

Answer on Question #45675 – Chemistry – Physical Chemistry

Question:

The systolic pressure is 0.158 atm and the diastolic pressure is 0.150 atm in the heart. If the volume pumped in one heartbeat is 75cm^3 . Calculate the work done in a heartbeat.

Answer:

The systolic pressure is the blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart. That's why we use the systolic pressure to calculate the work done in a heartbeat.

For a gas (in our case it's air), work **W** (J) is the product of the pressure **p** (Pa) and the volume **V** (m^3), during a change of volume.

$$W = p * V$$

$$V = 75\text{cm}^3 = 7.5 \times 10^{-5} \text{ m}^3$$

$$p = 0.158 \text{ atm} = 16009.35 \text{ Pa}$$

$$W = 7.5 \times 10^{-5} * 16009.35 = 1.2007 \approx \mathbf{1.20 \text{ J}}$$

Answer: 1.20 J.