Answers to sample test 1.

1. Rate = 0.20 [0.50]3 = 0.025 M/s

2. 1.6 x 10-3 M/s

3. 0.0693 min-1

4. When A doubles, the rate increases by a factor of 8, so A is third order.

 From run 1 to run 3, B doubles, but the rate stays the same. B is 0 order

 From run 1 to 4, only C halves, and the rate halves, so C is first order, and the overall rate order is fourth.

Rate = k[A]3[C] ( you could include [B]o )

K = 7.8 x 10-5 M-3/s

d) 0.32 M/s

5. Increase in temperature

6. Putting in initial values…

 Cu2+ + 4 NH3 → Cu(NH3)42+

 4.00 12.0 0

 -2.75 -11 +2.75

 1.25 1.0 2.75 K = 2.2

6b, It is a LEWIS base, choice B.

7. a Rate = k[Br2]

 B Rate = k[Br2][C2H4]

8. Decrease the container volume

9. H2CO3 and CO32- are the acid and base.

10 a) Take the log of 0.0080, change the sign…..2.10

 b) log of 3.5 x 10-4 + 14 = 10.54. Or, take – the log of 3.5 x 10-4, to get pOH, 3.46

 14 – pOH = pH, and get 10.54

 X2/(2-x) = 4.0 x 10-6 Assume 2-x = 2, so x2 = 8.0 x 10-6. X = 0.00283, take the log, and the pH = 2.55

11. The [H+] and the [A-] are both 1.0 x 10-3 (from the pH)

 [HA] ⇌ H+ + A-

 .4 -.001 .001, .001. You can use 0.399 instead of 0.4, but that won’t matter here…….Ka is 2.5 x 10-6

12. That is 0.10 mol of NaF, so 0.10 mol of F-, added to 0.20 mol of HF. A BUFFER! [ H+] = 6.4 x 10-4 ( 0.20/0.10) So [H+] is 1.3 x 10-3 M ( 1.28 rounded)

13. a) acid b) neutral c) base

I. [Ca2+][F-]2 = 4.0 x 10-11 4x3 = 4.0 x 10-11

 X = 2.1 x 10-4 M Ca2+ , and the F- is 2x, so twice that, 4.3 x 10-4

b) (x) ( 0.040)2 = 4.0 x 10-11 x = 2.5 x 10-8 M

c) Find each molarity by using Mf = MiVi/Vf

 the Ca2+ is 4.0 x 10-4 M, and the F- is 6.0 x 10-4 M.

 That gives a value of Q of 1.44 x 10-10 That is greater than the Ksp, so yes, there is a precipitate.

2. The first step is to find the rate constant, k. Ln 4 - Ln 1 = 25 k.

 k = 0.056 s-1 Now Ln 0.400 – Ln 0.300 = 0.056 t. t = 5.1 seconds.

 The half life is 12.5 seconds.

III. pH of 1.52 means that [H+] = 0.0302 M [NO2-] = 0.0302 M

 [HNO2] = 2.0 - .0302 = 1.97 M. ( If you left it as 2.0 it didn’t matter in this case) 0.0302^2/ 1.97 = 4.6 x 10-4

 B HNO2 + OH- → H2O + NO2-

 0.100 0.040 0

 - 0.040 -0.40 +.40 (moles)

 0.060 0.040 BUFFER!

 [H+] = 4.6 x 10-4 ( 0.060/040) = 6.8 x 10-4 C. pH = 12.15