

Chem 209 Final - W2017 - © Pavel Sedach & Prep 101

$$1. D \quad 2g \text{ Na}_2\text{H}_6\text{SO}_4 \times \frac{1 \text{ mol Na}_2\text{H}_6\text{SO}_4}{130.14g} \times \frac{6 \text{ H}}{\text{Na}_2\text{H}_6\text{SO}_4} = 0.0922 \text{ mol H}$$

$$\text{N}_2 \rightarrow 28.02g/\text{mol}$$

$$\text{H}_6 \rightarrow 6.06g/\text{mol}$$

$$\text{S} \rightarrow 32.06g/\text{mol}$$

$$\text{O} \rightarrow 64.00g/\text{mol}$$

$$0.0922 \text{ mol H} \cdot \frac{6.022 \times 10^{23} \text{ atoms}}{\text{mol}} = 5.55 \times 10^{22} \text{ atoms}$$

$$2. B \quad \text{F a) } \frac{dA}{dt} = \frac{(2.5 - 5) \text{ M}}{(0 - 2) \text{ s}} = \frac{1.25 \text{ M}}{\text{ s}} \quad \text{but } 2A \rightarrow B, \text{ rate is for a coeff. of 1}$$

so $\frac{1.25 \text{ M}}{\text{ s}} \div 2 = 0.625 \text{ M/s}$

$$\text{T b) } \frac{(5 - 0) \text{ M}}{(0 - 20) \text{ s}} = 0.25 \text{ M s}^{-1} = \frac{dA}{dt} \text{ true}$$

$$\text{F c) } \frac{dA}{dt} \text{ at } 8 \text{ sec} = \frac{(0 - 1)}{(11 - 4) \text{ s}} = -0.14 \frac{\text{M}}{\text{s}} \times \frac{+1 \text{ B}}{-2 \text{ A}} = \frac{0.07 \text{ M}}{\text{s}}$$

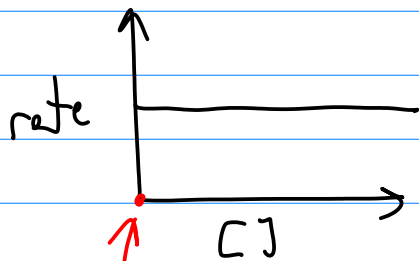
d) F

3. D Units of rxn rate always M s^{-1}

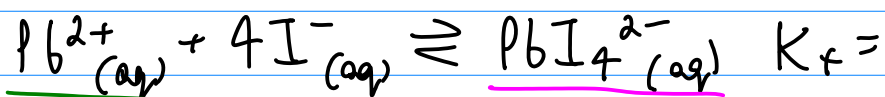
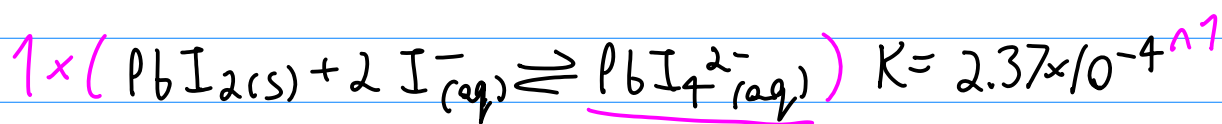
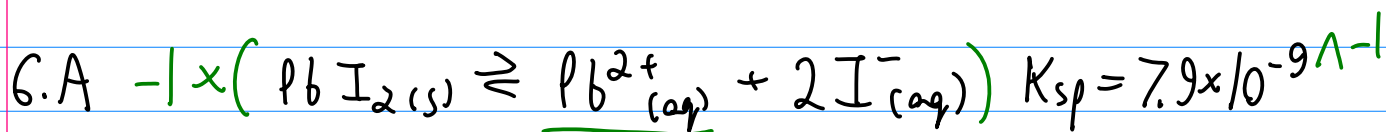
4. D 2nd order? $\frac{1}{[A]}$ vs t gives straight line

