Question of the Day

Problem: For an ideal gas, determine at what rate the temperature of a gas changes as the number of moles changes if all other parameters are held constant.

Solution:

$$PV = nRT$$
$$\frac{PV}{nR} = T$$

This can be rewritten making T a function of n

$$T(n) = \frac{PV}{nR}$$

To find how T changes with n, we must take the derivate of T with respect to n

$$\frac{d}{dn} T\ (n)\ = \frac{d}{dn} \frac{PV}{nR}$$

$$\frac{dT}{dn} = \frac{d}{dn}\left(\frac{PV}{R} \cdot \frac{1}{n} \right)$$

$$\frac{dT}{dn} = \frac{PV}{R} \cdot \left(-\frac{1}{n^2} \right) = -\frac{PV}{Rn^2}$$

The rate of change of temperature with respect to the change in moles equals $-\frac{PV}{Rn^2}$

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