95) $KE_{ave} = \frac{3}{2}RT$

@ same temp, CH_4 and N_2 same KE

273 K $\quad KE_{ave} = \frac{3}{2}RT = \frac{3}{2}\left(8.31 \frac{J}{mol\,K}\right)(273\,K)$

$3.40 \times 10^{3} \frac{J}{mol} \; \frac{1\,mol}{6.02 \times 10^{23}\,molecule} =$

$5.65 \times 10^{-21} \frac{J}{molecule}$

546 K $\quad KE_{ave} = \frac{3}{2}RT = \frac{3}{2}\left(8.31 \frac{J}{mol\,K}\right)(546\,K)$

$1.81 \times 10^{3} \frac{J}{mol} \; \frac{1\,mol}{6.02 \times 10^{23}\,molecules} =$

$1.13 \times 10^{-20} \frac{J}{molecule}$

96) $\mu_{rms} = \left(\frac{3RT}{M}\right)^{\frac{1}{2}}$

CH_4 @ 273 K $= \left(\frac{3\left(8.31 \frac{J}{mol\,K}\right)(273\,K)}{1.604 \times 10^{-2} \frac{kg}{mol}}\right)^{\frac{1}{2}} = 652 \frac{m}{s}$

CH_4 @ 546 K $= \left(\frac{3\left(8.31 \frac{J}{mol\,K}\right)(546\,K)}{1.604 \times 10^{-2} \frac{kg}{mol}}\right)^{\frac{1}{2}} = 921 \frac{m}{s}$

N_2 @ 273 K $= \left(\frac{3\left(8.31 \frac{J}{mol\,K}\right)(273\,K)}{2.802 \times 10^{-2} \frac{kg}{mol}}\right)^{\frac{1}{2}} = 493 \frac{m}{s}$

N_2 @ 546 K $= \left(\frac{3\left(8.31 \frac{J}{mol\,K}\right)(546\,K)}{2.802 \times 10^{-2} \frac{kg}{mol}}\right)^{\frac{1}{2}} = 697 \frac{m}{s}$

99)

	a	b	c	d
Ave KE	↑	↓	same	same
rms velocity	↑	↓	same	same
wall collision	↑	↓	↑	↑

101) a) same ave. KE, same temp

b) flask C H_2 smallest mm

103) $\frac{v_1}{v_2} = \sqrt{\frac{m_2}{m_1}}$

$\frac{1.07}{1.00} = \sqrt{\frac{137.4}{x}}$ $\quad x = 121 \frac{g}{mol}$

CF_2Cl_2

105) $\frac{v_1}{v_2} = \sqrt{\frac{m_2}{m_1}}$

$\frac{v_{^{12}C^{17}O}}{v_{^{12}C^{16}O}} = \sqrt{\frac{30.0}{29.0}} = 1.02$

$\frac{v_{^{12}C^{16}O}}{v_{^{12}C^{18}O}} = \sqrt{\frac{30.0}{28.0}} = 1.04$

$^{12}C^{16}O$ to $^{12}C^{17}O$ to $^{12}C^{18}O$

1.04 : 1.02 : 1.00

Advantage CO_2 not toxic

disadvantage

can get a mixture of isotopes

$^{12}C^{16}O^{18}O$ and $^{12}C^{17}O$

would effuse at the same rate, so they cannot be seperated