

**FOR CENTER DIRECTOR'S USE ONLY**

**ANSWERS**  
**MODEL SCIENCE – THE HEART**  
High School – All Grades

Students **MUST** be prepared to answer each question with a complete sentence or sentences.

**1. What is the size of the human heart?**

A normal sized healthy heart is roughly the same size as a fist.

**2. Describe the fetal heart's developmental stages.**

During the fetal heart's developmental stages, the heart actually takes on several distinct appearances. These heart structures resemble other animal hearts. During phase one, the tube-like heart is much like a fish heart. The second phase resembles a frog heart with two chambers where the two atria are partly separate but there is just one big ventricle. The three-chambered phase is similar to a snake or turtle heart with the two atria completely separate and the ventricles just beginning to separate. The final four-chambered heart structure distinguishes the human heart.

**3. Describe the pericardium and its function.**

The pericardium is the outermost layer of the heart which comprises of a sac. It is an extremely tough membrane that acts as a protective barrier for the heart against damage and infection from adjacent organs, that keeps the heart contained in the chest cavity, and that prevents the heart from overexpanding when blood volume increases.

**4. What is the function of the aorta and what are the sections of the aorta?**

The function of the aorta is to supply oxygenated blood from the heart to the body's organs and tissues. The aorta is traditionally divided into the ascending aorta, aortic arch, and descending aorta (which is subdivided into the thoracic aorta and the abdominal aorta).

**5. Describe the pulmonary arteries and its function.**

The pulmonary arteries begin with the pulmonary trunk (pulmonary artery or main pulmonary artery) at the base of the right ventricle. It then branches into two pulmonary arteries (left and right) to the corresponding lung. The function of the pulmonary arteries is to carry deoxygenated blood rich in carbon dioxide from the heart to the lungs where the carbon dioxide is exchanged for oxygen.

**6. Name four (4) risk factors for heart disease.**

- |                             |                        |
|-----------------------------|------------------------|
| a) Blood cholesterol levels | f) Physical inactivity |
| b) High blood pressure      | g) Obesity             |
| c) Diabetes mellitus        | h) Alcohol             |
| d) Tobacco use              | i) Heredity            |
| e) Diet                     |                        |

**7. Describe the left ventricle and its function.**

The left ventricle is the lower left chamber of the heart and it forms the apex of the heart. It has the thickest walls of all and is longer and more conical in shape than the right. From this chamber oxygenated blood is pumped out of the heart, into the aorta and out to the rest of the body.

**8. Describe the right ventricle and its function.**

The right ventricle is the lower right chamber of the heart. It is triangular in form and extends from the right atrium to near the apex of the heart. The right ventricle receives deoxygenated blood from the right atrium via the tricuspid valve, and pumps it into the pulmonary arteries and to the lungs.

**9. Where is the tricuspid valve located? What is its function?**

The tricuspid valve is located at the entrance of the right ventricle (between right atrium and right ventricle). The valve opens and closes to allow blood to flow in only one direction when the heart contracts and prevents deoxygenated blood from washing back into the right atrium.

**10. What is the function of the superior and inferior vena cava?**

The superior vena cava returns deoxygenated blood from the upper half of the body (the head, neck, and the arms) into the right atrium of the heart. The inferior vena cava returns deoxygenated blood from the lower part of the body (chest, abdomen, and legs) to the right atrium of the heart.

**11. Describe the right atrium and its function.**

The right atrium is the upper right chamber of the heart. It is the thin-walled area that receives venous or “used” blood (deoxygenated) returning to the heart by the veins. It receives the deoxygenated blood from the superior and inferior vena cava and pumps it into the right ventricle.

**12. What is the purpose of the cardiovascular system?**

The cardiovascular system, comprising both the heart and the blood vessels, circulates blood throughout the body. It carries essential supplies of oxygen and nutrients to every cell and exchanges them for potentially harmful waste products. The one-way closed circulatory system is composed of a complex network of arteries, arterioles, and capillaries that carry oxygenated blood and a complex network of veins and venules that carry deoxygenated blood.

**13. What is arteriosclerosis?**

Arteriosclerosis is the thickening, hardening and loss of elasticity of the arterial walls resulting in impaired blood circulation.

**14. Describe what happens in a myocardial infarction.**

A myocardial infarction occurs when the blood supply to part of the heart muscle is severely reduced or blocked due to a narrowing in one of the coronary arteries. This usually occurs as a result of atherosclerosis. When platelets gather at the narrowing, they can form a clot that completely blocks the blood flow. If the blood supply is cut off for more than a few minutes, the muscle cells of the heart may be permanently injured or die from lack of oxygen.

