Science 30 - Lesson 9 - Unit A Chapter 1 Review

Name: _____

1) List the four main functions of the human circulatory system.

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2) Copy and complete the following table comparing the chambers of the mammalian heart.

Heart Chamber	Location	Type of Blood Found in Chamber	Function
right atrium	top right	deoxygenated	receives blood from body from vena cava
right ventricle			
left atrium			
left ventricle			

3) Describe three ways in which arteries and veins differ.

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4) List the four main components of blood. Rank these components by their relative proportion in a blood sample from the largest proportion to the smallest proportion.

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5) State which of the four major blood components is responsible for initiating the clotting process.

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6) Define cardiovascular disease.

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7) Distinguish between a heart attack and a stroke.

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8) List four ways by which disease-causing pathogens can enter the body.

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9) Define vaccination.

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10) From the following data, carefully examine the relationship between the heart rate and the mass of an organism.

RESTING HEART RATE VERSUS MASS

Organism	Mass (g)	Resting Heart Rate (beats/min)
mouse	25	670
rat	200	420
guinea pig	300	300
rabbit	2000	205
small dog	5000	120
large dog	30 000	85
human	70 000	72
horse	450 000	38
African elephant	6 000 000	30

a. Observe trends from this data. Write a statement that describes how heart rate is affected by the size of an organism.

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b. Estimate the heart rate of a 3-kg cat from these data patterns.

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c. Tyrannosaurus rex was a ferocious carnivore that lived from about 85 to 65 million years ago. Paleontologists estimate that T.rex had a mass of up to 7000 kg. Estimate the resting heart rate of T.rex by extending the trends in this data.

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d. The extinct dinosaur Apatosaurus (also called Brontosaurus) belonged to the long-necked family of sauropods. This family included the largest land animals to ever live. Estimate the heart rate of Apatosaurus, which had a mass of 27 metric tons (27 000 kg) by extending the trends in this data.

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e. What problem does extending the trends in the data pose for paleontologists who are studying the circulatory systems of large extinct dinosaurs?

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11) The bodies of athletes who compete in endurance events—such as marathon runs, cross-country skiing, or bike races—require a huge amount of oxygen during the competition. Some endurance athletes have tried to improve their performance by removing their own blood, centrifuging it to isolate the red blood cells, storing it while the body replaces the lost blood, and then injecting it back into their own body right before the race. This process of "blood doping" has been banned by the International Cyclist Union (UCI) and also by the International Olympic Committee (IOC).

a. Why would injecting more red blood cells into their bodies create an advantage for athletes?

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b. Explain why it is more difficult to prove that athletes are using blood doping rather than taking performance-enhancing drugs.

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c. Predict the effects of blood doping on the athlete's blood pressure.

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d. List some possible negative health effects of the practice of blood doping.

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e. Athletes often train at high altitudes before a competition. The thin air at these altitudes stimulates red blood cell production. Some athletes feel that the practice of blood doping before a competition is no different than training at high altitudes. Evaluate this specific argument.

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12) Whales and seals are mammals well adapted for diving. For example, the Weddell seal is able to remain underwater for over an hour without surfacing to breathe. List some possible adaptations of a diving mammal's circulatory system that would allow it to remain below the water for so long.

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13) A doctor looks at three patient files containing information from lab tests and lifestyle data. Note that µL is a microlitre.

Health File Information	Patient 1	Patient 2	Patient 3
Cholesterol Level	200 mg/dL	280 mg/dL	150 mg/dL
Activity Level	moderate regular weekly exercise	little or no weekly exercise	intense physical training
Resting Heart Rate	72 beats per minute	81 beats per minute	50 beats per minute
Smoker?	occasionally	yes	no
Blood Pressure	120/80 mmHg	147/95 mmHg	120/80 mmHg
White Blood Cell Count	14 000 per μL	6500 per μL	5000 per μL

a. Explain which patient the doctor would be most concerned about in terms of circulatory health? What lifestyle changes or future precautions might the doctor recommend to the high-risk patient?

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b. Which patient most likely has an infection?

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c. State the likely reason why the resting heart rate of Patient 3 is significantly lower than the other two patients.

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Investigating Primary Literature: Predicting Sudden Death

Name: _____

Cardiovascular disease is the number one cause of death in Canada, with nearly 80 000 annual victims. For almost half of these people, death occurs within minutes of the first symptoms of a heart attack. In many cases the first heart attack pains were the first indication that this person had poor cardiovascular health—but by then it was too late! Clearly, if there is a way to predict whether an apparently healthy person is at risk of sudden death from a heart attack, preventative measures can be taken and lives can be saved.

Researchers from France and Italy analyzed data over 23 years from men working around Paris in the French civil service. The researchers claim that they have found a practical way to predict which members of a healthy population of men, who have no previous history of cardiovascular disease, may be susceptible to sudden death from heart attack. This research is described in the article "Heart-Rate Profile During Exercise as a Predictor of Sudden Death." This article is found in this handout. Since this article was published in the New England Journal of Medicine, it can be a challenging piece to read because it was written for physicians and medical science researchers. Nevertheless, there is value in reading primary literature because you can learn about scientific discoveries as they are reported by those people who actually did the research.

- Read questions 1 to 4 to develop a sense of what to focus upon when you read the article.
- Carefully read the article with these questions in mind. Remember to be an active reader by using a highlighter pen and/or by taking point-form notes.
- Save this evidence of your active reading strategies to help you answer questions 1 to 4.

1. The researchers used three tests to predict whether one of the men being studied was at risk of sudden death from a heart attack.
    a. Identify and describe each of the tests.

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    b. Identify the test that appears to have the best ability to predict sudden death from a heart attack.

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2. Describe screening procedures used to choose subjects for the study. Explain why these procedures were necessary.

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3. The data was collected from 5713 men in the study.
    a. How many men were in the control group, and how was this group defined?

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    b. How many men in the group died sudden deaths from heart attacks?

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4. List some limitations of this research.

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