S.A

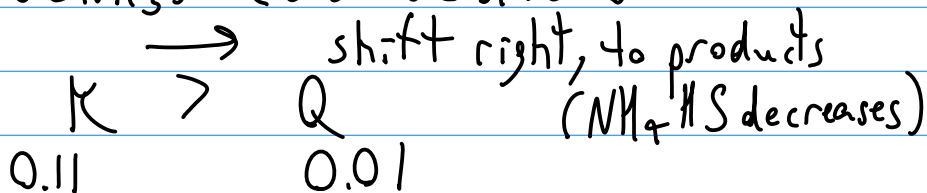
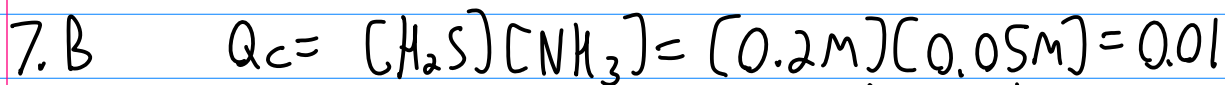
rate = k ← zero order, [C] does not affect rate!

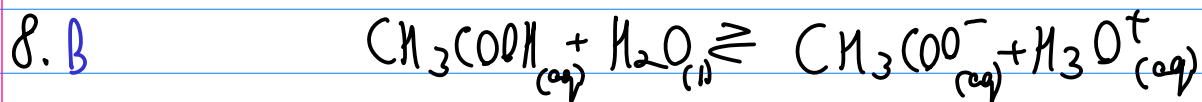


of course if [C] = 0, rate = 0 though...



$$(7.9 \times 10^{-9})^{-1} \cdot (2.37 \times 10^{-4})^1 = 3.0 \times 10^4$$





False a) Add HCl, shift left.

False d) Decrease T? Usually makes things less soluble.

True b) Scenario 1 \rightarrow add 200ml water $\frac{x^2}{0.09-x} = 1.8 \times 10^{-5}, x = 1.27 \times 10^{-3}$

$$\frac{1.27 \times 10^{-3}}{0.09} = 1.41 \times 10^{-2} = 1.41\% \text{ ionization}$$

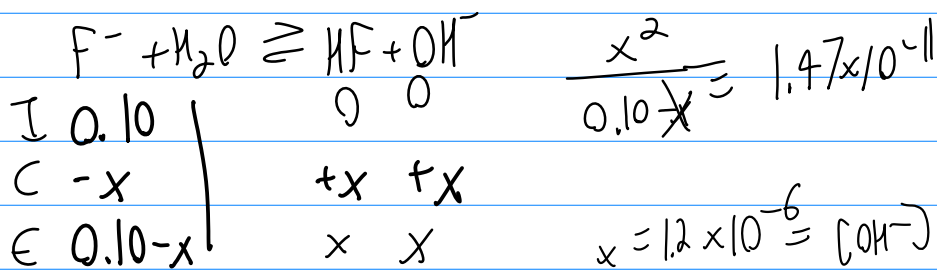
False c) Scenario 2 \rightarrow more concentrated acid $\frac{x^2}{0.11-x} = 1.8 \times 10^{-5}, x = 1.407 \times 10^{-3}$

$$\frac{1.407 \times 10^{-3}}{0.11} = 1.28 \times 10^{-2} = 1.28\% \text{ ionization}$$

* Generally, the more concentrated the acid, the less dissolves, you get diminishing returns as there is already H^+ in sol'n.
 * You can just memorize the above, no need to do math!

9.C pH of 0.10M NaF? ($K_a \text{ HF} = 6.8 \times 10^{-4}$)

$$K_{b \text{ F}^-} = \frac{1.00 \times 10^{-14} K_w}{6.8 \times 10^{-4}} = 1.47 \times 10^{-11}$$



