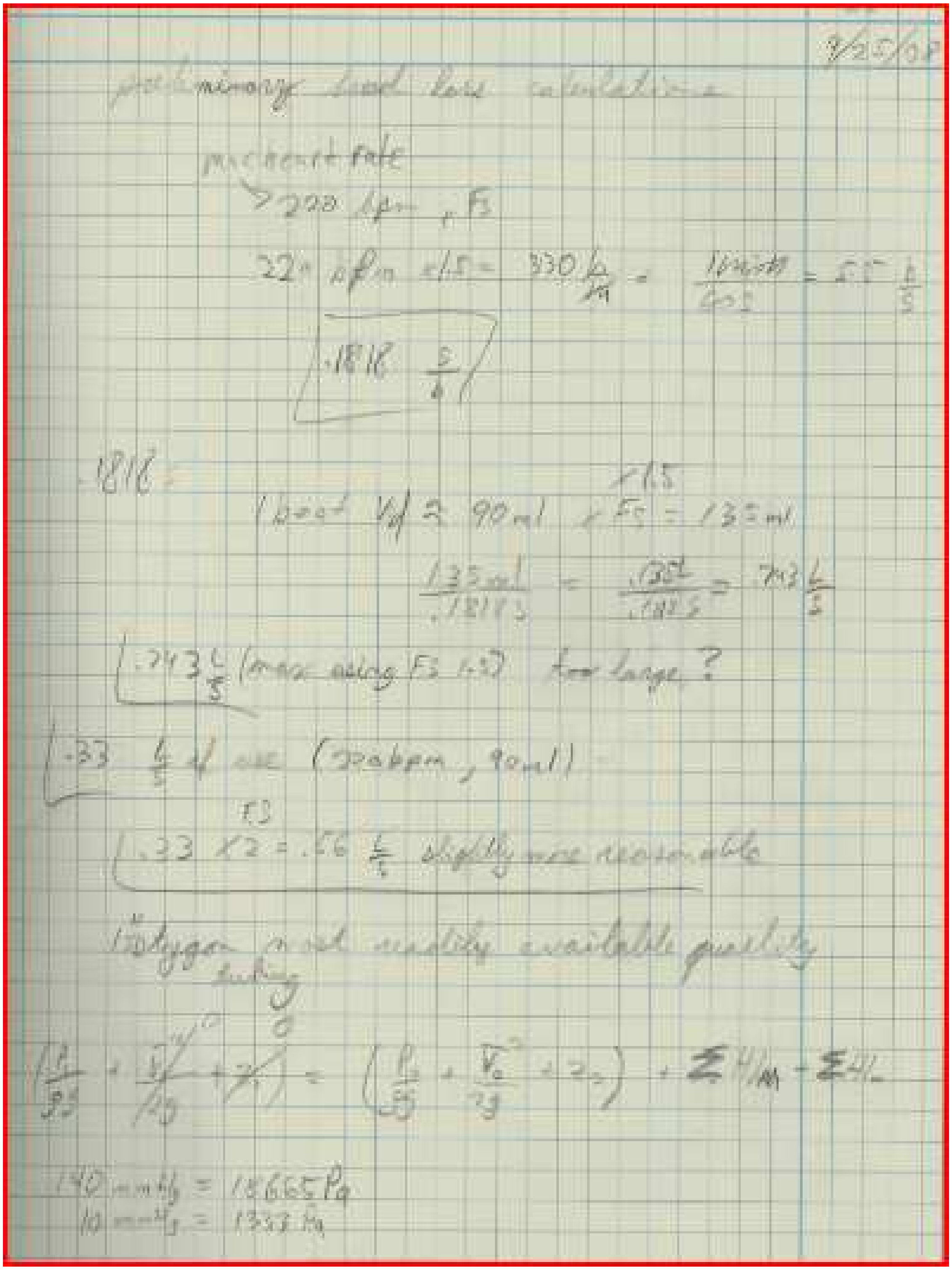
Hemodynamic Simulator II (P09026)

Circulatory System Analysis



9/25/08

preliminary head loss calculations

max heart rate

> 220 bpm, F.S.

220 bpm × 1.5 = 330 b/m = 1 min / 60 s = 5.5 b/s

.1818 s/b

.1818 s

(beat Vol) ≈ 90 ml × 1.5 F.S. = 135 ml

$\frac{135\ ml}{.1818\ s} = \frac{.135\ L}{.1818\ s} = .743\ \frac{L}{s}$

.743 L/s (max using F.S. 1.5) too large?

