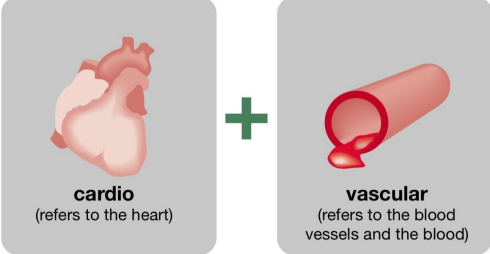


Science 30	Unit A: Biology
Lesson 2 - The Heart	84 mins

Circulatory System (Cardiovascular System)

<ul style="list-style-type: none"> - transports and delivers <ul style="list-style-type: none"> - Oxygen, nutrients and wastes - chemical messengers <ul style="list-style-type: none"> - Hormones - Body's defence cells <ul style="list-style-type: none"> - White Blood Cells - Heat (like a car radiator) 	
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Cardiac Output

<ul style="list-style-type: none"> - the volume of blood pumped by the heart in one minute, which is equal to the product of stroke volume and heart rate - Measured in volume per minute ($\frac{L}{min}$) <p><i>Cardiac Output = (stroke volume) × (heart rate)</i></p> $= \frac{volume}{beat} \times \frac{beats}{min}$	<p>Stroke Volume</p> <ul style="list-style-type: none"> - Amount of blood pushed per beat - <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Human ~70 mL/beat = ~0.070 L/beat</td> <td>Horse ~625 mL/beat = ~0.625 L/beat</td> <td>Cat ~1 mL/beat = ~0.001 L/beat</td> </tr> </table> <p>Heart Rate</p> <ul style="list-style-type: none"> - Number of beats per minute <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Human ~70 beats/min</td> <td>Horse ~40 beats/min</td> <td>Cat ~200 beats/min</td> </tr> </table>	Human ~70 mL/beat = ~0.070 L/beat	Horse ~625 mL/beat = ~0.625 L/beat	Cat ~1 mL/beat = ~0.001 L/beat	Human ~70 beats/min	Horse ~40 beats/min	Cat ~200 beats/min
Human ~70 mL/beat = ~0.070 L/beat	Horse ~625 mL/beat = ~0.625 L/beat	Cat ~1 mL/beat = ~0.001 L/beat					
Human ~70 beats/min	Horse ~40 beats/min	Cat ~200 beats/min					

Examples

- 1) If a male raised his heart rate to 180 beats per minute through intensive exercise, such as running on a treadmill, how much blood would his heart pump per minute? Assume that the stroke volume remains at 70 mL per beat.

$$Cardiac\ Output = (stroke\ volume) \times (heart\ rate)$$

$$Cardiac\ Output = 70\ mL/beat \times 180\ beats/min$$

$$Cardiac\ Output = 12,600\ mL/min...or\ 12.6\ L/min$$

- 2) Calculate your resting cardiac output (mine = 62 beats per min)

$$Cardiac\ Output = (stroke\ volume) \times (heart\ rate)$$

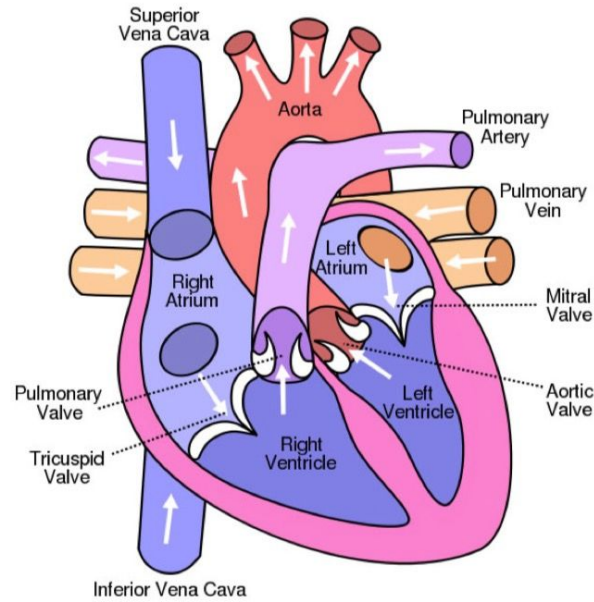
$$Cardiac\ Output = 70\ mL/beat \times 180\ beats/min$$

$$Cardiac\ Output = 12,600\ mL/min...or\ 12.6\ L/min$$

The Heart

<ul style="list-style-type: none"> - An Amazing Pump! - First muscle to start (in embryo) - About the size of a fist - Controlled by electrical currents (pacemaker..) 	<ul style="list-style-type: none"> - A muscle <ul style="list-style-type: none"> - Needs oxygen and nutrients - Heart muscle supplied by the coronary arteries
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Parts of the Heart



