February 2016
Analytical Cumulative Exam
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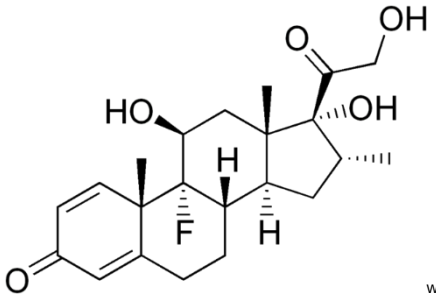
There are five questions. Answer each question in a complete and concise manner.

1. **Experimental Design:** You have been tasked with developing a method to quantitatively measure dexamethasone, a pharmaceutical steroid by liquid chromatography with UV detection. The structure is shown below. Describe in detail how you will set up the quantitative analysis method. Explicitly note the type of chromatography, solvent system and quantitative analysis of the data including error analysis for an unknown sample.



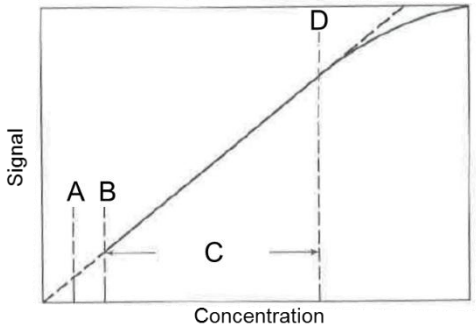
www.wikipedia.org

2. **Solution Equilibria:** (A) Describe what pKa is. (B) Amino acids are ampholytic in nature, what does that mean? (C) What is isoelectric point? (D) If a weak acid with a defined pKa was placed in an organic solvent system, would this change the pKa? Why or why not?

3. **Spectrophotometry:** Describe how the following phenomena occur: A) Absorbance, B) Fluorescence, C) Phosphorescence. What are the lifetimes of each?

4. **Detection:** Draw and explain the components of a Czerny-Turner monochromator for detection and how it works given two entrance wavelengths.

5. **Quantitative Analysis:** Label each part of the calibration curve:



Skoog, Holler, Nieman 5th Ed