

The Heart
Chapter Study Guide (C20)
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(In order to learn the function of the heart you must first learn the structure of the heart. This is why there are questions about the structure of the heart in this study guide, however. The lecture exam questions will predominately test you on the “function of the heart and not the structure of the heart”).

1. Study the anatomy of the heart (See Figures in Textbook). You will be tested in lab on the anatomy. We will cover the physiology of the heart in the lecture session. You need to know the anatomy in order to understand the physiology.
2. >What are the three “circuits” of blood flow? From where to where? What provides the force for each of these three circuits?
3. What are the names of the first two arteries to branch off of the ascending aorta?
 - a. What tissue is perfused by these arteries?
 - b. What is the significance of an anastomosis between these arteries?
 - c. Why might this prevent?
 - d. How does this blood return to the heart?
4. Trace the blood flow between the inferior and superior vena cava to the aorta:
5. What is the force that moves blood through the heart?
6. What structures direct the flow of blood through the heart? Name the “four” structures.
7. Where is the heart located in the thorax? What is the significance of the fibrous capsule?
8. What is the pericardium? :
 - a. What two terms are used to describe the pericardium's membranes?
 - b. What is the space called between these membranes?
 - c. What is the function of these two membranes?
9. >What are the three layers of the heart?
 - a. What type of cells make up the middle layer of the heart's walls?
 - b. What are the inner and outer layers called?
 - c. Which side of the heart has a thicker wall? Why?
 - d. What are the structures that you can see from inside the heart? (eight learning objectives)

10. The heart is a pump.
 - a. Why may we describe the heart as two pumps?
 - b. How is the pressure between the left and right side of the heart different? Why?
 - c. How can we describe the pumping action in terms of the direction of blood movement between the upper and lower chambers during the cardiac cycle?
11. How many valves are there in the heart?
 - a. What is the function of the heart valves?
 - b. >What are the names of the heart valves?
 - c. >Where are they located?
 - d. How do these valves differ from each other?
 - e. What causes the heart valves to open and close?
 - f. Is there a valve at the entrance of the right and left atria?

About the Intrinsic Conduction System: Fig 20.10

12. >What is the significance of the intrinsic conduction system?
13. >Cardiac muscle cells are autogenic. What does this mean? How are the action potentials different for the two distinct types of myocytes found in the heart?
14. How does the Autonomic Nervous System influence the heart rhythm?
 - a. >Where do sympathetic fibers synapse? Functions?
 - b. >Where do the parasympathetic fibers synapse? Function?
 - c. How does the vagal tone influence heart function?
 - d. Study Figure 20.10 and note the following structures: SA node, AV node, bundle of His, bundle branches, and Purkinje fibers.
15. >What structure allows action potentials to be transmitted between adjacent cardiocytes? Why is this important?
16. What are the metabolic features associated with cardiocytes? (key words to use in answer: anaerobic/aerobic; mitochondria; myoglobin; fuel source; fatigue)

About the Cardiac Rhythm

17. >What two terms are used to describe cardiac contraction and cardiac relaxation?
18. >Where is the location of the heart's two pacemaker(s)? What is this tissue called? Adult rhythm at rest (BPM)?
19. What is an ectopic focus? What can cause an ectopic focus?
20. >What is nodal rhythm? Location? What is the heart's rhythm under nodal rhythm?

21. What is the heart's beats per minute when under control of an ectopic focus? Can this rate of BPM sustain life?

About Pacemaker Physiology (Fig 20.11)

22. >Why does the SA node spontaneously fire? What is a pacemaker potential? (fig 20.10)

23. How does the pacemaker potential differ from a nerve action potential?

24. >Why is the SA node called the pacemaker?

25. >How long does it take for the SA node to depolarize and repolarize? What is this called?

About the Electrocardiogram (Fig 20.12 , Fig 20.14, and Fig 20.13)

26. Match the events which occur in the heart to the EKG tracing.

- a. What is the cardiac cycle?
- b. >How long is the cardiac cycle?
- c. >What events create the two most significant “sounds of the heart” ? Specifically, what is S1 and S2 sounds?
- d. What “sounds” are used to describe S1 and S2?

27. What instrument is used to measure blood pressure?

28. >Explain these terms in relationship to the Cardiac Cycle: Ventricular filling, end-diastolic volume, isovolumetric contraction, ventricular ejection, stroke volume, ejection fraction, end-systolic volume, and isovolumetric relaxation.

About Cardiac Output (Fig 20.17)

29. >What is the “equation” that describes cardiac output? How much blood is in the circulatory system?

30. >What is stroke volume? Volume?

31. What is the benchmark for an adult heart rate?

32. >What is the difference between resting and maximum cardiac output called?

33. >What is the different between the heart rate for an adult, new born and the elderly?

34. What are the benchmarks for tachycardia and bradycardia?

35. >What is a chronotropic effect? What type of factors can cause either a positive or negative chronotropic effect?
36. >What is an inotropic effect? What type of factors can cause either a positive or negative inotropic effect?
37. >What does “contractility” mean in relationship to cardiac output?
38. >What three factors “govern” stroke volume?
39. >What is the definition of preload and afterload?
40. What is cor pulmonale? What caused the right ventricle to fail? How does this affect afterload in pulmonary trunk?
41. What is fibrillation? How can you stop fibrillation?
42. >Which condition is more serious, atrial or ventricular fibrillation? Explain

Regulation of the Heart (Fig 20.16)

43. >How does the autonomic nervous influence the function of the heart?
44. >How do chemicals found in the blood influence the function of the heart? Where may these molecules come from?
45. >How do proprioceptors influence the function of the heart?
46. >How may your conscious (cerebrum) and subconscious (limbic system) influence the function of the heart?

Other Topics Related to Heart Function

47. >What is the difference between atherosclerosis and arteriosclerosis? (Fig 20.21)