HW problems

1. Mean K.E. of one molecule $\frac{3}{2}K_BT$.

$P = nK_BT \Rightarrow K_B = \frac{P}{nT}$

$\therefore E = \frac{3}{2}\frac{P}{nT}T = \frac{3}{2}\frac{P}{n}$

$\therefore n = \frac{3P}{2E} = \frac{3\times 2\times 13.6\times 980}{2\times 4\times 10^{-14}}$ (remember $1\ ergs = 10^{-7}\ J$)

$\simeq 10^{18}$.

2. $\bar{c} = \sqrt{\frac{3RT}{M}} \quad \therefore \frac{\bar{c}_1}{\bar{c}_2} = \sqrt{\frac{T_1}{T_2}}$

$\bar{c}_2 = \frac{\bar{c}_1}{2}, \quad T_1 = 273\,K \quad \therefore 2 = \sqrt{\frac{273}{T_2}}$

$\therefore T_2 = 68.25\,K = -204.75^{\circ}C$.