Septum: a thick wall of muscle that divides the left and right sides of the heart

Atrium: the smaller upper chamber that receives blood returning to the heart

Ventricle: the larger v-shaped bottom chamber that pumps blood from the heart

Heart Valves: thin flaps of tissue in the heart that open and close to ensure the proper direction for blood flow

Heartbeat

Lub
Systole
the phase of the heart's cycle when the ventricles contract to eject blood from within the chamber

Dub
Diastole
the phase of the heart's cycle where a chamber of the heart, either an atrium or a ventricle, relaxes and fills with blood

Drawing

Heartbeat and Health

Exercise:	Overall lowers heart rate.... Strengthen heart doesn't have to work as hard
Hot tub:	Quickens heart rate... harder to remove heat from the body
Cold Weather:	Slows heart rate... easier to remove heat from the body

Target Heart Rates for Exercise Goals

Maximum Safe Heart Rate
 $220 - age$

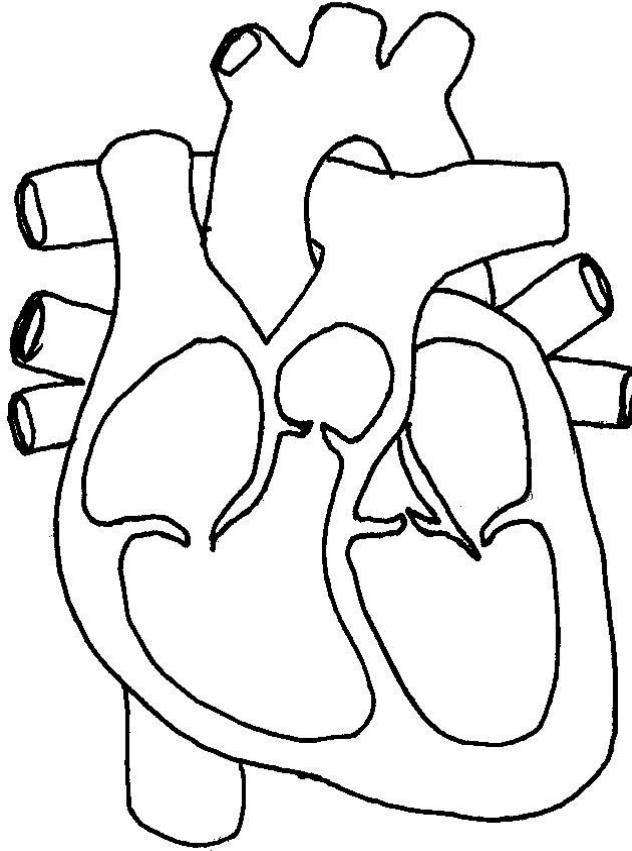
Using a heart rate monitor can greatly increase your exercise potential and health.

Personal Health Goal	Percentage of Maximum Heart rate
maintain fitness level	50 to 60%
increase fat burning or weight loss	60 to 70%
increase cardiovascular endurance	70 to 80%

Science 30 - Lesson 1 - The Heart

Name: _____

Label and Colour the heart below to show the flow of blood through the heart



Septum: _____

Atrium: _____

Ventricle: _____

Heart Valves: _____

- 1) Beginning with the vena cava, indicate the order of the following structures of the cardiovascular system through which blood flows: left atrium, right ventricle, lungs, body, right atrium, left ventricle, aorta.

- 2) Refer to your diagram above Match the structures on the heart to the part of the heart that

- a) receives oxygenated blood from the lungs _____
- b) sends oxygenated blood to the body _____
- c) prevents the backflow of blood in the heart _____
- d) separates the right and left halves of the heart _____

e) collects deoxygenated blood from the body _____

3) If a person has a heart murmur it means their heart has a weak or malfunctioning valve in their heart. Usually the mitral or tricuspid valves. How might this affect the blood flow through the heart?

4) Person is diagnosed with a "hole" in their heart, this small hole is in between the left and right atrium. How might this affect the blood flow through the heart?

5) A typical human male has a stroke volume of 70 mL per beat and a resting heart rate of 72 beats per minute

a) Calculate the cardiac output. Express your answer in liters per minute.

b) Calculate the volume of blood that would be pumped in ONE DAY based on the cardiac output.

6) If an Olympic athlete has an increased stroke volume of 100 mL, calculate their cardiac output at rest (50 BPM), with light exercise (115 BPM) and with high-intensity exercise (180 BPM). Assume the stroke volume remains constant.

7) Explain why you might expect an Olympic athlete to have a lower resting heart rate than a person with an inactive lifestyle.

8) Use your age to calculate what your fitness goal rates should be

Maximum Heart Rate	
maintain fitness level	
increase fat burning or weight loss	
increase cardiovascular endurance	