

1) Compound A has a molar absorptivity of  $10000 \text{ L mol}^{-1} \text{ cm}^{-1}$  at  $\lambda 475\text{nm}$ . Compound B has a molar absorptivity of  $500 \text{ L mol}^{-1} \text{ cm}^{-1}$  at  $\lambda 475 \text{ nm}$ . Using the same spectrometer set at  $\lambda 475 \text{ nm}$  and identical cuvettes, you obtain identical absorbance readings. Which sample has the greater concentration?

2) A blue dye is used in a blue raspberry flavored drink. You have been asked to find out the concentration of this blue dye in the prepared beverage. You have 1.0 g of the dye (MW = 369 g/mol) available to you and need to prepare the solutions in Table 1.

- Describe (in detail) how you would prepare 100 mL of sample 2.
- Why would you choose 686nm as the wavelength that you measure?

After preparing the solutions and a sample of the drink mix, you obtain the absorbance data in Table 1.

- What is the molar absorptivity of the dye (assume you used a 1cm wide cuvette)?
- What is the concentration of the dye in the drink mix?

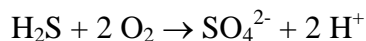
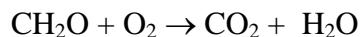
**Table 1: Data for Problem 2**

Sample Name	Conc (M)	Absorbance (686nm)
Blank	0	0.001
1	0.001	0.19
2	0.002	0.415
3	0.004	0.876
4	0.005	1.2
drink		0.235

3a) Based on the Well Wishes case study, is there enough  $\text{O}_2$  in the drainfield to oxidize all the carbon, nitrogen and sulfur species under unsaturated soil conditions?

b) Under saturated soil conditions?

The relevant chemical equations are:



4) How would you prepare 500 mL of a  $2.00 \times 10^{-6} \text{ M}$  KCl (molar mass = 64.55 g) solution by using a balance that can measure mass only to 0.01g.