Name_____Date_____Per._____No._____

Anatomy & Physiology

STUDY GUIDE for *Unit 7 – The Cardiovascular System*

(Chapter 18: The Cardiovascular System: The Heart, pages 658 – 691;
Chapter 19: The Cardiovascular System: Blood Vessels, pages 692 – 745, 767 – 772;
Chapter 17: Blood, pages 646 – 676)

16. I identify and describe the ANATOMY of the cardiovascular system.
    a. I can describe the size, location, and orientation of the heart in the thorax. (pages 659 & 660, including Figure 18.2; and *Exercise 27: Heart Structure and Function*, page 430)
    b. I can describe and identify, on a human model or diagram, the anatomy of the heart.
        i. I can identify, on a diagram or model, and describe the coverings of the heart (fibrous pericardium, serous - parietal and visceral - pericardium). (pages 660 & 661, including Figure 18.3; and *Exercise 27: Heart Structure and Function*, pages 440 & 441)
        ii. I can identify, on a diagram or model, and describe the three layers of the heart. (page 661, including Figure 18.3; and *Exercise 27: Heart Structure and Function*, pages 440 & 441)

            1. List the three layers of the heart from superficial to deep.

            2. What is the function of the myocardium?

        iii. I can identify, on a diagram or model, and describe the surface features of the heart. (pages 662 - 665, including Figure 18.5a - e; and *Exercise 27: Heart Structure and Function*, pages 430 & 431)
        I can identify, on a diagram or model, and describe the surface features of the heart. (pages 662 - 665, including Figure 18.5a - e; and Exercise 27: Heart Structure and Function, pages 432 & 433)
        iv. I can identify, on a diagram or model, and describe the internal structures of the heart including the four chambers and the atrioventricular and semilunar valves of the heart. (pages 662 - 668, including Figures 18.5e - 18.8; and *Exercise 27: Heart Structure and Function*, pages 430 & 431)

            3. What is the function of valves?

            4. Describe the four valves of the heart by completing the table below.

Valve	Location	Structure
Right AV valve		
Left AV valve		

Pulmonary semilunar valve		
Aortic semilunar valve		

5. Identify the great vessels and internal features of the heart on Figure 18.5 below.

A. Aorta	B. Aortic (semilunar) valve	C. Bicuspid (mitral) valve
D. Chordae tendineae	E. Endocardium	F. Inferior vena cava
G. Interventricular septum	H. Left atrium	I. Left pulmonary artery
J. Left pulmonary veins	K. Left ventricle	L. Myocardium
M. Papillary muscle	N. Pulmonary (semilunar) valve	O. Pulmonary trunk
P. Right atrium	Q. Right pulmonary artery	R. Right pulmonary veins
S. Right ventricle	T. Superior vena cava	U. Trabeculae carnae
V. Tricuspid valve	W. Visceral pericardium/ Epicardium	

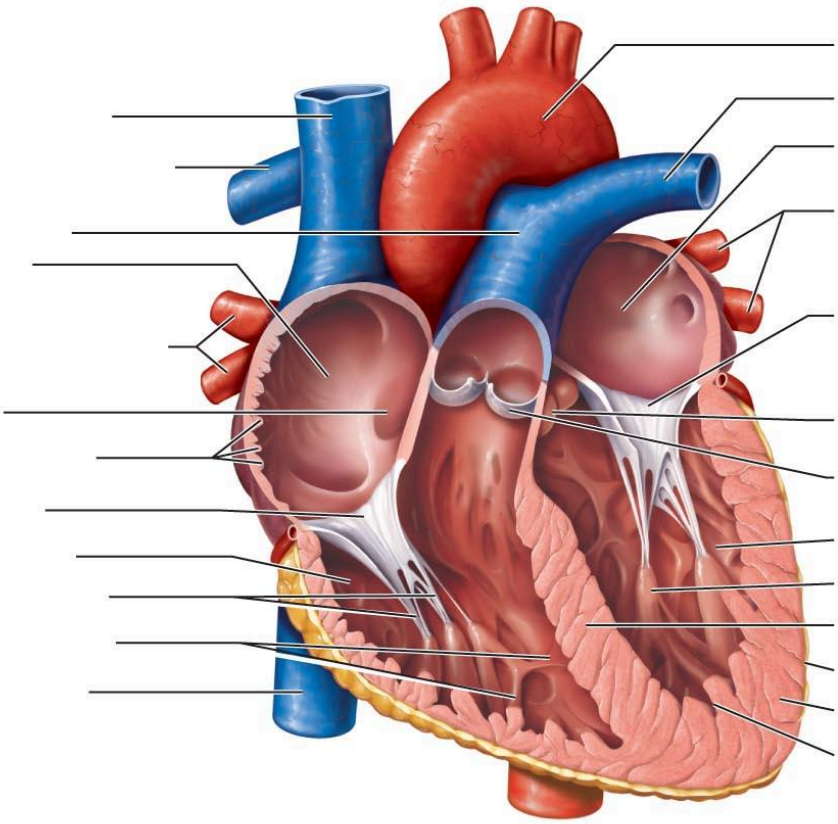

Figure 18.(e) **Gross anatomy of the heart.** (page 665)

