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Biology 3515/Chemistry 3515 Biological Chemistry Laboratory Spring Semester 2016 Quiz 1 - 11 February 2016

Please write your name on each page. Be sure to show your work and include correct units in all of your answers! 25 points total.

- 1. Two students have each been given the same rather vague instructions for preparing a tris buffer solution, but have interpreted the instructions differently. The pK_a of tris is 8.1.
 - (a) (4 pts) Student A weighed out 0.1 moles of tris base and dissolved it in about 400 mL of water. She then added 0.05 moles of tris-HCl salt (i.e., the conjugate acid of tris base) and adjusted the final volume to 500 mL by adding water. Calculate the total molar tris concentration in this solution (base plus conjugate acid) and the expected pH.

(b) (4 pts) Student B also weighed out 0.1 moles of tris base and dissolved it in about 400 mL of water. But, this student then added 0.05 moles of HCl and adjusted the final volume to 500 mL. Calculate the total molar tris concentration in this solution (base plus conjugate acid) and the expected pH.

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(c) (5 pts) Student A has decided that the pH of her buffer solution is too high and so has added 10 mL of a 1 M solution of HCl to it. Calculate the expected pH after adding the HCl.

- 2. Many proteins that contain metal atoms absorb light in the visible range quite strongly. For instance, the absorption spectrum of hemoglobin has peaks at approximately 420 and 550 nm, which are due to the iron-containing heme groups. The molar extinction coefficient at 420 nm is approximately 5×10^5 cm⁻¹M⁻¹, and the molar mass is 64,000 g/mol.
 - (a) (3 pts) A student has been given a sample of human blood and instructed to measure the concentration of hemoglobin in it. He realizes that the absorption is so strong that he will have to dilute it in order to obtain a reliable measurement. After a few tries, he discovers that a sample diluted 1000-fold gives an absorbance of 1.4 at 420 nm, in a cuvette with a path length of 1 cm. Calculate the molar concentration of hemoglobin in both the diluted sample and the undiluted blood.

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(b)	(3pts)	${\bf Calculate}$	the	concentration	of	hemoglobin	${\rm in}$	undiluted	blood,	in	units	of
	mg/ml	L.										

- 3. Another students suggests that it might be a good idea to measure the hemoglobin concentration using the Bradford dye-binding assay.
 - (a) (3 pts) What advantage might the Bradford assay have for this situation?

(b) (3 pts) What disadvantage might the Bradford assay have for this situation"