.33 L/s of use (220 bpm, 90 ml)

F.S. .33 × 2 = .66 L/s slightly more reasonable

Tygon most readily available quality tubing

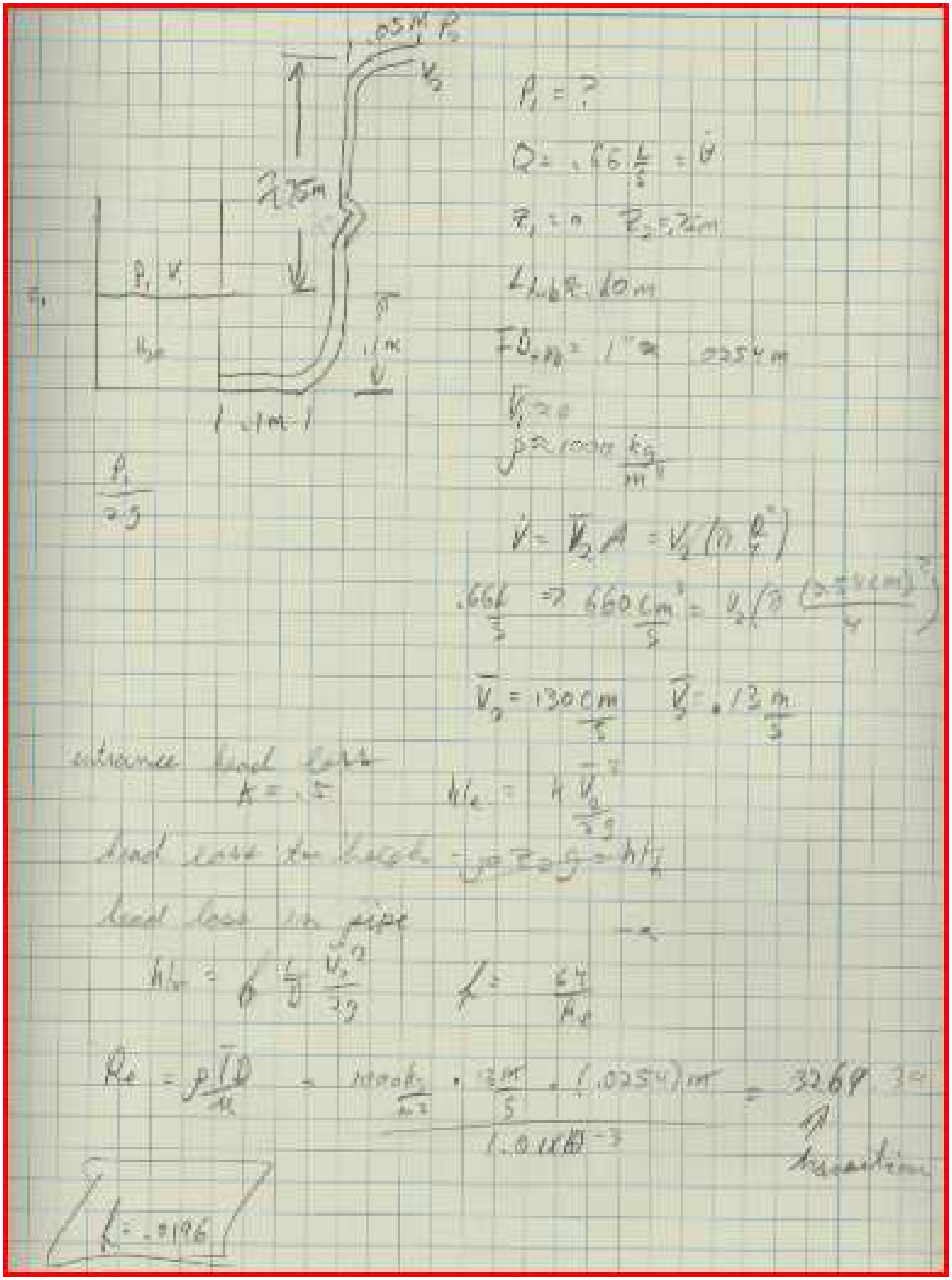
$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + z_1 = \left(\frac{P_2}{\rho g} + \frac{V_2^2}{2g} + z_2\right) + \Sigma h_M + \Sigma h_L$$

