

## The Heart

### Study Guide (HL) - C20

Tortora & Derrickson

(Note: Many of these questions are about the structure of the heart. All of the questions about function are to be considered “hot list questions”.)

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 “blood circuits” of the circulatory system? What provides the force for these three circuits? What are the structure (blood flow route) of these three blood circuits?
3. What are the names of the first two arteries to branch off of the ascending aorta? (Trick questions, be careful!)
  - a. What tissue do these arteries perfuse?
  - b. What is the significance of an anastomoses between branches of these arteries?
  - c. Why might this prevent a myocardial infarction?
  - d. What is the pathway for this venous blood return to the heart?
4. Trace the blood flow through the heart by starting at inferior and superior vena cava. Note: blood flow and pumping action are two different events
5. What is the force that moves blood through the heart?
6. What regulates the flow of blood through the heart? Name structures.
7. Where is the heart located in the thorax? What is the fibrous capsule?
8. What is the Pericardium? :
  - a. What are the names for the two layers of the pericardium?
  - b. What is the space called between the two membranes?
  - c. What is the function of these two membranes?
9. What type of cells make up the middle layer of the heart’s walls?
  - a. What are the inner and outer layers called?
  - b. Which side of the heart has a thicker wall? Why?
  - c. What are the structures that you can see from inside the heart? (eight learning objectives)
10. The heart is a pump.
  - a. Why is it appropriate from a functional perspective to describe the heart as two pumps?

- b. How is the pressure different between the left and right side of the heart? Why?
  - c. Describe the pumping action in terms of the direction of blood movement?
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 opens and closes the heart valves?
  - f. Is there a valve at the entrance of the right and left atria?

About the Intrinsic Conduction System: Fig 20.10

12. 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?
13. How does the Autonomic Nervous System influence the heart rhythm?
- a. Where do sympathetic fibers synapse? Functions (3)?
  - b. Where do the parasympathetic fibers synapse? Function (1)?
  - c. What is cardiac vagal tone?
  - d. Study Figure 20.10 and note the following structures: SA node, AV node, bundle of His, bundle branches, and Purkinje fibers.
14. How is an action potential transmitted between individual cardiocytes? Why is this important?
15. What are cardiocytes' metabolic features? (key words to use in answer: anaerobic/aerobic; mitochondria; myoglobin; fuel source; fatigue)

About the Cardiac Rhythm

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

21. Why does the SA node spontaneously fire? Pacemaker potential? (fig 20.10)
22. How does the pacemaker potential differ from a nerve action potential?
23. Why is the SA node called the pacemaker?

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

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

25. 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 creates the “sounds of the heart” ? Specifically, what is S1 and S2 sounds?
- d. What words are used to describe S1 and S2?

26. What instrument is used to measure blood pressure?

27. 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)

28. What is the definition of cardiac output? How much blood is in the circulatory system?

29. What is stroke volume?

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

31. What two factors determine CO?

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

33. How is adult heart rate different than HR for 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. What is more serious, atrial or ventricular fibrillation? Explain

Regulation of the Heart (Fig 20.16)

43. How does the autonomic nervous system regulate the heart?

44. How do chemicals regulate the heart?

45. How do proprioceptors influence the heart?
46. How may your conscious (cerebrum) and subconscious (limbic system) influence the heart?
47. What is the difference between atherosclerosis and arteriosclerosis? (Fig 20.21)