries, while veins carry deoxygenated blood back to the heart. Capillaries facilitate the exchange of substances between the blood and body tissues.



Slide 24 Poll

How confident did you feel in describing the circulatory system just now?

- Very confident
- A little bit confident
- Not very confident

Note: this is an interactive activity. Students fill in their answers and the answers are shown on the board where all the students can see. This way, the teachers know what the level of knowledge is of the students and can respond to this accordingly.



Slide 25 Augmented Reality

Note: this is an interactive activity. For this you need to have access to AR glasses. The website used is: [Complete Anatomy - advanced 3D anatomy platform \(3d4medical.com\)](https://3d4medical.com). The AR glasses used are Microsoft Hololens 2.

1. Open the 3D model of the heart animation on the next slide.
2. Click on the AR button.
3. Position the heart in front of your fellow student and take a photo by clicking on the screenshot button. You can also record a video.
4. Display the picture or video on the board or share within the class online environment.


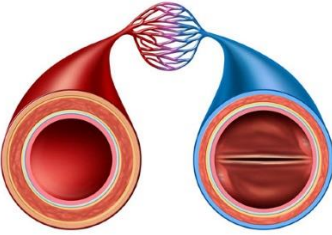
Slide 26 Web content 3D model of the heart

Note: this is an interactive activity. Students can follow the link on their own device and discover the blood circulation system on their own pace. It is also a possibility to end with a central evaluation and most interesting finds, this can be presented by the students. The site is in Dutch.






<https://online.corinth3d.com/partner/HucbJu>

Slide 28 Quiz

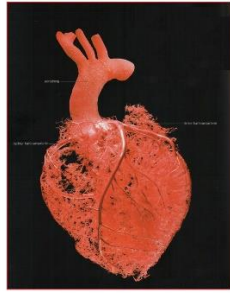
Note: this is an interactive activity. Students can answer the questions individually or in groups.

Question (correct answers are marked as bold)	Image
<p>1. What is the function of heart valves?</p> <ol style="list-style-type: none"> a. To prevent backflow of blood. b. To promote the backflow of blood. 	
<p>2. Which statement about arteries is correct?</p> <ol style="list-style-type: none"> a. Arteries carry blood away from the heart. b. Arteries have a strong, thick, elastic wall. c. Arteries contain valves to propel the blood forward. d. Arteries transport one liter of blood per minute. 	
<p>3. The contraction motion of the heart is called systole.</p> <ol style="list-style-type: none"> a. Correct b. Incorrect 	



<p>4. The aorta is the largest artery in our body.</p> <ol style="list-style-type: none"> Correct Incorrect 	
<p>5. What is considered as a normal heart rate?</p> <ol style="list-style-type: none"> 40 bpm 50 bpm 80 bpm 100 bpm 	
<p>6. What is the route of the systemic circulation?</p> <ol style="list-style-type: none"> Left ventricle, aorta, inferior and superior vena cava, right atrium. Right ventricle, pulmonary artery, pulmonary vein, left atrium. Left atrium, left ventricle, right atrium, right ventricle. Pulmonary vein, lungs, pulmonary artery, left atrium. 	
<p>7. What is an aneurysm?</p> <ol style="list-style-type: none"> A localized dilation of a blood vessel. A localized constriction of a blood vessel. 	
<p>8. Blood pressure depends on:</p> <ol style="list-style-type: none"> Stress and dietary pattern Physical exertion and smoking Age and weight All answers are correct 	
<p>9. What explains the fact that blood pressure tends to increase to some extent as one gets older?</p> <ol style="list-style-type: none"> Elderly individuals have an elevated cholesterol level. Older people often suffer from overweight. The elasticity of the arterial wall gradually decreases. People are living longer than before. 	



