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- **Open Book 4 Cardiovascular and Lymphatic Systems**

- **Go to the opening Page, Page 8 and Read and Learn a few cool things:**

**SECTION 1**

**Heart**

**TOPICS COVERED IN SECTION 1**

1. List the functions of the cardiovascular system.
2. Describe the location, coverings, and layers of the heart.
3. Describe the anatomy and function of the heart chambers.
4. Describe the anatomy and function of the Atrioventricular heart valves.
5. Describe the anatomy and function of the Semilunar heart valves.
6. Describe the anatomy and function of the major blood vessels of the heart.
7. Trace the blood flow through the heart.
8. Trace the pathway of the systemic, pulmonary, and coronary circuits.
9. Trace the electrical conduction pathway of the heart.
10. Relate electrical activity of the heart with deflection waves of an ECG.
11. Explain the stages of the cardiac cycle by correlating with systole, diastole, pressures, valves and sounds.
12. Define heart rate, stroke volume, and cardiac output and how heart rate and stroke volume determine cardiac output.

This is a wonderful chapter filled with blood and bodily fluids, tubes and the pump that drives them. Wait, that doesn’t sound wonderful. It sounds like a horror film. Why does the talk of blood and bodily fluids make the average person want to seek shelter, preferably away from a dark basement where the axes are stored? Maybe because blood is mysterious, and loss of it makes us think life is ebbing away. Well, that is not far from the truth.

Blood is one of the most important tissues in the body and without it, we could not survive. Blood and other fluids carry oxygen, carbon dioxide, hormones, nutrients, wastes and pathogen fighting agents, all to maintain our lives. Blood is contained within vessels or tubes where it circulates throughout the entire body, keeps you warm, makes you turn red when you are embarrassed, and reaches every cell in your body to keep them alive.

The heart is the driving pump. Without the essential heart, the blood would not circulate and provide our cells with such important things as oxygen and food. Without the heart, we could not pump the blood all the way to our toes and back, carrying wastes, antibodies, and proteins. And without the heart, horror movies would be no fun. Blood wouldn’t splatter, girls wouldn’t scream and axes would lose their luster. So let’s take a look at that red stuff and why it is so essential.
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1. **Note the tool bar:** The upper left and right corners, you can scroll, view thumbnails, find the page you need, choose a new book or highlight text as you read. Our icons are consistent throughout all 6 books.

2. **Read** the first TOPIC: Functions of the Cardiovascular System

**Topic 1: Functions of the Cardiovascular System**

The cardiovascular system consists of the heart, the blood vessels and blood. One of the main functions of this system is to transport substances to and from the cells of the body. The heart will pump the blood, the blood vessels contain and deliver the blood and the blood itself contains our essential nutrients, body wastes and respiratory gases. There are a few more functions of this system we should also consider.

1. The cardiovascular system generates blood pressure
2. Exchange of nutrients and wastes takes place at the smallest vessels or capillaries
3. The cardiovascular system regulates blood flow as the needs of the body changes

Oxygen (O₂) is a respiratory gas that is essential for our body’s cells to thrive, to process sugar and generate energy to run reactions and maintain the lives of our cells.

Carbon dioxide (CO₂) is the other respiratory gas produced as a by-product from the chemical reaction of cellular respiration. But how do we transport oxygen and carbon dioxide throughout our blood vessels? First let’s learn about the heart, the blood vessels, and then we will explain oxygen and carbon dioxide exchange and blood pressure, and blood’s essential role in all of it.

Please answer the 2 questions in the review below:

**Review**

**Question 1**

The cardiovascular system consists of:

- A. Heart
- B. Blood vessels
- C. Blood
- D. All of the above (heart, blood vessels, and blood)

**Question 2**

Oxygen (O₂) is a respiratory gas that is essential for our body’s cells to thrive. To process sugar and generate energy to run reactions and maintain the lives of our cells, oxygen must:

- A. Be transported by the blood vessels
- B. Be produced by the heart
- C. Be carried to the cells by the heart
- D. Be processed by the liver

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- **Concept Check** – Check your knowledge, are you learning it? Complete a multiple-choice question set over your reading.