v. I can identify, on a diagram or model, the major vessels involved in supplying the heart itself with blood (i.e., coronary circulation). (pages 668 - 671, including Figures 18.5b, d & 18.11; and Exercise 27: Heart Structure and Function, pages 438 & 439)

vi. I can describe the symptoms, causes, treatments and/or cures, and prevention of each of the following disorders associated with the heart: angina pectoris and myocardial infarction/heart attack (page 671); incompetent valve, valvular stenosis, and mitral valve prolapse (page 668).

6. (a) What causes coronary artery disease and myocardial infarction? (b) How are coronary artery disease and myocardial infarction similar? (c) How are they different? (d) Which layer of the heart is affected in both conditions?

a.

b.

c.

d.

c. I can trace the pathway of blood through the heart and pulmonary and systemic circuits listing the vessels, chambers, and valves, and indicating which of these vessels and chambers carry/pump oxygenated blood and deoxygenated blood. (pages 668 & 669, including Figure 18.09; and *Exercise 27: Heart Structure and Function*, pages 436 & 437)

- I can relate the anatomical differences of the right ventricle and the left ventricle to their roles in pulmonary and systemic circulation, respectively. (pages 668 & 670, including Figure 18.10)

7. Describe the functions of the pulmonary and systemic circuits by completing the table below.

Circuit	Function
Pulmonary	
Systemic	

8. **(a) Use Figure 18.1 (page 659) to trace the flow of blood through the pulmonary circuit starting with the right ventricle and ending with the left atrium. (b) Trace the flow of blood through the systemic circuit starting with the left ventricle and ending with the right atrium.**

a.

b.

9. **(a) Describe the difference in thickness of the right and left ventricles and (b) relate the difference to the functions of each of the ventricles**.

a.

b.

10. **In the blanks, trace the flow of blood through the heart, lungs, and body by listing in order all vessels, heart chambers, and valves through which the blood passes, starting with the right atrium.**

- aorta
- aortic (semilunar) valve
- bicuspid (mitral) valve
- left atrium
- left ventricle
- pulmonary arteries
- pulmonary capillaries
- pulmonary (semilunar) valve
- pulmonary trunk
- pulmonary veins
- right atrium
- right ventricle
- systemic arteries
- systemic capillaries
- systemic veins
- tricuspid valve
- venae cavae and coronary sinus

1. right atrium
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____

11. Indicate, by writing next to each structure, whether oxygen-rich (*O-R)* or oxygen-poor (*O-P*) blood flows through each vessel, heart chamber, and valve

d. I can identify select heart structures on a dissected sheep heart. (*Exercise 27: Heart Structure and Function*, pages 442 - 444)
e. I can describe how the fetal heart (foramen ovale, ductus arteriosus) differs from the adult heart (fossa ovalis, ligamentum arteriosum). (pages 686)
f. I can distinguish among the types of blood vessels based on their structure and function. (*Anatomy Review: Blood Vessel Structure and Function* online activity)

12. Summarize the functions of the three major types of blood vessels by completing the table below.

Type of blood vessel	Function
Artery	
Vein	
Capillary	

i. I can describe the three layers (tunics) that typically form the wall of a blood vessel and relate their structure to their function. (page 693; and *Anatomy Review: Blood Vessel Structure and Function* online activity)
ii. I can identify which tunics are present in arteries (pages 693 - 696, including Table 19.1), capillaries (page 696, including Table 19.1), and veins (pages 698 & 699, including Table 19.1, page 696) and explain the relationship among the tunics present and the functions of the blood vessels.
iii. I can describe the structural adaptations (larger lumens, venous valves) (page 669) and functional adaptations (muscular and respiratory pumps and smooth muscle layer of tunica media) (pages 703 & 704, including Figure 19.7) of veins that compensate for their low pressure.
iv. I can describe arteriosclerosis (pages 700 & 701; mayoclinic.org) and varicose veins (pages 699; mayoclinic.org) including their symptoms causes, prevention, and treatment.

