

Chem 231 Quiz Number 1 - Solutions

A. Short Answer/Multiple Choice Section (2 points each)

1. Besides, placing a solid in a container, adding solvent and shaking, list one other piece of equipment frequently used for extracting analytes from solids with solvents.

Piece of equipment = a) Soxhlet Extractor, b) ultrasound bath

2. Which type of solid phase extraction cartridge would make the most sense for retaining ethanol (a polar organic compound) in a gasoline (mostly non-polar alkyl and aromatic hydrocarbons) sample.

- a) **normal phase** (or hydrophilic interaction) b) reversed phase
c) cation-exchange d) anion-exchange

3. List one practical advantage in using thin layer chromatography over HPLC.

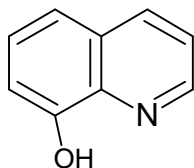
- a) **lower equipment cost** b) **simpler to use**

4. For which of the following methods is it most important to use an internal standard

- a) HPLC with manual injection b) HPLC with autosampler injection
c) **GC with manual injection** d) GC with autosampler injection

B. Calculations/Longer Answer. (5 points each)

1. 8-hydroxyquinoline (see structure below) has an acid group (OH) with a pK_a of 9.81 and a base group ($N:$) whose conjugate acid (NH^+) has a pK_a of 4.91. It also has a K_{ow} of around 100. What would be a useful pH to extract 8-hydroxyquinoline from “permanent ionic compounds” (ions at all pH values) in water using a liquid–liquid extraction with octanol?



The best pH values would occur where 8-hydroxyquinoline exists as a molecule in a high fraction. This would occur at ~2 pH units below the OH group pK_a and ~2 units above the base group pK_a . This leads to pH values of between 6.9 and 7.8. (Values between 6 and 9 would work reasonably well, though).

2. A chemist is analyzing water for pesticides and has collected 1.0 L water samples. The pesticides are only weakly polar and are extracted from water by solid phase extraction (SPE). Initially, she passes 25 mL of water through a SPE cartridge and elutes the pesticides using 5 mL of methanol which analyzed by direct injection (1 μ L volume) into a GC. Peaks for pesticides are observed but have low signal to noise ratios.

a) Describe a change in the procedure which would be expected to increase the signal to noise ratio of the pesticide peaks.

Increase the volume of water passed into the SPE cartridge (you have way more than 25 mL) or decrease the volume of methanol used to extract pesticides off of the SPE cartridge (you have way more than needed for injections and could either use less or evaporate to concentrate the methanol)

b) What test should be done to ensure there are no other problems associated with the change in procedure from your answer in a).

Test the method for a) trapping and b) removal efficiencies