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- **Animations**: Created by our Instructional Designers based on storyboards written by the authors. These unique animations tell stories of our most difficult concepts or “pain points”. Get ready to learn!

Imagine your heart enclosed in a doubled layered water balloon. The outer layer of the balloon sticks close to the fibrous sac, and the inner layer, sticks close to the heart itself. That is the basis of the serous pericardium.

The heart is really a big, hollow muscle, capable of contracting very forcefully to drive the blood around your body. As we learned however, the heart has some unique tissues that protect it, and protect the blood inside of it from clotting. Your heart is central in your thoracic cavity (remember we called the area where the heart resides the mediastinum). So when you say the “Pledge of Allegiance” and you put your hand over your heart, remember to stay in the middle of your chest. If you move your hand too far to the left or right, you will be saying the pledge of allegiance to your lung.

I’m not sure that means the same thing.

- **Fibrous Pericardium**: This is a loose heart covering or sac that serves as an anchor for the heart and prevents it from overfilling. The fibrous tissue or sac does not stretch.

- **Serous Pericardium**: This delicate inner lining of the pericardial sac has an outer parietal layer, which adheres to the sac and an inner visceral layer that adheres to the heart. Between the two layers is fluid, known as serous fluid, which provides a slippery film to reduce friction as the heart contracts and fills with blood.
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3. **Watch the video** on Blood flow through the heart in Book 4 (just tap the animation)... all videos are captioned for ADA compliance.

*The Coronary Vessels*

The heart is an organ just like your brain or stomach and also needs blood supply rich with oxygen and the capability to remove wastes and carbon dioxide. The heart takes no oxygen from the blood that moves through its chambers, so it must have special blood vessels that supply and drain the heart muscle itself. These are called the coronary blood vessels. The **coronary arteries** supply the heart and the heart muscle with oxygen-rich blood. These branch off of the base of the aorta, and supply all aspects of the heart wall. The coronary veins drain the heart of oxygen-poor blood and waste products of cellular metabolism. The veins converge before entering the right atrium of the heart.

**TOPIC 7: BLOOD FLOW THROUGH THE HEART**

The more we learn about the heart, the more we see it as a pump; a complex organ designed in such a way as to provide a driving force to push blood throughout the body. Think of the blood vessels as being a closed circuit, a series of tubes that begin and end at the heart. They travel tens of thousands of miles in that circuit by supplying oxygen-rich blood to tissues and draining oxygen-poor blood from tissues. The blood also has a unique pattern of flow inside the heart, from where it first enters to where it leaves, gaining oxygen along the way. To truly understand the pump, and the provision of oxygen, we must understand the flow of blood inside it. Let us learn the pathway of blood through the heart and lungs.

To begin, **deoxygenated** blood enters the right atrium via the superior and inferior vena cava and coronary veins. The blood passes through the tricuspid valve and enters the right ventricle. From the right ventricle,

- Or for a fun way to learn Parasympathetic vs Sympathetic, Click on this video in **Book 3**
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- **Keynotes**: we use these to present “mini” lectures, in which students can watch narrated presentations or work through the slides on their own:

4. Tap on the icon to watch a narrated keynote on the Layers, Coverings and Lining of the heat or self-guide and walk through the lesson on your own.

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- **Course Enhancements/Interactives** – These custom widgets are created by our Instructional Designers based on storyboards written by the authors. These comprehensive activities offer formative assessments, while engaging the students and testing their readiness to move on to new objectives.

5. Go to page 28 and Click on the light bulb to complete the activities of the heart.

overfilling. This fibrous sac is composed of both a fibrous layer and a serous layer.

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6. **You did it!** You mastered the Cardiovascular System. Now feel free to move on to new subjects!! What else would you like to learn?