Acid base and Aqueous equilibria Answers

MC

1. B 2) D 3) C 4) B 5) B 6) E 7) B 8) D 9) C 10) B 11) B 12) E 13) D 14) D 15) D 16) C 17) B 18) D 19) A 20) C 21) C 22) B 23) C 24) C 25) D 26) E 27) B 28) B 29) D 30) B 31) B 32) B 33) A 34) C 35) C

AP #1

(a) 

(b) let X = [H3O+] = [F–]; let (0.40-X) = [HF]

7.2×10–4 =; X = 1.7×10-2 = [H3O+]

(c) (0.40 *M*)(15 mL) = 6.0 mmol OH– neutralizes and equal number of moles of HF

(0.40 *M*)(25 mL) = 10. mmol HF

4.0 mmol HF remains (or 0.0040 mol)

(d) 6.0 mmol OH– produces 6.0 mmol of F–, from a 1:1 stoichiometry in the equation

now in 40. mL of solution, [F–] = = 0.15 *M*

(e) = 0.10 *M* HF; let X = [H3O+]; 7.2×10–4 =; X = 4.8×10–4

pH = –log[H3O+] = –log(4.8×10–4) = 3.32

AP #2 1985 Answer:

(a) SrSO4*(s)* ↔ Sr2+*(aq)* + SO42-*(aq)*

At equilibrium: [Sr2+] = *X* M = [SO42-]

*X*2 = Ksp = 7.610-7

*X* = 8.710-4 mol/L, solubility of SrSO4

(b) SrF2*(s)* ↔ Sr2+*(aq)* + 2 F-*(aq)*

At equilibrium: [Sr2+] = *X* M = [F-] = 2*X* M

KSP = [Sr2+][F-]2 = (*X*)(2*X*)2 = 7.910-10

*X* = 5.810-4 mol/L, solubility of SrF2

(c) Solve for [Sr2+] required for precipitation of each salt.

Ksp = [Sr2+][F-]2 = 7.910-10

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Ksp = [Sr2+][SO42-] = 7.610-7

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Since 2.010-6 M < 7.610-6 M, SrF2 must precipitate first.

When SrF2 precipitates, [Sr2+] = 2.010-6 M

AP #3

(i) HAsa ↔ Asa– + H+

× = 0.133 *M*

pH = –log[H+]; 2.22 = –log[H+]

[H+] = *M* = [Asa–]

[HAsa] = 0.133 *M* – 6.03 × 10-3 *M* = 0.127 *M*

K = = × = 2.85× 10-4

**OR**

when the solution is half-neutralized, pH = p*Ka*

at 10.00 mL, pH = 3.44; K = 10–pH

= 10–3.44 = 3.63×10-4

(ii) 0.025 L × 0.100 mol/L = 2.50 × 10-3 mol OH-

2.50 × 10-3 mol OH- - 2.00 × 10-3 mol neutralized = 5.0 × 10-4 mol OH- remaining in (25 + 15 mL) of solution; [OH-] = 5.0×10-4 mol/0.040 L = 0.0125 M

pH = 14 – pOH = 14 + log[OH-] = 14 – 1.9 = 12.1

AP #4 (2012) answer

1. The pH at the equivalence point is above 7, which indicates that HA is a weak acid.
2. HA(*aq*) + OH(*aq*)  A(*aq*) + H2O(*l*)
3. At the equivalence point, the number of moles of base added equals the number of moles of acid initially present.
   1. \* 0.250 mol NaOH / 1L \* 1 mol HA / 1 mol NaOH =0.0100 mol HA
4. MM = mass of acid/moles acid = 1.22 g/0.01 mol = 122g/mol
5. Ka = [H3O+][A-]/[HA] 6.3x10-5 = (x)(x)/(.02-x) assume x is small

= x2/0.02

X= 3.5x10-3M pH = 2.45

1. HA + OH- → A- + H2O

mol before rxn: 0.0100 0.00750 0.00000

mol after rxn: 0.00250 0.00000 0.00750

[HA] = 0.0025mol/0.0800L = 3.3x10-2M

[A-] = 0.0075mol/0.0800L = 9.38x10-2M

Ka = 6.3x10-5 = x(9.38x10-2+x)/(3.3x10-2-x) assume x is small

X = 2.5x10-5M