<p>10. What supplies blood to the heart?</p> <ul style="list-style-type: none">a. Pulmonary arteryb. Pulmonary veinc. Aortad. Coronary arteries	
<p>11. Where is oxygenated blood located in the heart?</p> <ul style="list-style-type: none">a. Right ventricle and right atriumb. Left atrium and left ventricle	

Slide 29 Cardiovascular diseases

- Arteriosclerosis
- Heart failure (Decompensatio Cordis)
- Angina Pectoris
- Heart attack (Myocardial infarction)
- Cardiomyopathy
- Arrhythmia

Choose one of these conditions you would like to learn more about. Make sure you can describe the condition, its symptoms, causes, treatment, and risk factors. Write down what you have found.

Note: this is an interactive activity. Students have to do their own research on a specific cardiovascular disease. When needed you can give them extra instructions like:

1. *Use reputable and reliable online sources, such as medical websites, research journals, and healthcare organizations, to gather information about the chosen condition.*
2. *Focus on understanding the following aspects of the disease: its definition, symptoms, causes, risk factors, diagnostic methods, treatment options, and preventive measures.*
3. *Take notes and organize the information you find, making sure to properly reference your sources.*
4. *Pay attention to any new developments or advancements in the diagnosis or treatment of the chosen cardiovascular disease.*
5. *Be critical of the information you come across, and cross-reference the findings from multiple sources to ensure accuracy and reliability.*
6. *Summarize your findings in a concise and clear manner, highlighting the key points about the cardiovascular disease you researched.*
7. *If applicable, consider including any personal reflections or insights gained from your research.*



Slide 32 + 33 Arteriosclerosis

Note: this is an interactive activity. Students see a video (link: [Arteriosclerosis - YouTube](#)) . Just like the video about the Lymphatic system, questions can be added to the video when wanted.

Slide 34 Risk factors of arteriosclerosis

- too much animal fat
- too much salt
- smoking
- stress
- excessive alcohol consumption
- obesity



Slide 35 Symptoms of heart failure

- fatigue
- shortness of breath
- weight gain frequent
- urination (at night)
- swollen hands and feet
- coughing
- restless sleep
- dizziness
- confusion



Slide 36 Causes of heart failure

- Angina Pectoris
- Heart attack (Myocardial infarction)
- Cardiomyopathy
- Arrhythmia

Slide 37 Symptoms of a heart attack

- Chest pressure or discomfort
- This pain may radiate to the jaw and arms, especially the left arm
- Pain in the shoulders or between the shoulder blades
- Pallor and profuse sweating
- Dizziness, nausea, and sometimes vomiting
- Shortness of breath
- Anxiety and in some cases, a sense of impending doom
- Brief loss of consciousness without warning
- Restlessness



Slide 38 What happens during a heart attack

Note: this is an interactive activity. Students see a video (link: [What happens during a heart attack? - Krishna Sudhir - YouTube](#)) and on certain times questions are displayed and the video paused. The students can't continue watching the video until they have answered the questions correctly. The answers are provided in the video, so by listening and paying attention the student can succeed. The minute, second, type of question and question are provided below.

