Chemistry 236
Gas-Phase Kinetics Lab Study Problems -- Answers

2. $P(0) = P_0 = a + b$; $P(\infty) = 3P_0 = b$ $a = -2P_0$.

   $P(t) = P_0\,(3 - 2\,e^{-kt})$.

3. The heating that is needed to prevent condensation of liquid in the manometer and connecting tubing also produces an expansion of the Hg. The magnitude of the effect is about 1–1.5 mm. Thus the apparent P is ~ –1 torr when the actual P is 0.0. Assuming the Hg in the right arm remains at room T (this appears to be roughly true), the correction should be proportional to the length of Hg in the left arm (*i.e.*, it should be +1.0 torr, say, at the reading that corresponds to $P = 0$, and it should be 0 when the Hg is near the bottom in the left tube).

4. $P(t) = a\,e^{-kt} + b + ct$.

5. See Eqs. (27) on p. 286 of SGN. Note that for the half-life, $\exp(-k\,t_{1/2}) = {}^1/_2 \rightarrow t_{1/2} = \ln 2/k$, while the "third-life" is defined as the point where the reaction is ${}^1/_3$ completed, or $\exp(-k\,t_{1/3}) = {}^2/_3$.

6. $k = A\exp(-E_a/RT) \rightarrow k_1/k_2 = \exp[E_a/R\,(T_2^{-1} - T_1^{-1})] \rightarrow$

   $k_1/k_2 = 3.00$ $E_a = 113$ kJ/mol.