Chemistry 416, Fall Semester 1993, Dr. Glaser

Quiz II: "Mass Spectroscopy", Monday, October 18, 1993, 20 minutes, not announced

Your Name:

Question 1. Terminology.

Fill in the blanks as required (or chose from the selection given in parentheses). (8 points)

Mass spectroscopy has progressed in a most exciting fashion over the past decade. A significant role for these advances have played the developments of new methods to generate cations in the gas phase. The oldest method, the EI method, has the disadvantage to require the samples to be in the gas phase. With the development of _____ and _____ it is now possible to generate ions directly from solid or dissolved samples. Another method has recently been described that allows for the analysis of molecules with more than a million mass units, that method is called _____ ionization. After the ions are in the gas phase, we can use E and B fields to select according to the mass/charge ratio. In the time-of-flight method, for example, we accelerate the ions in an _____ field and measure the time they need to hit the detector. The TOF experiment requires a _____ ion source. In an ion cyclotron resonance mass analyzer a _____ field is used to accelerate the ions. Double focusing devices provide the highest resolution; these devices contain a _____ and a _____ in series. The effect of double-focusing is that ions with the same m/z but with different _____ and with different _____ hit the detector at the same time. The detector consists in an electron multiplier placed after a _____.

So far, so good. To complete this question, give the full names of the following abbreviations.

SIMS:

FAB:

FD:

EI:

IE:

OVER

Points for Question 1:	/8		
Points for Question 2:	/8		
Points for Question 3:	/9	Total Points:	/25

Question 2. Negative Ions.

In the lecture, we discussed several ways to generate negative ions. Among the examples were two ways for the generation of 2,4,6-trichlorophenoxide from the corresponding phenol. Show the ionizing reaction for both cases and write down the technical terms used to describe the type of reaction in each case. (8 points)

Reaction 1. Technical term for reaction type:
Reaction 2. Technical term for reaction type:

Question 3. Isotopic Substitution Patterns. (9 points)

Predict the rel. intensities of the (M), (M+1), & (M+2) peaks for $C_{10}H_{22}$ based on the natural abundances of the heavy isotopes. (M) : (M+1) : (M+2) = 100 : ____ : ____. The (M+2) peak reflects the occurrence of _____ .
Predict the rel. intensities of the (M), (M+1), (M+2), (M+3), & (M+4) peaks for $C_{10}H_{21}Br$ based on the natural abundances of the heavy isotopes. (M) : (M+1) : (M+2) : (M+3) : (M+4) = 100 : ____ : ____ : ____ : ____
Predict the rel. intensities of the (M), (M+1), (M+2), (M+3), & (M+4) peaks for $C_{10}H_{20}Br_2$ based on the natural abundances of the heavy isotopes. (M) : (M+1) : (M+2) : (M+3) : (M+4) = 100 : ____ : ____ : ____ : ____ The (M+4) peak is due to ions that contain _____ of bromine.