

**GG325 -- PRINCIPLES OF GEOCHEMISTRY**  
**Homework set #3 - Due on Friday 10/12**

**1. The Hydrosphere:**

Tables 10.8 and 1.1 in "the hydrosphere" lecture notes give two different estimates for the volume of water in the polar ice caps and other glaciers. If the glaciers are at steady-state (for volume) and the flux of water added to them each year (which equals the flux removed as well) is  $90 \text{ km}^3/\text{yr}$ , what is the implied residence time ( $T_{\text{res}}$ ) of water in the glaciers with for each of the volume estimates?

**2. Hydrosphere composition**

a. What is the Alkalinity of seawater with the following composition:

$\text{Na}^+$	0.481 M	$\text{Cl}^-$	0.560 M
$\text{Mg}^{2+}$	0.0544 M	$\text{SO}_4^{2-}$	0.0283 M
$\text{Ca}^{2+}$	0.011 M	$\text{HCO}_3^-$	0.00238 M
$\text{K}^+$	0.011 M		

b. write the charge balance equation for this solution and substitute in the numbers above. Is this solution balanced? If not, what other ion(s) that are not listed might be present in seawater to help balance the charge?

**3 Weathering**

a. How does ECS differ from CEC?

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**3b.** A sediment has a CEC of 70 meq/100 g. The following exchangeable cations make up the CEC:  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{H}^+$ . The first 4 were measured at concentrations of 20, 5.7, 4.1 and 1.5 meq/100g, respectively. What is the ECS of  $\text{H}^+$  on this sediment?

**4a.** What does "Zero Point of Charge" mean for particles surfaces?

**b.** Are particle surfaces without charge at the ZPC?

**5. Soils**

**a.** How does pH change with depth in a typical soil zone, and why?

**b.** Name 2 chemicals (or minerals) that precipitate from soil water as the pH changes

**c.** what is the name of the soil zone where the precipitation occurs?