

Chemistry 4114: Homework #7

- 20-1 With gaseous sources, the analyte is in the vapor phase and at low pressure initially. With desorption sources the sample is coated onto a substrate and the sample is introduced into the instruments in the solid or liquid form. Gaseous sample introduction's main advantage is the simplicity of the instrumentation and the ease of introduction of the sample into the ionization area. Desorption's advantage is the fact that solids or liquids can be introduced into the instrument. In addition, desorption sources tend not to fragment the sample as much as found with ionization methods typically used with gaseous sample introduction.
- 20-2. The principle difference is in the extent of fragmentation of the sample ions. EI has the most, CI the next most, and field ionization the least amount of fragmentation of the sample ions.
- 20-4a. Because ionization occurs at approximately $\frac{1}{2}$ way between the filament and the target, we will require a 140V potential difference between the filament and the target to have a 70eV electron beam at point SS.
- b. At point P, the analyte will encounter an electron beam with lower energy. It is likely, therefore, that the initial ion formed following electron impact will not fragment as much as those ions that encounter the more energetic electron beam. In addition, ions formed at point P are not in-line with the aperture entrance to the mass analyzer; consequently, it is unlikely that those ions will enter the mass analyzer and ultimately be detected.
- 20-9 The electric sector of a double focusing instrument serves as a Kinetic Energy filter. This portion of the instrument, therefore, results in a narrowing of the Kinetic Energy distribution of the individual ions before they enter the Magnetic sector of the instrument. The narrower the Kinetic Energy distribution of the ions, the better the ability of the magnetic sector to discriminate between slightly different masses – hence better measurement resolution.