

NAME: _____

1. (16 POINTS) Sketch the shape of the titration curves expected for the following titrations:

(a) NaOH with HCl

pH



mL HCl

(b) HCl with NaOH

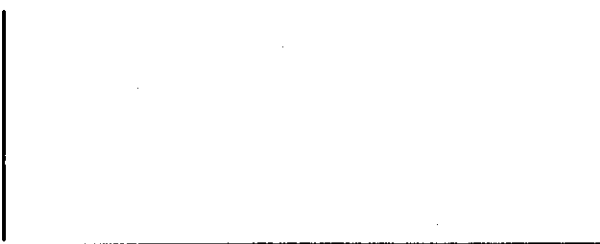
pH



mL NaOH

(c) KHP with NaOH

pH



mL NaOH

(d) Na₂CO₃ with HCl

pH



mL HCl

2. (24 POINTS) Suppose a student is determining the total base content of an antacid tablet by performing a back titration. He/she weighs out a 0.4022-gram portion of a tablet whose total weight is 1.6665 grams, dissolves this in exactly 30.00mL of deionized water, and then adds exactly 25.00 mL of 0.1000M HCl in order to bring the pH down to 2.2. This solution is then carefully back-titrated with 0.1050M NaOH, with 4.77 mL required to reach the equivalence point. Calculate the total base content (i.e., the number of mmoles of base contained) of the antacid tablet. **SHOW ALL WORK CLEARLY.** (Formula weight of HCl = 36.46 gram/mole; formula weight of NaOH = 40.00 gram/mole).

3. (24 POINTS) (a) Write the equation for Beer's Law and define all the terms (including the correct units for each term).

(b) The absorbance of a 1.0×10^{-5} M $\text{Fe}(1,10\text{-phen})_3^{2+}$ solution is measured at a wavelength of 510 nm and found to be 1.00. What is the transmittance of this solution? **SHOW YOUR WORK.**

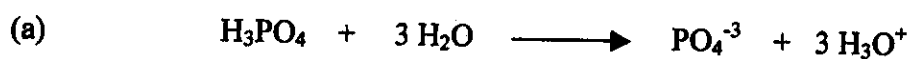
(c) Suppose the solution in part (b) is diluted with deionized water by a factor of 10. What are the absorbance and transmittance of the diluted solution? **SHOW YOUR WORK.**

4. (16 POINTS) What quantities are plotted on the x- and y-axes of:

	<u>x-axis</u>	<u>y-axis</u>
(a) a chromatogram?	_____	_____
(b) an absorption spectrum?	_____	_____

5. (8 POINTS) Define the term "retention time". What is its principal use in GC analysis?

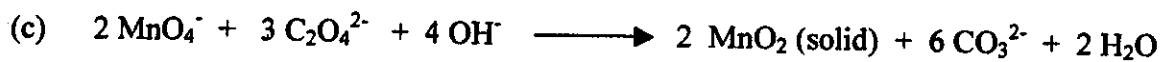
6. (12 POINTS) Write the equilibrium constant expressions for the following balanced chemical reactions:



K =



K =



K =
