Name:_____

1. (20 pts; 2 pt each) State the identity of each instrument shown on the computer screen. Then describe the distinguishing features of the instrument that helped you with the identification.

ID	Instrument	Distinguishing Features
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		

2. (15 pts) A 3.31×10^{-4} M solution of a new drug (373 g mol^{-1}) has an absorbance of 0.750 in a 1.00 cm cell. A 0.0312 g tablet containing the drug is dissolved in water to a final volume of 500.0 mL and has an absorbance of 0.654 under the same conditions. What is the mass percent of the drug in the tablet?

3. (2 pts) Describe the attributes of random error and state how it can be quantified.

4. (3 pts) List at least three ways you could assess a method for systematic error.

5. (4 pts) Identify an example of instrumental error and give an example of how one type of instrumental error is adjusted for in real-life measurement

6. (6 pts) List 2 factors that can affect the linearity of Beer's Law. Describe how each would be observed in the data and how it would affect the data. Also, how can each factor be avoided or corrected?

Factor	How can it be observed in the data? How does it affect the data? How can it be corrected for?

7. (5pts) What physical portion of the instrument controls throughput and resolution? How are they related? How do you determine the setting for the physical portion of the instrument controlling them?

8. (10 pts) Describe how FT-IR measurements are made by the instrument. Be sure to discuss the data domains that the information travels through as it moves through the instrument, interacts with the sample, and is detected.

(2 pts) Draw an example interferogram of a continuum source. Be sure to label the axes

(2 pts) Draw an example output spectrum. Label the axes. Describe how the interfereogram is converted to the familiar output spectrum.

(1 pt) What do regions where photons are absorbed represent about the physical sample

9. (10 pts) Diagram, label and describe how a monochromator works.

10. (10 pts) Diagram, label and describe how a PMT works.

11. (10 pts) The diffraction pattern of copper metal was measured with X-ray radiation of wavelength of 1.315 Å. The first order Bragg diffraction peak was found at an angle 2θ of 50.5 °. Calculate the d-spacing between the diffracting planes in the copper metal.

Extra Credit:(10 pts) Draw a schematic of how x-rays are diffracted off the crystal of sample atoms. Show the how the relationship described in Bragg's Law is derived.