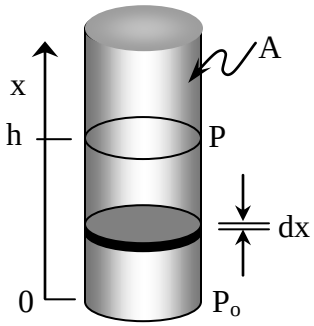
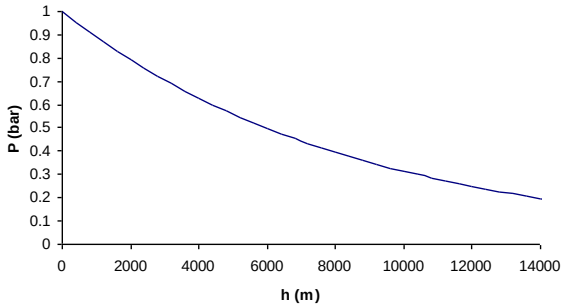
# Barometric Formula

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mass of thin disk = d A dx

f = ma : $\quad df = -d\,g\,A\,dx$

$dP = df/A = -d\,g\,dx$

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$$d = \frac{\mathcal{M}_{gas}\,n}{V} = \frac{\mathcal{M}_{gas}\,P}{RT}$$

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$$dP = -\frac{\mathcal{M}_{gas}\,P}{RT}\,g\,dx$$

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$$\frac{dP}{P} = -\frac{\mathcal{M}_{gas}\,g}{RT}\,dx$$

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$$\int_{P_o}^{P}\frac{dP}{P} = -\int_{o}^{h}\frac{\mathcal{M}_{gas}\,g}{RT}\,dx \qquad \int\frac{dx}{x} = \ln x$$

$P_o$ from pressure of all the disks

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$$\left(\ln P\right|_{P_o}^{P} = -\frac{\mathcal{M}_{gas}\,g}{RT}\left(x\right|_{0}^{h}$$

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$$\ln P - \ln P_o = -\frac{\mathcal{M}_{gas}\,g\,h}{RT}$$

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$$\ln\frac{P}{P_o} = -\frac{\mathcal{M}_{gas}\,g\,h}{RT}$$

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$$P = P_o\,e^{\left(\frac{-\mathcal{M}_{gas}\,g\,h}{RT}\right)}$$

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$\mathcal{M}_{air} \approx 0.209(32.0\ g\ mol^{-1}) + 0.791(28.0\ g\ mol^{-1}) = 28.8\ g\ mol^{-1}$

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adiabatic lapse rate: -6°C/1000m