(5) At a given temp., the kinetic energy of any two gases are equal. this means that heavier gases move more slowly, since kinetic energy is calculated with this equation:

$$KE = \frac{1}{2}mv^2 \quad (m = \text{mass}; v = \text{velocity})$$

(6)(a) Gay-Lussac's Law: $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$$\frac{340\ kPa}{713\ K} = \frac{P_2}{273\ K}$$

$$713P_2 = 92820$$

$$\boxed{P_2 = 130\ kPa}$$

(b) Combined: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\quad \frac{(97)(140)}{308} = \frac{(101.3)V_2}{273}$

$$31200.4V_2 = 3707340$$

$$\boxed{V_2 = 119\ mL}$$

(c) Ideal gas law = $PV = nRT$

$P = ?$

$V = 22.0\ L$

$n = 85\ g \left| \frac{1\ mol}{32\ g} \right. = 2.66\ mol$

$R = 8.31$

$T = 303\ K$

$P = \frac{nRT}{V} = \frac{(2.66)(8.31)(303)}{22.0}$

$$\boxed{P = 304\ kPa}$$

(d) Charles' law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\quad \frac{590\ mL}{218\ K} = \frac{V_2}{303\ K}$

$$218V_2 = 178770$$

$$\boxed{V_2 = 820\ mL}$$

(e) Boyle's Law: $P_1V_1 = P_2V_2$

$$(210\ kPa)(15.0\ L) = (790\ kPa)V_2$$

$$\boxed{V_2 = 3.99\ L}$$