KH = 3.3 x 10-7

Ka1 = 4.5 x 10-7 (carbonic acid)

Ka2 = 4.7 x 10-11 (bicarbonate)

Ksp = 5 x 10-9 (calcite)

Assuming equilibrium between the atmosphere, seawater, and calcite:

[H+]3 = KH2Ka12Ka2PCO22

 2Ksp

[HCO3-] = 2Ksp{H+]2

 Ka12Ka2KHPCO2

[CO32-] = Ka1Ka2KHPCO2

 [H+]2

[Ca2+] = Ksp{H+]2

 Ka1Ka2KHPCO2

(a) Predict seawater pH, [CO32-], [Ca2+] at an atmospheric concentration of 280 ppmv

 Predict seawater pH, [CO32-], [Ca2+] at an atmospheric concentration of 840 ppmv

(b) How would these changes affect the tendency for calcite or aragonite to dissolve or precipitate from seawater? Explain how this affects the carbonate pump for removing CO2 from the atmosphere?