

Out-of-Class Questions

Article: D.L. Phillips, I.R. Tebbett, and R.L. Bertholf, "Comparison of HPLC and GC-MS for measurement of cocaine and metabolites in human urine" *J. Anal. Toxicol.* **1996**, *20*, 305-308.

1. Using only the information in the abstract, answer the following questions about this work.
 - a. What did the authors do?

 - b. Why did they do it?

 - c. How did they do it?

 - d. What did they find?

2. Fill in the table below using the information from the introduction.

	GC-MS	HPLC-UV
Advantages		
Disadvantages		

3. Toward the end of the introduction, often in the last paragraph, it is common to transition from background information to a brief summary of the specific question addressed in the manuscript. What question did these authors want to answer?

4. Skim the Materials and Methods section with a focus on what types of details are included. Check the boxes to indicate which pieces of information below are in the methods section, and be sure to note the level of detail.

chemicals used

manufacturers of supplies

glassware used

sample calculations for how to make stock solutions or dilutions

concentrations of solutions

description of data analysis procedures

instruments used

results of the experiment

operating parameters for instruments

5. Why do the authors spike the standards into a urine sample instead of diluting them in water or buffer?

6. Look up the structures of the analytes and bupivacaine and record them below.

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1. Consider the structures of the analytes and bupivacaine that you looked up outside of class. What was the purpose of the bupivacaine in this analysis? Do you think this compound was a good choice for this purpose? Explain.
2. The authors state that “Overall, GC-MS demonstrated better precision than HPLC, but the methods had generally equivalent sensitivities.” Consider the data in Tables 1 and 2. Do you agree with the authors’ statement? Why or why not? What additional data might be useful in comparing the two methods’ sensitivity and precision? What other information might you want to know when choosing a method for your application? Is this information provided in the manuscript?
3. Do you agree with the authors’ conclusion that HPLC with UV detection is a suitable alternative to GC-MS for analysis of cocaine in urine? Consider this conclusion generally and in the context of the following scenarios. Decide whether you would recommend HPLC-UV or GC-MS for each analysis, and justify your choices.
 - a. You manage a small business. The owner of the company decides to require drug testing for cocaine for all new hires.
 - b. You are working on a research project to study how genetic variation in rats affects the metabolism of cocaine.
4. Since this article was published, a method to couple HPLC to MS, called electrospray ionization, has become much more widely available. What would be the advantages of this method for this application?