**15. What three (3) types of exercise are needed for a healthy heart? Describe each.**

- a) Aerobic exercise such as swimming, walking, running, dancing or using any of the aerobic (cardiovascular) machines at the gym (treadmill, stepper or elliptical trainer) increases your breathing rate and gets you breathing more deeply.
- b) Strength exercise helps to make your muscles stronger, strengthens your bones and protects your joints from risk of injury. This type of exercise may involve use of weights and weights machines such as those found in the gym, but this also includes carrying heavy shopping bags or doing press-ups, lunges or squats.
- c) Stretching. It encourages improved blood flow and helps keep you supple so you can move more easily. These exercises can be found in any exercise book or by doing yoga or Pilates.

**16. Name four (4) differences between an angina and heart attack.**

- a) Angina is only a temporary reduction of the flow of the blood to the heart; a heart attack is a sudden, permanent stopping of the flow of blood to the heart.
- b) Heart attack chest pain is more severe and lasts longer than chest pain caused by angina.
- c) Angina pain will go away with rest or medication; heart attack pain does not.
- d) Both angina and a heart attack can be accompanied by indigestion, sweating or nausea; however, heart attack symptoms are typically milder.
- e) Angina does not cause permanent damage to the heart muscle; a heart attack causes permanent damage.

**17. Describe a heart-healthy diet.**

- a) Nutritious and well-balanced
- b) Low in saturated fat, trans fat, cholesterol, and salt
- c) High in fruits, vegetables and whole grains

**18. What three (3) major waves of electrical signals appear on the ECG/EKG? Describe each wave.**

- a) P Wave (1<sup>st</sup> wave) – records the electrical activity of the heart’s two upper chambers (atria).
- b) QRS Wave (2<sup>nd</sup> wave) – records the electrical activity of the heart’s two lower chambers (ventricles).
- c) T Wave (3<sup>rd</sup> wave) – records the heart’s return to the resting state.

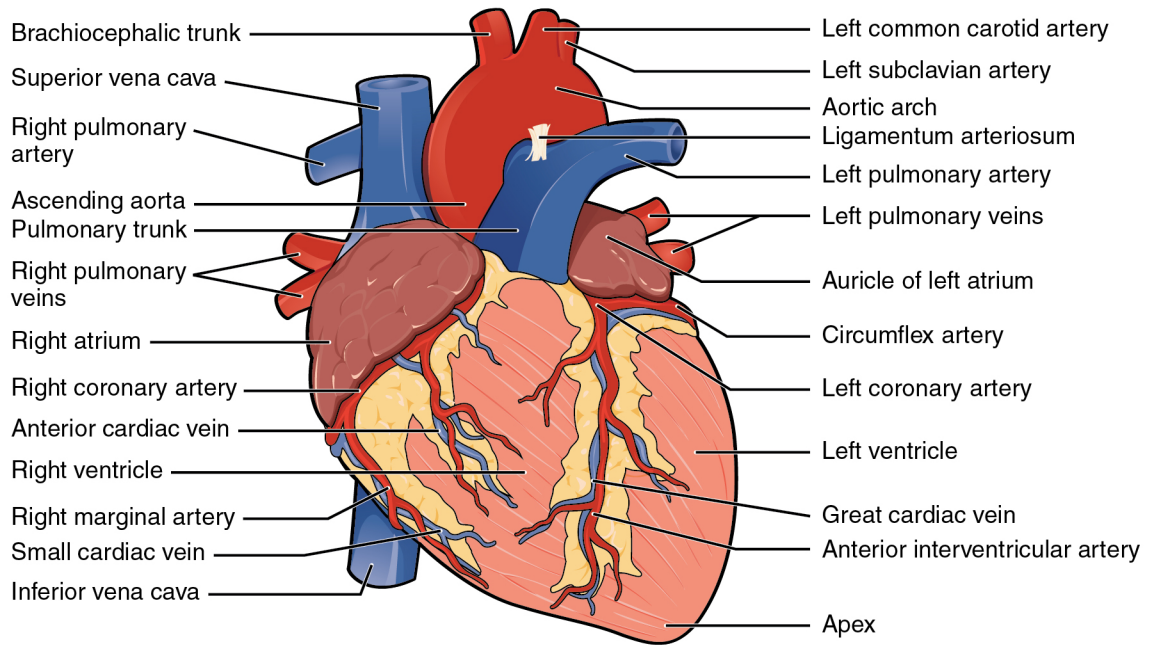
**19. What regulates the rhythm of the heartbeat?**

The rhythm of the heartbeat is regulated by electrical impulses produced normally by the sinoatrial node – the heart’s natural pacemaker. The electrical impulses are carried by special conducting tissue, causing the atria and ventricles to contract.

**20. Describe ventricular systole.**

During ventricular systole, the pressure in the ventricles increases and eclipses the pressure in the atria, closing the tricuspid and mitral valves. The pressure in the ventricles continues to rise until the pressure is greater than the pressure in the pulmonary artery and the aorta, causing the pulmonary and aortic valves to open. At the end of the ventricular systole, when the pressure of the ventricles falls rapidly, the pressure in the pulmonary artery and the aorta will close the pulmonary and aortic valves.

**Anterior view**



**Posterior view**