13. **What is atherosclerosis**? (mayoclinic.org → *Arteriosclerosis / atherosclerosis → Definition*)

14. What is the relationship between atherosclerosis and myocardial infarction (heart attack)? (mayoclinic.org → *Arteriosclerosis / atherosclerosis → Complications*)

g. I can describe and identify, on a diagram, the differences between fetal and adult circulation patterns, and describe the changes in the patterns of blood flow that occur at birth. (pages 1079 - 1081, including Figure 28.14)

17. I can explain the PHYSIOLOGY of the cardiovascular system.
    a. I can identify the components of the conduction system of the heart on a diagram and describe the pathway of action potentials through this system. (pages 674 - 676)
        i. I can relate the pathway of action potentials through the conduction system to the contractions of the atria and ventricles. (*Exercise 28: Cardiac Cycle*, page 451)
        ii. I can describe how the sympathetic and parasympathetic subdivisions of the autonomic nervous system modify the basic heart rate. (page 676)
        iii. I can state where in the brain the cardiac centers that modify the basic heart rate are located. (pages 676 & 677, including Figure 18.16)
    b. I can relate the electrical activity of the conduction system of the heart to an ECG tracing. (pages 677 & 678, including Figure 18.18; and *Exercise 28: Cardiac Cycle*, pages 451 & 452)
        i. I can draw a diagram of a normal electrocardiogram tracing, name the individual waves and intervals, **and indicate what each represents (PQRST)**. (pages 677 & 678, including Figure 18.18; and *Exercise 28: Cardiac Cycle*, pages 451 & 452)

15. Match the parts of an ECG tracing, *A - C*, to their descriptions, *a - i*.

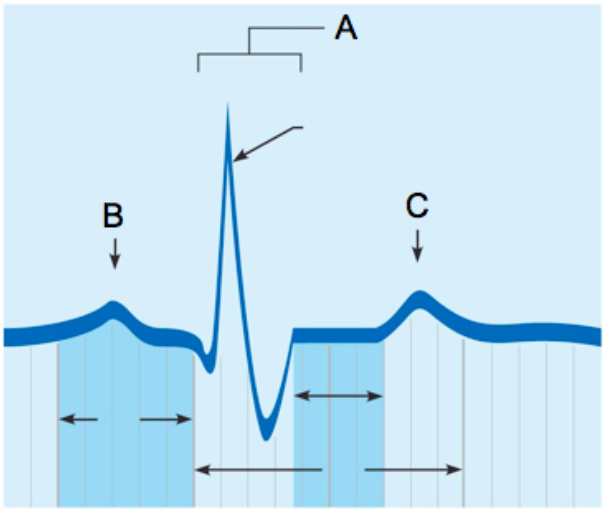

Figure 18.17 **An electrocardiogram (ECG) tracing.** (page 677)

a. _____ Atrial depolarization
b. _____ P wave
c. _____ Proceeds atrial contraction
d. _____ Proceeds ventricular contraction
e. _____ Proceeds ventricular relaxation
f. _____ QRS complex
g. _____ T wave
h. _____ Ventricular depolarization
i. _____ Ventricular repolarization

ii. I can analyze an ECG tracing to detect abnormalities (tachycardia, bradycardia, atrial & ventricular fibrillation). (page 679, 684 & 685; *Analyzing the Heart with EKG*; and *Exercise 28: Cardiac Cycle*, pages 452 & 453)

16. In a healthy heart, the size, duration, and timing of the deflection waves tend to be consistent. Changes in the pattern or timing of the ECG may reveal a diseases or damaged heart or problems with the heart's conduction system. Compare abnormal ECG tracings *b* - *d* to *a*, a normal ECG. For each abnormal tracing (a) identify which waves or deflections are absent or irregular and (b) describe how the normal conduction of electrical signals through the heart have been affected that resulted in the absent or irregular wave. (*Physiology of the Heart* PowerPoint - *Anatomy & Physiology* Course Site → *Unit 7 - The Cardiovascular System* → *PowerPoints* folder)

