Estimate the optical depth for infrared light with wavelength 15 μm when it travels through our atmosphere at standard temperature and pressure STP. The number density of air molecules at STP can be found from $pV = Nk_BT$.

Our air is 0.041% CO_2 (410 ppm).

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Figure 1: Absorption cross sections σ_a. The graph is from *Fundamentals of Atmospheric Radiation* by Craig Bohren, a highly recommended book.