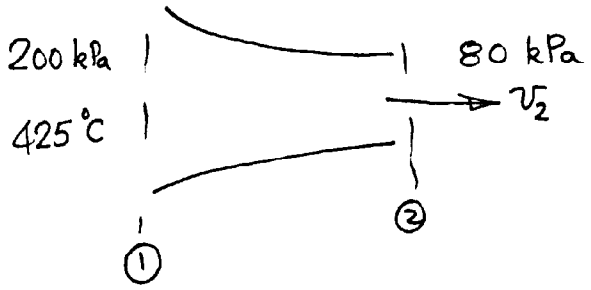
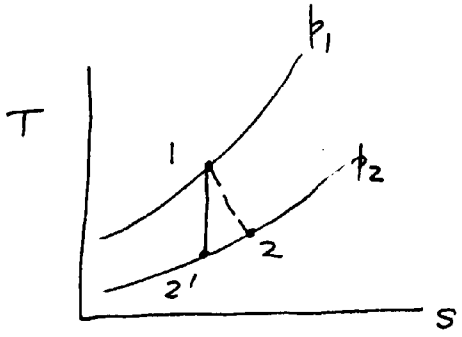
Qu. 8




The isentropic efficiency $= \dfrac{T_1 - T_2}{T_1 - T_{2'}}$

For an isentropic expansion $\dfrac{T_{2'}}{T_1} = \left(\dfrac{p_2}{p_1}\right)^{\frac{\gamma-1}{\gamma}}$

$$\therefore T_{2'} = (425+273)\left(\frac{200}{80}\right)^{\frac{1.4-1}{1.4}} = 537 \text{ K}$$

$$\therefore \quad 0.93 = \frac{698 - T_2}{698 - 537} \qquad \therefore T_2 = \underline{548.3 \text{ K}}$$

Applying the SFEE to the nozzle :-

$$\cancel{\dot{Q}} + \cancel{\dot{W}} = \cancel{\dot{m}}\,\Delta\left(\frac{v^2}{2} + \cancel{gz} + h\right)$$

$$\Delta\left(\frac{v^2}{2}\right) = -\Delta h$$

$$\text{or} \quad \frac{v_2^2}{2} - 0 = h_1 - h_2 = c_p(T_1 - T_2)$$

$$\therefore \quad v = \sqrt{2\,c_p(T_1 - T_2)}$$

$$= \sqrt{2 \times 1010 \times (698 - 548.3)}$$

$$\underline{v = 550 \text{ m/s}}$$