

LAB 5: CARDIOVASCULAR SYSTEM: BLOOD PRESSURE PHYSIOLOGY

Trace the pathway of blood from the aortic arch to the left radial artery:

1. Aortic Arch
2. _____
3. _____
4. _____
5. Left Radial Artery

Trace the pathway of blood from the aortic arch to the right radial artery:

1. Aortic Arch
2. _____
3. _____
4. _____
5. _____
6. Right Radial Artery

Trace the pathway of blood from the right radial vein to the right atrium:

1. Right Radial Vein
2. _____
3. _____
4. _____
5. _____
6. _____
7. Right Atrium

Trace the pathway of blood from the right anterior tibial vein to the right atrium:

1. Right Anterior Tibial Vein
2. _____
3. _____
4. _____
5. _____
6. _____
7. Right Atrium

Trace the pathway of blood from the aortic arch to the right anterior tibial artery:

1. Aortic Arch
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
 7. _____
 8. Right Anterior Tibial Artery
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ACTIVITY 12: MEASURING BLOOD PRESSURE

Pre-Lab Help! Mean Arterial Pressure (MAP) Calculations

The mean arterial pressure or MAP represents an average arterial blood pressure of an individual. If MAP values fall below 65 mm Hg, then organs will not receive enough oxygen and hypoxic conditions will arise. The MAP is calculated to determine how much of a given medication is needed when blood pressure is falling and causing shock.

What is an order of operation? An order of operation involves performing a set of mathematical functions in a particular order. For example, items in parenthesis are done first, followed by multiplication or division, and addition or subtraction is done last.

How to determine MAP: The formula for MAP is Diastolic pressure + $1/3$ (pulse pressure). Pulse pressure (PP) is the difference between systolic and diastolic pressures. Hence $PP = \text{systolic pressure} - \text{diastolic pressure}$

Step 1. Calculate PP.

Step 2. Divide pulse pressure by 3 OR multiply by 0.333. Note these are equivalent mathematical operations.

Step 3. Add diastolic pressure to the number you calculated in step 2. It is key to add diastolic pressure in this step and NOT systolic pressure.

Step 4. Common sense - see if the number you calculated makes sense. The MAP should be in-between the systolic and diastolic pressures. A MAP that is lesser than the diastolic pressure or greater than the systolic pressure indicates that the calculation was done incorrectly.

Example: A person has a blood pressure of 125/70 mm Hg. Determine MAP.

Step 1. Calculate the PP. $125 \text{ mm Hg} - 70 \text{ mm Hg} = 55 \text{ mm Hg}$

Step 2. $55 \text{ divided by } 3 = 18.3$

Step 3. $70 \text{ mm Hg} + 18.3 \text{ mm Hg} = 88.3 \text{ mm Hg}$

Step 4. This number makes sense since it falls in the range between the systolic and diastolic pressures

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Introduction: This activity is designed to help you understand the proper method for using a blood pressure cuff. You'll have an opportunity to practice differentiating the values for systolic and diastolic pressures using the cuff. You will count the arterial pulse and learn how to calculate pulse pressure and mean arterial pressure (MAP). Blood pressure varies throughout the day and can change based upon physical activity and the patient's emotional state.

Blood Pressure is the force, measured in mm Hg, exerted by the blood against the walls of the blood vessels.

Systolic Pressure is the maximum pressure in the artery; it is created when blood is ejected into the aorta from the left ventricle due to contraction of the ventricle (ventricular systole).

--The normal number for systolic pressure is lower than **120 mm Hg** during rest.

Diastolic Pressure is the minimum pressure in the artery due to ventricular diastole.

--The normal number for diastolic pressure is lower than **80 mm Hg** during rest.

How to determine the pulse pressure: Subtract the diastolic (D) pressure from the systolic (S) pressure.

$$\text{Systolic Pressure} - \text{Diastolic Pressure} = \text{Pulse Pressure}$$

Example: Systolic pressure = 180 mm Hg and Diastolic pressure = 90 mm Hg

$$\text{Pulse Pressure (PP)} \text{ is } S - D = 180 \text{ mm Hg} - 90 \text{ mm Hg} = 90 \text{ mm Hg}$$

How to determine the Mean Arterial Pressure (MAP) = diastolic + (1/3) pulse pressure. Calculator trick: Take pulse pressure and divide by 3 OR multiply it by 0.333. Take that number and add it to the diastolic pressure.

Example: S = 180 mm Hg and D = 80 mm Hg

$$\text{MAP} = 80 \text{ mm Hg} + (1/3 \times 100 \text{ mm Hg}) = \underline{\hspace{2cm}} \text{ mm Hg}$$

$$\text{MAP} = 80 \text{ mm Hg} + 33 \text{ mm Hg} = 113 \text{ mm Hg}$$

1. Calculate MAP given: Systolic Pressure = 180 mm Hg and Diastolic Pressure = 60 mm Hg
 2. Calculate MAP given: Systolic Pressure = 145 mm Hg and Diastolic Pressure = 50 mm Hg
 3. Calculate MAP given: Systolic Pressure = 210 mm Hg and Diastolic Pressure = 110 mm Hg
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Answers to the MAP Practice Problems

1. Calculate MAP given: Systolic Pressure = 180 mm Hg and Diastolic Pressure = 60 mm Hg

MAP = diastolic + (1/3) pulse pressure

Pulse pressure = S - D = 180 mm Hg - 60 mm Hg = 120 mm Hg

MAP = 60 mm Hg + (1/3) (120 mm Hg) = 60 mm Hg + 40 mm Hg (it is ok to round to the nearest whole number.

60 mm Hg + 40 mm Hg = **100 mm Hg**

2. Calculate MAP given: Systolic Pressure = 145 mm Hg and Diastolic Pressure = 50 mm Hg

MAP = diastolic + (1/3) pulse pressure

Pulse pressure = S - D = 145 mm Hg - 50 mm Hg = 95 mm Hg

MAP = 50 mm Hg + (1/3) (95 mm Hg) = **82 mm Hg**

3. Calculate MAP given: Systolic Pressure = 210 mm Hg and Diastolic Pressure = 110 mm Hg

MAP = diastolic + (1/3) pulse pressure

Pulse pressure = S - D = 210 mm Hg - 110 mm Hg = 100 mm Hg

MAP = 110 mm Hg + (1/3) (100 mm Hg) = **143 mm Hg**

