A peat soil was found to have the following Langmuir constants for the adsorption of heavy metals.

Metal Q (adsorption capacity) k (Langmuir reaction energy)

Lead (Pb2+) 36.5 1.096

Cadmium (Cd2+) 10.6 0.483

Chromium (CrO42-) 6.8 0.330

Langmuir adsorption equation

qe = QkCe / (1+ kCe)

Where qe is metal conc in adsorbent (mg/g) and Ce is the metal conc in solution (mg/L)

1. Using the nonlinear Langmuir equation above, show the equations and plot the nonlinear adsorption isotherms for the three metals (adsorbed metal on y axis vs. dissolved metal on x-axis).
2. Based on the isotherms, which metal would be least mobile in peat soils?
3. Show how to derive the linear form of the Langmuir that would approximate behavior at low concentrations in solution. Calculate partitioning coefficient Kd for each metal that would apply at low metal concs in peats (in units of L/kg)
4. Suggest how chromate (an anion) could adsorb on an organic material such as peat.