**Exercise # 6: MS Trivial Pursuit**

*Chem 6614 Chemical Instrumentation*

1. theory

Which way will the positively charged mass m+ curve as it traverses the magnetic field shown below ?

a) into the page b) down and on the page c) out of the page

d) up and on the page e) no change f) can’t be determined

N

m+

*S*

2. design

2.1. The magnetic sector design of an MS normally varies what parameter to

`scan’ the MS spectrum ? **Accelerating voltage, V (RH/V ~ m/e)**

2.2 Which order of components below best describes the path of the

introduced sample in an typical MS ?

a) inlet mass analyzer ion source dynode detector

b) ion source inlet mass detector HCL detector

c) inlet ion source mass analyzer dynode detector

d) mass analyzer ion source inlet TC detector

2.3. What’s `quad’ about a quadruple MS ?

two sets of magnets=> 4 poles (2 N and 2 S)

2.4. Briefly...how does a TOF MS work ?

Basically, the charged masses are lined up at a common starting point then accelerated at common V towards a detector. The heavier masses move slower than the lighter masses and are thus distinguished by the time it takes to traverse the space between launch point ant detector.

3.) hardware

a)which MS method reduces the peaks to the `parent mass’ only ?

CI (chemical ionization method, using CH4+ instead of electrons to ionize sample)

b)what kinds of pumps are resident on the ASC GC-MS, and which is

the low pressure (high vacuum) pumps ? mechanical roughing pump; oil diffusion and turbomolecular pumps. The last two are the low pressure (hi vac) pumps

c)what is the usual pressure desired in the ion chamber ?

10-6 -10-5 torr

d)how are the sample masses actually `cracked’ ? via electron impact with a beam of electrons (In our spectrometers, the accelerating voltage is between 1000-2000 V)

**4) Really Geeky MS trivia**

a) name three different pumping methods besides those above in 3b

ion, cryogenic and titanium sputter

b) name for kind of flange used in high vacuum work (contains slang for prisoner)

con-flat flange

c) Define the term `resolution’ in the MS world

R= M/ ΔM, where ΔM is the minimum distance between resolvable peaks at/near M

d) name for the detector used in the ASC MS (Rheodyne) dynode detector

e) name of pressure gauge used to measure high vacuum P. (hyphenated name)

Phillips gauge

f) What gas is typically used in `CI’ MS to create the charged masses ?

methane (CH4)

g) EI stands for ? Electron impact

h) 1 micron in pressure is how many millitorr ? 1 milltorr

i) another name for the mass `accelerator’ \_\_\_\_\_\_ion optics\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

j) most compact MS design TOF=time of flight MS

k) best resolution MS design magnetic sector

l) most commonly used MS design quadrupole

m) simplest detector ? Faraday cup