MOCK EXAM TEST III

The first three questions refer to an acid-base titration. I suggest doing it on a scartch paper, then looking at the questions. 50ml of .15 M HNO2 are placed in a flask, and titrated with. .15 M NaOH. You are asked to calcualte pH at the point where 30ml of the strong base has been added. Ka of nitrous acid is 4 \* 10-4.

1. Before doing the acid-base reaction, what are the molarities adjusted to in order to account for mixing?

a) 0.09375 M HNO2, 0.05625 M NaOH

b. 0.09375 M HNO2, 0.09375 M NaOH

c.) 0.05625 M HNO2, 0.05625 M NaOH

d.) 0.1500 M HNO2, 0.00 M NaOH

e.) 0.1500 M HNO2, 0.1500 M NaOH

2. After doing the tble for the acid base reaction, what species are present and at what conc. in M?

a.) [HNO2] = 0.0375, [OH] 0.0, [NO2]= 0.0

b.) [HNO2] = 0.05625, [OH] 0.0, [NO2]= 0.05625

c.) [HNO2] = 0.09375, [OH] 0.0, [NO2]= 0.05625

d.) [HNO2] = 0.0375, [OH] 0.0, [NO2]= 0.05625

e.) [HNO2] = 0.0, [OH] 0.0, [NO2]= 0.0

3.) The pH of the solution after 30ml of NaOH has been added is

a) .82 b.) 3.58 c.) 1.03 d.) 1.25 e.) 3.40

4.) How can you find the pKa of the weak acid by an experiment? The chemical formula is known, so that a solution of kown molarity can be made.

a.) Allow the acid solution to come to equilibrium, measure pH, calculate equilibrium concentration of H3O+ as x= 10-pH, solve for all equilibrium conc., substitute into expression for Ka, pKa is –log(Ka)

b.) Titrate with a strong base to find equivalent point, recording pH as a function of volume of strong base added. At the volume of strong vase where volume of strong base added is half of equivalence point volume of base added, pH=pKa.

c.) Both a) and b)

d. Neither a) or b)

5. What is Ksp expression for Ag3PO4?

a) [Ag3][PO4] b.) [3Ag3][PO43-] c.) [3Ag3][PO43-]/[Ag3PO4] d) [Ag3+]3[PO4] e) [Ag+]3[PO43-]

6. What is the molar solubility of Ag3PO4 in water? Ksp= 8.9\*10^-17

a) 1.3\*10-8 M b.) 8.9\*10-17 M c) 9.7\*10-12 M d.) 4.3\*10-5 M e) 7.9\*10-33 M

7. The molar solubility of Ag3PO4 in a solution that is initially .01M silver nitrate (AgNO3) is

a.) 1.3\*10-8 M b.) 1.5\*10-5 M c.) 8.9\*10-11 M d) 3.3\*10-12 M e.) 1.1\*10-3 M

8.) What is ∆G (in kj/mol) for the chemical reaction you write for dissolving silver phosphate in water (prob 5-6)? Assume room temp. 25C.

a.) 0.0 b. 91.6 c. -91,600 d) more info is needed e) 7.7

9.) Which statement is true for mixing 10mL of .002 M Na3PO4 with 10ml of .002M AgNO3?

a. Qsp > Ksp, no precipitate forms

b.) Qsp > Ksp, precipitate forms

c.) Qsp < Ksp, precipitate forms

d.) Qsp < Ksp, predipitate does not form

e) Qsp = Ksp, solution is saturated but no solid

10. Cyrus McCrank files a patent for a device which he claims violates the second law. He has calcuations of the entropy change to prove it. Which statement is correct?

a.) Cyrus’ calculation are wrong

b.) the second law can be violated by intelligent design

c) the second law can be violated because his device creates energy

d.) Cyrus can’t be wrong

e.) Calculationss are never wrong

11.) What is ∆S for the reaction: CH4 (g)+ H2O(g) 🡪 CO (g) + 3 H2 (g). Absoltute entropies for one mol are given: 186.3 188.8 197.7 130.7

a. -134 b. 64 c) -321 d) 215 e) 142

12) What is the temperature range over which a reaction is spontaneous, if ∆H= -139 kj/mol, ∆S=-95 J.mol K?

a) T< .7 K b) T > 1.5 K c) T > 298K d.) T> 1463 K e) T< 1463K

Part 2: Short Answer

1. 6. A 100ml 5 M Acetic acid/acetate ion buffer is titrated with 5 M NaOH. Calculate the pH when 100ml of NaOH. Ka of acetic acid is 1.8E-5.

2. Calculate the Conc. of all species after equilibrium is established for the following titration: 100ml of a .05M NH4 solution is titrated with 50ml of a .05 M NaOH solution.

b.) calculate the pH of solution.