
Activity 4.1.1: Path of Blood in the Heart

Introduction

At the time of her death, Anna's heart stopped beating. The body's pump was no longer able to propel oxygen-rich blood to her tissues and cells. As you continue to piece together the circumstances of her untimely death, examine any evidence housed in Anna's *cardiovascular system*, the system of the heart and the associated blood vessels, for additional clues.

The human heart is an amazing pump. Each beat correlates with the pumping action of the heart as it moves blood through the entire body. On average, a person's heart beats 100,000 times each day. That is over 35 million beats a year and over 2.5 billion beats during an average lifetime. The human heart has to pump 5.6 liters (about six quarts) of blood every 20 seconds. In an average lifetime the heart pumps over 55 million gallons of blood. That is a lot of pumping!

The blood pumped by the heart carries many of the resources necessary for life, including nutrients, oxygen, and water, to your cells. The body's cells must carry out many reactions in order to survive, grow, repair, or replicate. All of these processes require energy, and oxygen is required for cells to obtain energy. Therefore, all cells need a constant supply of oxygenated blood.

To understand the design of the heart, it is important to examine the structures of this incredible organ and trace the path of blood flow. In this activity you will investigate the basic structure of the heart as well as identify the major blood vessels that bring blood in and out of the heart's main chambers. You will create a graphic organizer to help you remember the basic traffic pattern of blood flow to and from the heart and lungs. The diagrams you draw in this activity will help you to identify the actual structures of the heart when you dissect a four-chambered sheep's heart in the next activity.

Equipment

- Computer with Internet access
- 8.5 x 11 inch paper, chart paper, or poster board
- Colored pencils or markers
- *An Illustrated Dissection Guide to the Mammalian Heart* by David Hall or other anatomy atlas of the heart

Procedure

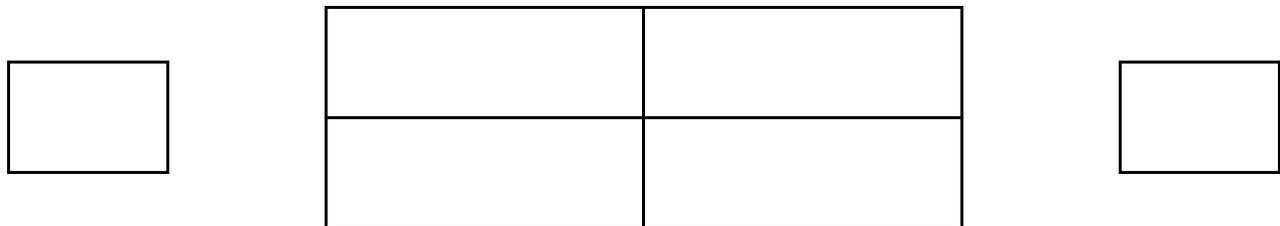
1. Go to the website <http://www.wikihow.com/Check-Your-Pulse>. Calculate your own pulse rate, and write it down in your NB.

2. Open the NOVA *Map of the Human Heart* Interactive available at <http://www.pbs.org/wgbh/nova/body/map-human-heart.html>.
3. Click on the *Launch Interactive* button to the right of the heart drawing.
4. Click the *Track* button to track the liters of blood your heart pumps while completing this interactive.
5. Click on the *Anatomy* tab to view the basic structures of the heart. Pay special attention to the information regarding the convention in naming the right and left sides of the heart. Return to this drawing as needed throughout the activity.
6. Click on the *Step Thru* tab and follow the main steps as blood moves through the heart, lungs, and body. List these six steps in your NB. Note which side of the heart takes oxygen to the lungs and which side of the heart is responsible for delivering oxygen to the body.
7. Note the amount of blood (in liters) your blood has pumped before exiting the animation. Remember that a traditional soda bottle holds two liters. Write this number down in your NB.
8. Follow the directions below to create a simplified drawing of the heart showing the basic flow of blood through the organ. This “heart box” will be a general reference for you as you further explore the main blood vessels that serve the body and the heart. It is not designed to show you an anatomical drawing of the heart, but to help you remember key structures as well as the general flow of blood.
9. Use any of the following websites or a reference textbook to view the structure of the human heart and complete the remaining steps of the activity.
 - Human Anatomy Online – Heart
<http://www.innerbody.com/image/card02.html>
 - Get Body Smart: An Online Examination of Human Anatomy and Physiology
<http://www.getbodysmart.com/ap/circulatorysystem/heart/menu/menu.html>
 - Texas Heart Institute – Heart Anatomy
<http://www.texasheartinstitute.org/HIC/Anatomy/anatomy2.cfm>
 - John Wiley and Sons, Inc. Blood Flow Through the Heart animation
http://www.sumanasinc.com/webcontent/animations/content/human_heart.html
 - Yale University; Cardiothoracic Imaging: Gross Anatomy of the Heart at:
http://www.yale.edu/imaging/anatomy/ant_heart_2/
10. Obtain a piece of chart paper or poster board. Alternatively, your teacher may have you complete the activity on an 8 ½” x 11” sheet of paper.
11. Use a ruler to create a large 2 x 2 table in the center of the paper as shown below.





12. Remember that there are four chambers in the human heart. Think about each square in the box as a chamber of the heart. Label the right and left atria as “RA” and “LA.” Label the right and left ventricle as “RV” and “LV.” Remember that you are looking at an illustration of someone else’s heart. Make sure you are clear as to which side is labeled as the right and which side is labeled as the left.
13. Review circulation in the body. *Pulmonary circulation* moves blood to the lungs to pick up oxygen and back to the heart so that oxygenated blood can be delivered. *Systemic circulation* pumps oxygen rich blood to the body and returns deoxygenated blood back to the heart to be sent out for refueling.
14. Use a ruler to create a smaller box on either side of the main 2x2.



15. Determine which side of the heart is responsible for pulmonary circulation and which side is dedicated to systemic circulation. Label the appropriate side box “lungs” and the other box “body.” Add drawings to represent the lungs and the body.
16. Answer Conclusion question 1 and 2 on a sheet of NB paper labeled **4.1.1 Conclusion Questions**. Remember to write down the questions.
17. Note that a series of tubes, or vessels, serve as the highways for the transportation of blood. *Arteries* are responsible for carrying blood away from the heart and *veins* are responsible for returning blood back to the heart.
18. Add the major blood vessels to your diagram. Refer to the resources in Step 11 for guidance. Draw tubes running from one box to another (outside the boxes) to show the path of the vessels listed below. Think about where each vessel starts and ends. For example, the pulmonary arteries move blood from the heart (the right ventricle) to the lungs to pick up oxygen. In this case you would draw a tube from the box representing your right ventricle to the box representing the lungs.
 - Pulmonary Artery
 - Pulmonary Vein
 - Aorta
 - Superior and Inferior Vena Cava
19. Label each major blood vessel. Make sure the path you show on your diagram is accurate. Note that blood that is moving out of the ventricles actually moves up through the top of the heart. Major vessels do not leave the bottom of the heart

