

Do 5 of the following 7 questions. It is essential YOU indicate the problems you want graded. Otherwise, I will grade the first five with writing.

1 2 3 4 5 6 7

Write CLEARLY and label each part of your answer.

1. (20) I recently had some samples analyzed by one method, but there was incomplete dissolution of some samples. I had the samples reanalyzed, but didn't get data for an important analyte. I need to determine if the methods produce data that are significantly different at a 50% confidence interval.

	Method 1	Method 2	d_i	$d_i - d$	$(d_i - d)^2$
C-366895	6.9	6.15	0.75	-0.668	0.446224
C-366899	1.2	1.57	0.37	-1.048	1.098304
C-366900	6.1	5.64	0.46	-0.958	0.917764
C-366901	0.4	0.69	0.29	-1.128	1.272384
C-366906	1.3	1.72	0.42	-0.998	0.996004
C-366907	47.1	54.56	7.46	6.042	36.505764
C-366908	5.3	6.51	1.21	-0.208	0.043264
C-366909	3.8	4.69	0.89	-0.528	0.278784
C-366910	3.8	4.71	0.91	-0.508	0.258064
n=9			d= 1.418		$\Sigma(d_i - d)^2 = 41.82$

2. (20) A weak acid HA ($pK_a=4.50$) was titrated with 1.00 M KOH. The acid solution had a volume of 100.0 mL and a molarity of 0.100M.

a. (4) When a weak acid is titrated by a strong base, with the pH of the equivalence point be greater, equal to, or less than 7?

b. (4) Determine the volume base added at the equivalence point.

Begin by writing the reaction governing the solution in each case:

c. (4) Determine the pH of the initial solution before the titration begins

d. (4) Determine the pH of the solution after 3 ml base is added

e. (4) Determine the pH at the equivalence point

3. (20) Consider the following reduction potentials:



a. (6) Draw a voltaic cell with Pt | Fe²⁺, Fe³⁺ on one side and Zn | Zn²⁺ on the other. Label the anode, cathode, salt bridge, and direction of electron flow.

b. (7) Write the appropriate half reactions, balanced full reaction, and calculate E⁰ for the cell described above.

c. (7) Calculate E for the cell if [Fe²⁺] = 0.032 M, [Fe³⁺] = 0.017 M, [Zn²⁺] = 0.052 M

4. (5) Match each instrument diagramed on the board with the appropriate instrument (hint, not all instruments are shown).

- ___ UV-VIS absorption
- ___ UV-Vis Fluorescence
- ___ Atomic Emission
- ___ Atomic absorption
- ___ Atomic Fluorescence
- ___ ICP-MS
- ___ ICP-OES
- ___ GC-MS
- ___ HPLC

(10) How did you identify each instrument on the board:

A

B

C

D

E

(5) Now match each of the following instrument parts with the appropriate instrument (hint, more than one instrument may use each of these parts:

- _____ Hollow Cathode Lamp (HCL)
- _____ Photomultiplier Tube (PMT)
- _____ Channeltron
- _____ Tungsten filament
- _____ Deuterium arc
- _____ flame or plasma source

6. Consider a Mass Spectrometer.

a. (4) On what basis does a mass spectrometer measure?

b. (16) Diagram, label and explain a TOF mass spectrometer with chemical ionization.

