

CHEM 212
Exam 4
Fall 2013

Name _____

1. What does ICP stand for?
2. Diagram the ICP portion of the instrument and label the pieces
3. Describe the function of the pieces of the instrument listed below.
Piezo crystal

Carrier gas

Radio Frequency coil

nebulizer

sample injection

plasma

4. Describe what happens to the sample from the point of injection until it is in the plasma

5. What are the TWO types of detectors are generally used with an ICP source?

6. Diagram and describe the function of each part of a GENERALIZED mass spectrometer.

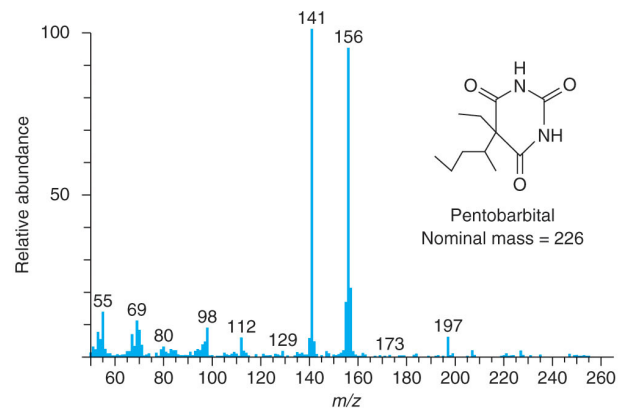
7. What does a mass spectrometer measure?

8. What is the pressure inside a mass spectrometer (roughly)? Why is pressure controlled?

9. Define and label the parent peak and base peak in the diagram. Which ionization method might have been used and what evidence leads you to this conclusion?

Parent peak

Base peak



10. Draw an electron ionization method. And label the pieces.

11. Describe how this piece of the instrument generates ions.

12. Electron ionization is a relatively aggressive ionization technique. What does this mean in terms of the relative abundance of peaks.

13. What is the difference between electron ionization (EI) and chemical ionization (CI)?

14. What changes in the fragmentation pattern would you expect from a CI vs an EI spectrum for the same compound.

15. Draw a magnetic sector mass spectrometer and describe how it works.

16. How can a magnetic sector mass spectrometer be used to detect multiple ions.

17. Diagram an electron multiplier or channeltron. Describe how this piece of instrumentation works.

18. Define what chromatography is used for.

19. If solute A and B have retention times of 16.7 and 17.8 minutes, respectively and a $w_{1/2} = 0.3$ min for each peak. Calculate the resolution of these peaks. Is it adequate for a quantitative separation?

20. Calculate the number of plates in this column relative to solute A.

State the mathematical relationships between each pair of variables shown below. Also indicate the direction of change to the second variable as the first is increased.

21. Column length and Resolution

22. elution time and band width

23. particle size and resolution

24. Describe the causes of “fronting”

25. Describe the causes of “tailing”