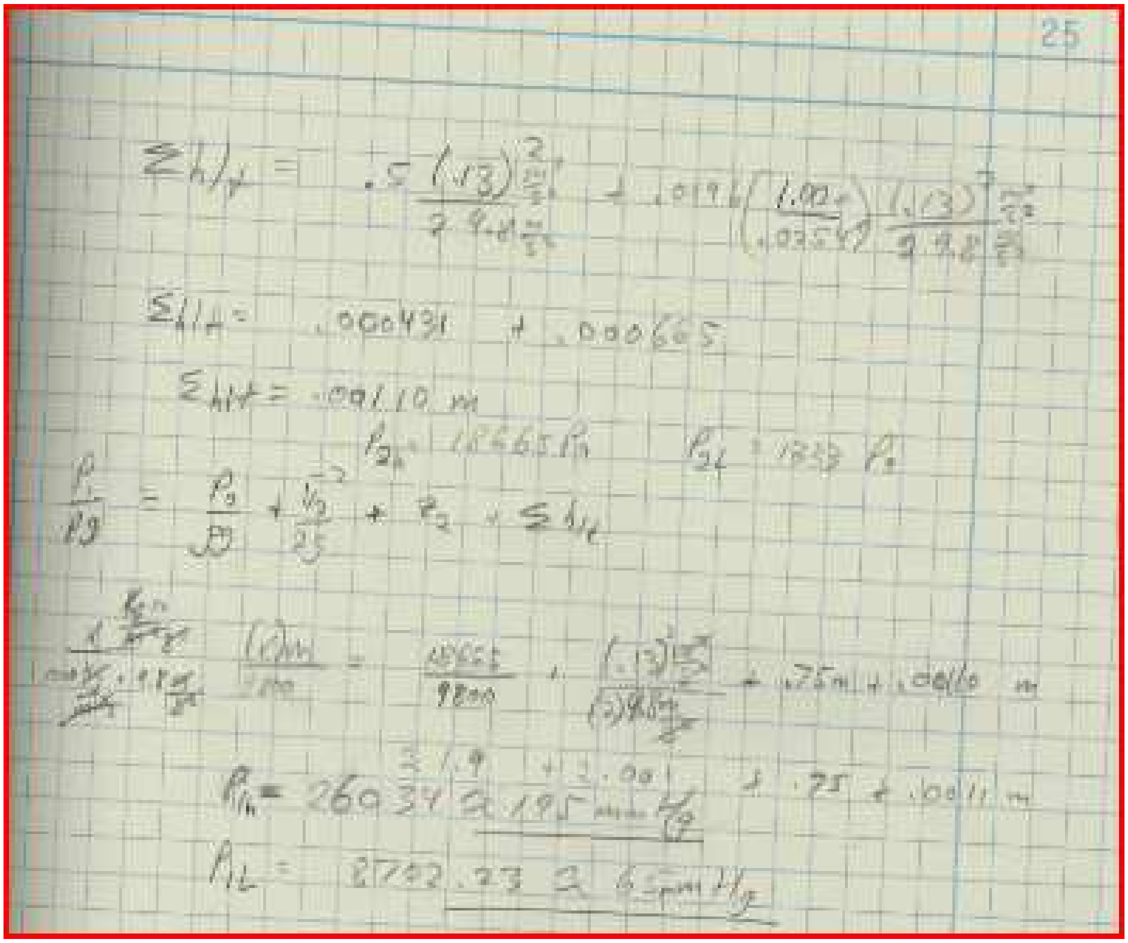
140 mmHg = 18665 Pa

10 mmHg = 1333 Pa

Hemodynamic Simulator II (P09026)

Circulatory System Analysis





25

$$\Sigma h_{lt} = .5\frac{(.13)^2\ \frac{m^2}{s^2}}{2 \cdot 9.8\ \frac{m}{s^2}} + .0196\left(\frac{1.00\ m}{.0254}\right)\frac{(.13)^2\ \frac{m^2}{s^2}}{2 \cdot 9.8\ \frac{m}{s^2}}$$

$$\Sigma h_{lt} = .000431 + .000665$$

$$\Sigma h_{lt} = .00110\ m$$

$P_{2h} = 18665\ Pa$ $\quad P_{2L} = 1333\ Pa$

$$\frac{P_1}{\rho g} = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + z_2 + \Sigma h_{lt}$$

$$\frac{(1)m}{9800} = \frac{18665}{9800} + \frac{(.13)^2 \frac{m^2}{s^2}}{(2)9.8\frac{m}{s^2}} + .75\ m + .00110\ m$$

$P_{1h} = 26034 \approx 195\ mm\ Hg$ $\quad \approx 1.9 + .001 + .75 + .0011\ m$

$P_{1L} = 8702.23 \approx 65\ mm\ Hg$