

**HW#3****Due: September 17, 2009**

- (a) Assuming matrix blocks are vertical cylinders, show that  $\sigma = \frac{32}{d^2}$ .
- (b) Assuming matrix blocks are spherical, show that  $\sigma = \frac{60}{d^2}$ .

**Deliverables:**

- Detailed derivation
- Assumptions

**Hints:**Diffusivity equations (pseudo-steady state conditions)*For cylindrical coordinates:*

$$\frac{1}{r} \frac{\partial}{\partial r} \left( r \frac{\partial p_m}{\partial r} \right) = - \frac{qB\mu}{\pi r_e^2 h_m k_m} \frac{\partial p_m}{\partial t}$$

*For spherical coordinates:*

$$\frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial p_m}{\partial r} \right) = - \frac{qB\mu}{\frac{4}{3}\pi r_e^3 k_m} \frac{\partial p_m}{\partial t}$$