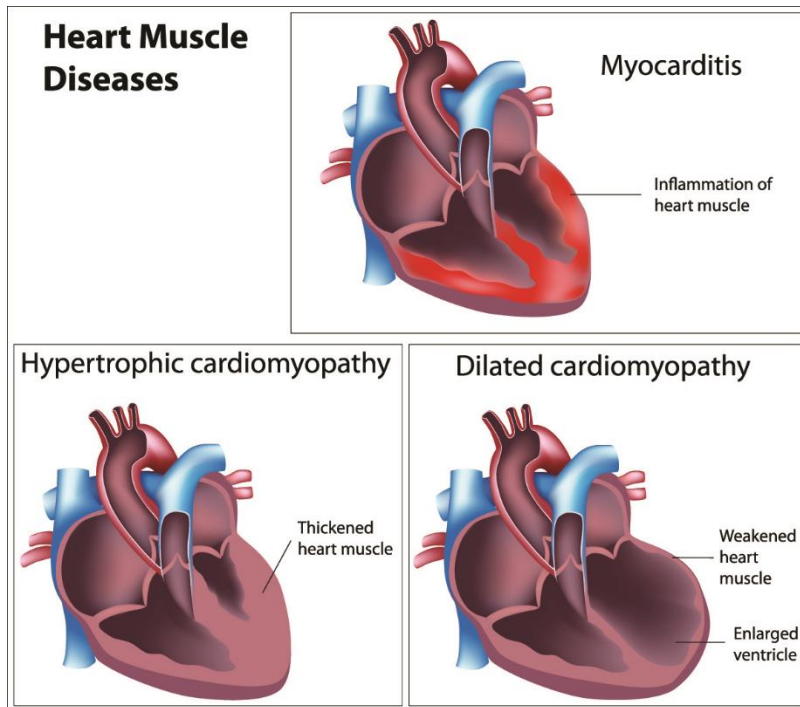
1. 00:05 Open ended question: What do you already know about why a heart attack occurs?
2. 00:15 Multiple choice question: During a heart attack _____.
 - a. too much oxygen flows to the heart.
 - b. oxygen does not get to the heart. (correct answer)
 - c. the heart pumps faster.
 - d. the muscle contracts too quickly.
3. 01:06 Multiple choice question: What are symptoms of a heart attack?
 - a. Chest pain
 - b. Pain in left arm
 - c. Pain in jaw
 - d. All of the above (correct answer)
4. 04:26 Multiple choice question: You can reduce your risk of a heart attack by _____.
 - a. eating healthy.
 - b. losing weight.
 - c. exercising.
 - d. All of the above (correct answer)
5. 04:39 Open ended question: What did you find the most surprising?

Slide 39 Cardiomyopathy

Cardiomyopathy is a heart muscle disease that can be hereditary or develop when the heart is continuously burdened. This can occur, for example, in cases of:

- Inflammation of the heart muscle (myocarditis)
- Long-term high blood pressure or arrhythmias
- Narrowed coronary arteries
- Heart valve disease
- Diabetes
- Thyroid or metabolic disorders
- Prolonged use of alcohol or drugs
- Radiation therapy or chemotherapy

Slide 40 Heart muscle disease



Slide 41 Arrhythmia




Note: this is an interactive activity. Students see a video (link: [Arrhythmia Overview - Mechanism of bradyarrhythmia and tachyarrhythmia - YouTube](#)). Just like the video about the Lymphatic system and What happens during a heart attack, questions can be added to the video when wanted.

Slide 44 Quiz

Note: this is an interactive activity. Students can answer the questions individually or in groups.

Question (correct answers are marked as bold)	Image
1. High cholesterol can cause the clogging of blood vessels (atherosclerosis). a. Correct b. Incorrect	
2. What is Decompensatio Cordis? a. Tissue necrosis b. Arterial calcification c. Heart failure d. Arrhythmia	



<p>3. "Intermittent claudication" or "Peripheral arterial disease (PAD)" is caused by a narrowing in the leg arteries.</p> <p>a. Correct b. Incorrect</p>	
<p>4. Medication group Statins:</p> <p>a. Are diuretics b. lower cholesterol levels c. lower blood pressure d. are anti-inflammatory drugs</p>	
<p>5. What is the underlying cause of a tight chest pain (Angina Pectoris)?</p> <p>a. Inflammation of the pericardium b. Narrowing of the coronary arteries c. Thrombosis of the heart d. Heart failure</p>	

Recap of the lesson

Note: this is an interactive activity. Students can make their own summary of the lesson by pointing out lessons learned or the most important information. Example:

- The circulatory system is responsible for transporting oxygen and nutrients throughout the body.
- It consists of the heart, blood vessels, and blood.
- The heart pumps blood through the circulatory system via the systemic and pulmonary circulations.
- Different types of blood vessels include arteries, veins, and capillaries, each serving specific functions.
- Common cardiovascular diseases include arteriosclerosis, heart failure, angina pectoris, heart attack, cardiomyopathy, and arrhythmia.
- Symptoms of heart conditions may include chest pain, shortness of breath, fatigue, and swelling.
- Risk factors for cardiovascular diseases include high blood pressure, high cholesterol, smoking, obesity, and family history.
- Medical interventions and lifestyle changes can be used to manage and prevent heart conditions.

This is also the moment for students to ask questions to each other or to their teacher.