1.) 1.5 g/L = [SO_4]

a. $\left[1.5\ \frac{g\text{-}SO_4}{L}\right]\left[\frac{32.1\ \frac{g\text{-}S}{mol}}{96.1\ \frac{g\text{-}SO_4}{mol}}\right] = \boxed{0.50\ g\text{-}S/L}$ ANS ⟸ SHOULD BE ONLY TO 2 SIGNIFICANT DIGITS

b. $\frac{\left[1.5\ \frac{g\text{-}SO_4}{L}\right]}{\left[96.1\ \frac{g\text{-}SO_4}{mol}\right]} = \boxed{0.016\ mol/L = 16\ mM}$ ANS

c. SO_4^{2-} has a charge of 2, hence there are 2 equivalents per mole

$[0.016\ mol/L][2\ eq/mol] = \boxed{0.032\ \frac{eq}{L} = 0.032\ N = 32\ mN}$ ANS

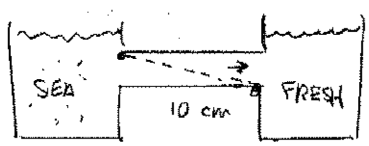
d. $[1.5\ g/L][1000\ mg/g]\left[1\ \frac{ppm}{mg/L}\right] = \boxed{1{,}500\ ppm}$ ANS

2) [#6] FLUX DENSITIES: (units like $g/m^2{\cdot}h$)

a. $C_N = 10\ mg/L = 10\ g/m^3$

$v = 2\ cm/hr = 0.02\ m/h$

$J = Cv = (10\ g/m^3)(0.02\ m/h)$ $\boxed{= 0.2\ g/m^2{\cdot}h = 200\ mg/m^2{\cdot}h = 0.02\ mg/cm^2{\cdot}h}$ etc ANS

b. 

$C_s = 30\ g/L$ $C_f = 0\ g/L$

$J_s = -D\frac{\partial c}{\partial x} = -D\frac{\Delta C}{\Delta x} = \left[1\times10^{-5}\ \frac{cm^2}{s}\right]\left[\frac{-30\ g/L}{(10\ cm)(1000\ cm^3/L)}\right]$

↑ FROM EITHER p. 18 OF TEXT OR IN CLASS HANDOUT OF SLIDES

$\boxed{J_s = 3\times10^{-8}\ \frac{g}{cm^2\,s} = 3\times10^{-4}\ \frac{g}{m^2\,s} = 2.6\times10^{-3}\ \frac{g}{cm^2{\cdot}day} = 26\ g/m^2{\cdot}d}$ ANS

3.J=-D(dc/dx)

D=10^{-5} cm2/s

t1:

x = 1.5 cm	~0.7 g/l/cm	J = 0.7e-05 g/l/cm
x = 2.0 cm	~2.5 g/l/cm	J = 2.5e-05 g/l/cm

t2:

x = 1.5 cm	~0.3 g/l/cm	J = 0.3e-05 g/l/cm
x = 2.0 cm	~0.3 g/l/cm	J = 0.3e-05 g/l/cm

If we define a control volume in the portion of the tube between 1.5 and 2 cm, clearly the above shows that at t1, about 3+ times as much dye is leaving as entering. Therfore, the dye conc must decrease, which it does by t2, where the difference in fluxes is almost negligible.