$$x = 1.2 \times 10^{-6} = [\text{OH}^-]$$

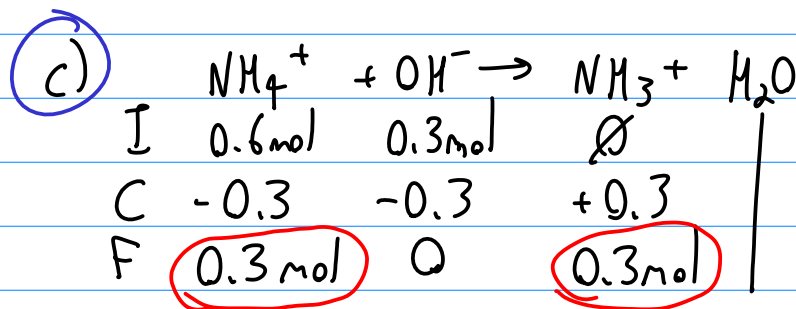
$$\text{pOH} = 5.92$$

$$14 - 5.98 = 8.02 = \text{pH}$$

10.C Capacity depends on moles of acid/base (not just concentration)

a) 0.2 mol A^- / 0.2 mol HA

b) 0.5 mol NH_3 + 0.5 mol HCl $\xrightarrow{100\%}$ 0.5 mol NH_4Cl
not a buffer



d) 0.15 mol NH_4^+ / 0.15 mol NH_3

11. B Use moles for buffers, 0.05 mol HOBr, 0.05 mol OBr⁻

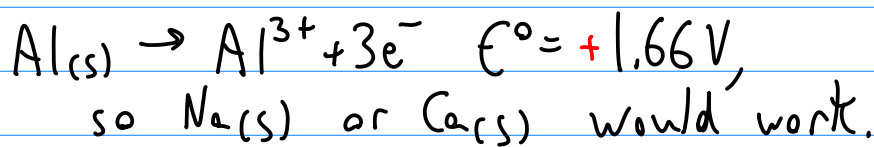
$$\text{pH} = \text{p}K_a + \log\left(\frac{B}{A}\right) = -\log(2.3 \times 10^{-9}) + \log\left(\frac{0.05}{0.05}\right)$$
$$= 8.63$$

12. D

- i. Mg \rightarrow [Ne] 3s², diamagnetic
- ii. Si \rightarrow [Ne] 3s² 3p², paramagnetic
- iii. Cr \rightarrow [Ar] 4s² 3d¹⁰, 4p⁵, paramagnetic

13. D

Which metal has more +ve oxidation than Al(s)?

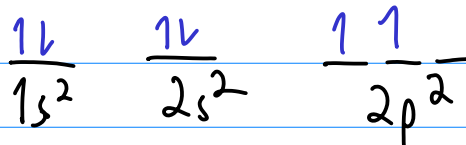


14. B

Strongest OA = best at being reduced
= most positive reduction.
= Ag⁺

15. A

a. X

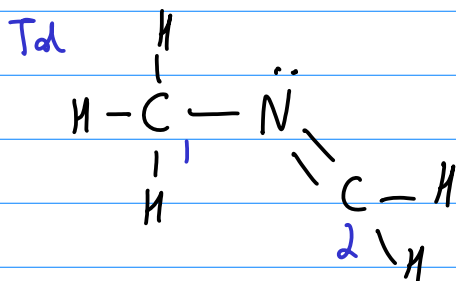


b. ✓

c. ✓

d. ✓

16. A

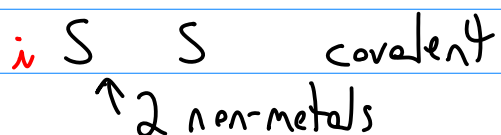


All $\text{AX}_4 = \text{sp}^3$

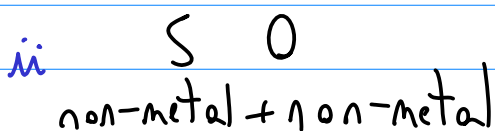
17. C

All $\text{AX}_3 = \text{sp}^2$
+ derivatives

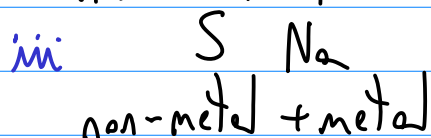
18. A) i and iii only



(note if Na-Na metallic)
↑



covalent



ionic

19. C

