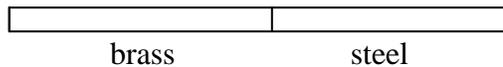


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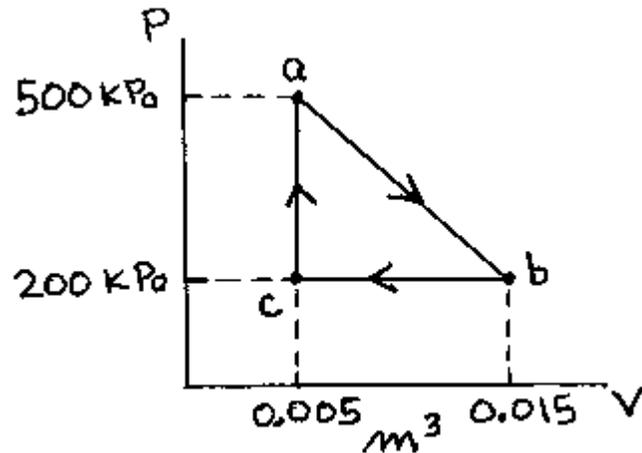
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1. A spherical balloon has a radius of 0.305 m and contains nitrogen, N_2 , at $27.2^\circ C$ and one atmosphere total pressure.
 - a) What is the volume of the nitrogen in the balloon?
 - b) How many moles of nitrogen are in the balloon?
 - c) What is the mass of the nitrogen in the balloon?
2. At $5.8^\circ C$ a metal rod is 1.420 m total length with half the length brass and the other half steel. If the entire rod is heated to $145.6^\circ C$, what is its total change in length?



3. A 32.5 gram ice cube at $0.0^\circ C$ is added to 200.0 g of water at $85.0^\circ C$ in a styrofoam (insulated) container. What is the final temperature of the mixture? The affect of the container is negligible.
4. A light bulb has a metal filament that has an emissivity of 0.330 and a surface area of $4.71 \times 10^{-5} m^2$. It is heated to $2450^\circ C$ in a room of temperature $25^\circ C$. What is the power dissipated through radiation by the filament?
5. A heat engine has an energy source at $400^\circ C$ and a cooling system at $80^\circ C$.
 - a) What is the maximum possible efficiency of this engine?
 - b) If it does 100,000 J of work what is the least amount of heat it must exhaust?

6. A thermodynamic cycle (heat engine) with a fixed amount of ideal working gas is represented on the following diagram:



- If the gas temperature at point c is 400 K, how many moles of gas are in the engine?
- What is the temperature at point b?
- Is process stroke bc a heat intake or cooling stroke?
- How much work is done by process stroke bc?
- How much net work is produced for the whole cycle?