P # 40

Ch 10 - pg 329

a) $T = 240\ K$

Find the mass of 1 mole of H_2

$$M = (2\ \text{moles}).\left(\frac{1.008\ g}{mol}\right).\left(\frac{1\ kg}{1000\ g}\right)$$

$$M = 2.016 \times 10^{-3}\ kg/mol$$

$$v_{rms} = \sqrt{\frac{3 \cdot R \cdot T}{M}} = \sqrt{\frac{3(8.31\ J/mol \cdot K)(240\ K)}{(2.016 \times 10^{-3}\ kg/mol)}}$$

$$\boxed{v_{rms} = 1700\ m/s}$$

b) Find the mass of 1 mole of CO_2

$$M = \left(\frac{12.011\ g}{mol}\right).\left(\frac{1\ kg}{1000\ g}\right) + (2\ \text{moles}).\left(\frac{15.999\ g}{mol}\right).\left(\frac{1\ kg}{1000\ g}\right)$$

$$M = 4.401 \times 10^{-2}\ kg/mol$$

$$v_{rms} = \sqrt{\frac{3 \cdot R \cdot T}{M}} = \sqrt{\frac{3(8.31\ J/mol \cdot K)(240\ K)}{(4.401 \times 10^{-2}\ kg/mol)}}$$

$$\boxed{v_{rms} = 370\ m/s}$$

c) $v_{escape} = 10.3\ km/s = 10300\ m/s$

$1/6 \cdot v_{escape} = 1700\ m/s$

$\boxed{H_2 \text{ escapes}}$ $\boxed{CO_2 \text{ does not escape}}$