Cardiac Output

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Module: Distribution
Activity: Animations
Title: Cardiac Output

1. a. Define *cardiac output* and explain how it is calculated.

b. What is normal cardiac output?

2. How does exercise affect cardiac output?

3. a. Explain how the End Diastolic Volume (EDV) and the End Systolic Volume (ESV) produce the Stroke Volume (SV).

b. How much is normal stroke volume?

4. The following three factors affect stroke volume. Define each.

   a. Preload -

   b. Contractility -

   c. Afterload -

5. Describe how End Diastolic Volume (EDV) affects the degree of cardiac muscle stretch, known as preload.

6. Explain how sarcomere stretch and contraction strength affects stroke volume.
7. a. Explain the Frank-Starling Law.

b. What are the limits of the Frank-Starling Law?

8. Contrast the effects of positive and negative inotropic agents on stroke volume and cardiac output.

b. Name specific types of inotropic agents.

Positive -

Negative -

9. How does ventricular pressure and afterload affect activity of the semilunar valve?

10. a. How does high blood pressure or hypertension affect aortic pressure?

b. Eventually, ventricular pressure will build and overcome aortic pressure thereby opening the semilunar valve and ejecting the blood.

How does increased afterload affect ejection and stroke volume?

How does the heart adjust to maintain homeostasis?

11. a. What initiates the 60-100 (75 normal resting) heartbeats per minute?

b. Describe the correlation between cardiac output and heart rate.
12. Describe the sympathetic nervous system and hormonal responses to low blood pressure. How does this response contribute to maintaining homeostasis?

13. Describe the parasympathetic nervous system and hormonal responses to high blood pressure. How does this response contribute to maintaining homeostasis?

14. What affect do epinephrine, norepinephrine, and thyroxine have on heart rate?

15. How does low blood \( O_2 \) and pH, high blood \( CO_2 \), and increasing cytosolic \( Ca^{++} \) affect heart rate?