Kb and the pH of a Weak Base

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

For the conjugate acid-base pair, HA(aq), A–(aq), we know that  **Ka × Kb = Kw**

For HA(aq) + H2O(l) H3O+(aq) + A–(aq) we know that 

For A–(aq) + H2O(l) HA(aq) + OH–(aq) we know that 

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| --- | --- |
| Consequently |  |
| Therefore |  |

The pOH/pH of a weak base is calculated using its Kb and molar concentration.

1. Calculate the base ionization constant for aqueous:

(a) cyanide ion. (b) ammonia.

(c)\* bicarbonate ion. (d) ethanoate ion.

(e) citrate ion. (f)\* dihydrogen phosphate ion.

(g)\* hydrogen phosphate ion. (h)\* hydrogen sulfite ion.

(i) Compare the Ka and Kb values for each amphiprotic\* species in this question.

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| Species | Ka | Kb | Acid or Basic Solution? |
| HCO3–(aq) |  |  |  |
| H2PO4–(aq) |  |  |  |
| HPO42–(aq) |  |  |  |
| HSO3–(aq) |  |  |  |

2. Calculate the [OH–(aq)], pOH and pH of the following bases:

(a) 0.10 mol/L aqueous cesium cyanide.

(b) 0.10 mol/L ammonia.

(c) 0.50 mol/L aqueous potassium ethanoate.

(d) 0.10 mol/L aqueous lithium citrate.

(e) 1.0 mol/L aqueous sodium hypochlorite.

(f) 0.69 mol/L aqueous hydrazine - Ka of N2H5+(aq) is 7.7 × 10–9.