Answers to old final exam.

1 B 2 C 3 A ( element A must be Na, and element B must be Cl)

4 B 5 A ( I got this wrong myself. Se has THREE additional sublevels)

6 C 7 B 8 B 9 C ( the non dipole is insoluble. I really did not cover solute-solvent attractions yet) 10 C 11 B 12 D. (tough one, I think. The energy given is the same as the given ionization energy, just in a different unit. The ionization energy is the lowest energy peak. That would be the 3p4 , second highest since 2p6 would be higher.

13 A 14 C 15 B 16 B 17 C 18 C No 19 or 20

21 C 22 D 23 B 24 B 25 to 27, solid state, was not taught yet. Answers are

25 B 26 C 27. C Students should be able to get 25 and 26 based on Regents Chem.

28 D 29 C 30 B 31 B Another hard one, I think. Tell them to just choose a convenient mass - it doesn't matter which. Say, 40 g. That would be 10 moles of He, and 1 mole of Ar. So the P of the He is 10/11 times 11.

32 C 33 A 34 D 35 C 36 A 37 A 38 A 39 B 40 C

I. A. S(g) is not the standard state of sulfur, which is a solid at room temp.

B. -297 - x = -576. x = + 279 kJ

C. 495 - 2 x = -576 . x = 536 kJ/mol

D. SO2 structure showing one single bond, one double, lone pair on the S...

ii. There is resonance , so that the two bonds are equivalent, in between single and double. (or, the pi bond is shared equally over both bonding sites.)

iii. +1.

E. SO2 showing two double bonds, still with a lone pair. (extended octet on the S)

F. The bond energy we found of 536 kJ is closer to the 525 given for a double bond. Therefore the second structure is more likely.

II. NOTE: (tell the students this). The year this exam was given, we had actually performed both of the experiments described in the question! It is important that you know these experiments, even if we never get to do them.

A. 8.00 g B. The water is 99.7 g, + the ammonium nitrate = 107.7 g

ii. 107.7 x 3.90 x 45 = 1890 J 1890 J/0.1 mol = 18.9 kJ/mol

D. The coffee cup insulates the mixture from the surrounding air.

E. 2.8 x 4.18 x 50 = 585 J ( or 590 to two sig figs)

 ii. 585/(20.0g)( 77.2°) = 0.379 J/g° or 0.38 J/g°

III. The limiting factor is the 0.0400 g or 0.00165 mol of Mg. ( compared with 0.100 mol HCl) V = nRT/P using 1 atm for P, 0.00165(0.0821)(298 K) = 0.0403 L

B. It would be greater. Because of the water vapor present, the pressure of the hydrogen has would be LESS than 1 atm. Since P is in the denominator, that would produce a greater volume. OR, The water vapor would increase the total number of moles of gas present, which would increase the volume at constant total pressure.

C. 3.3 x 10-3 mol. ( twice the moles of Mg) ii. 0.0967 moles remain, which in 50 mL is 1.93 M.

D. 466 x 0.00165 mol = 0.769 kJ

ii. Both acids are completely ionized, so the NET reaction is the same for both.

iii. Acetic acid is a weak acid, and so is NOT completely ionized in solution. Some heat is absorbed in ionizing the acid, (breaking the O-H bond..) so the amount of heat released is smaller.

(ii and iii would be tough for the students at this time)

IV. A. Correct Lewis structure B. sp2 C. There would be resonance in the formate ion, but not in formic acid. So in formic acid there would be one C-O bond shorter than the other, while in the formate, both bonds would be the same length.

V. Using the law of partial pressures, the P of the oxygen should be 6.0 atm. The moles are PV/RT , and I get 1.83 mol

B. This is easily done WITHOUT using moles, although moles will work. Just use the pressures in a limiting factor problem. 14.0 atm SO2 and 6.0 atm. O2

The oxygen is limiting, so it goes down 6.0 atm. The SO2 must go down twice that, or 12.0 atm, so 2.0 atm remains.

C. This is extremely tedious using moles! Even using atm., it is probably too difficult for most of the students, who seldom are able to come up with an algebraic solution.

 The initial pressures are 14.0 6.0 0. Let the change in the oxygen pressure be "x"

Then the SO2 is 14 - 2x, the O2 is 6 - x, and the SO3 is 2 x.

Since the total pressure is 18.0 atm., 14 - 2x + 6 -x + 2x = 18. x = 2.0 atm.

That makes the final pressure of the SO2 14 - 2(2.0) = 10. atm.

The O2 is 6 -2 = 4.0 atm. And the SO3 is 2 ( 2.0) = 4.0 atm.