

EXTRA PROBLEM 5A

a) LAB $R_o = 9 \text{ cm}$
 $R = 20 \text{ cm}$

$$\omega = 8000 \frac{\text{REV}}{\text{MIN}} \times \frac{2\pi}{\text{REV}} \times \frac{\text{MIN}}{60\text{s}} = 837.8 \text{ s}^{-1}$$

$$g \ln(R/R_o) = v_g \omega^2 t$$

$$(981) \ln(20/9) = v_g (837.8)^2 (30 \times 60)$$

$$v_g = \underline{\underline{6.20 \times 10^{-7} \text{ cm/s}}}$$

b) PROCESS

FOR TUBULAR BOWL CENTRIFUGE $\Sigma = \frac{\pi L (R_o^2 - R_i^2) \omega^2}{g \ln(R_o/R_i)}$

$$R_o = 20 \text{ cm}$$

$$R_i = 4 \text{ cm}$$

$$L = 190 \text{ cm}$$

$$\omega = 12000 \frac{\text{REV}}{\text{MIN}} \times \frac{2\pi}{\text{REV}} \times \frac{\text{MIN}}{60\text{s}} = 1256.6 \text{ s}^{-1}$$

$$\Sigma = \frac{\pi (190) (20^2 - 4^2) (1256.6)^2}{(981) \ln(20/4)} = 2.293 \times 10^8 \text{ cm}^2$$

$$Q = \Sigma v_g = (2.293 \times 10^8) (6.20 \times 10^{-7}) = 142 \text{ cm}^3/\text{s}$$

$$t = \frac{(7500 \text{ L}) \left(\frac{1000 \text{ cm}^3}{\text{L}} \right)}{142 \text{ cm}^3/\text{s}} = 52766 \text{ s} = \underline{\underline{14.7 \text{ h}}}$$