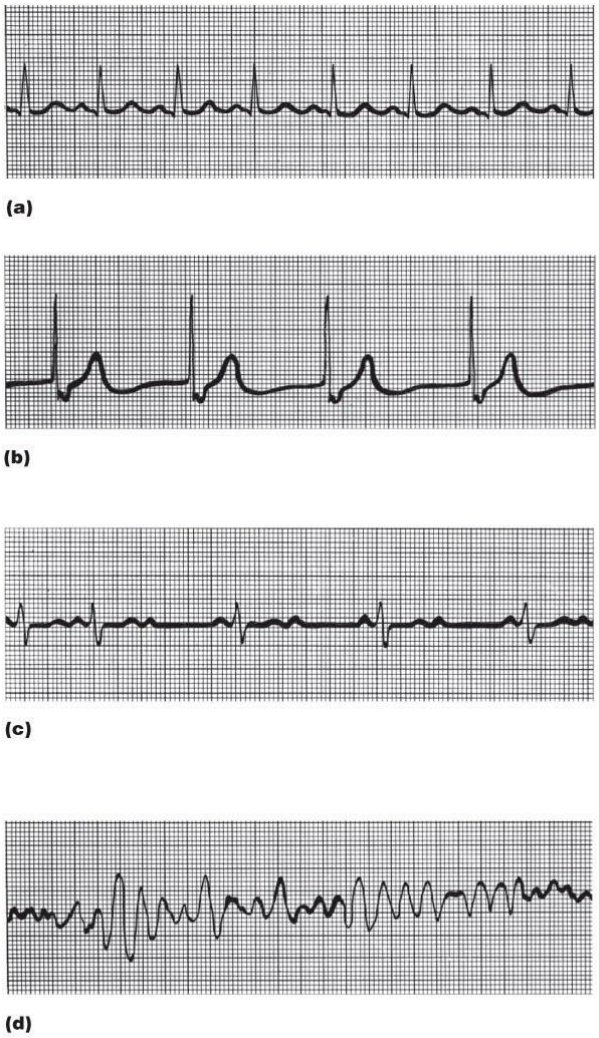

Figure 18.19. **Normal and abnormal ECG tracings.** (page 679)

ECG tracing	Which waves are absent or irregular?	Why are waves absent or irregular? (Describe how the normal conduction of electrical signals through heart has been affected.)
b		
c		

d		

c. I can explain the events of the cardiac cycle and relate the heart sounds to specific events in this cycle. (pages 678 - 681; and *Interactive Physiology: The Cardiac Cycle*)

17. Define the following:

a. **systole** -

b. **diastole** -

c. **cardiac cycle** -

d. I can define *cardiac output* and describe factors that influence heart rate and stroke volume. (pages 681 - 685)

i. I can explain how the autonomic nervous system (sympathetic and parasympathetic nervous systems) modifies heart rate and cardiac output. (page 684)

ii. I can describe how age, gender, exercise, and body temperature influence heart rate. (page 684)

18. Describe how each of the following factors affects heart rate by completing the table below.

Factor	Effect on heart rate
Age	
Gender	
Exercise	
Body temperature	

iii. I can describe congestive heart failure (including pulmonary congestion and peripheral congestion) and identify and explain conditions that contribute to it. (page 685; *Anyone Who Had a Heart* case study)

iv. I can define heart murmur, describe its symptoms, causes, and treatment. (page 679; and mayoclinic.org)

e. I can define and measure *blood pressure*. (pages 701 - 703, 710 & 711)

19. What is blood pressure?

20. Distinguish between systolic and diastolic blood pressure

i. I can assess an individual's blood pressure using a sphygmomanometer and analyze the results including the effects of body position on blood pressure. (page 710; and *Heart Rate and Blood Pressure as Vital Signs* lab handout and data and analysis sheet)
ii. I can explain what the sounds correspond to when blood pressure is measured. (pages 710; and *Heart Rate and Blood Pressure as Vital Signs* data and analysis sheet)
iii. I can assess an individual's apical, radial, and carotid pulse rate and analyze the results. (page 710, including Figure 19.12
iv. I can describe hypotension and hypertension and shock including their symptoms, causes, prevention, and treatment. (pages 710 & 711; and mayoclinic.com)

21. What is cardiac output measure? What is the formula?

g. I can describe the ABO and Rh blood groups in terms of the antigens present on the erythrocytes' plasma membranes and the antibodies present in the blood.
(pages 651 - 653)
   i. I can describe how blood is typed and simulate ABO and Rh blood typing. (page 653, including 17.16; and *Human Blood Typing & Simulated Blood Typing: Whodunit* activity handouts
   ii. I can define *transfusion reaction* and explain what happens when mismatched blood is infused (including agglutination and hemolysis). (pages 652 & 653; and *Human Blood Typing* & *Simulated Blood Typing: Whodunit* activity handouts)

21. Describe the ABO blood groups by completing the table below.

Blood group	Antigens (on surfaces of RBCs)	Antibodies (in plasma)
A		
B		
AB		
O		