pH and pKa calculations

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| pH = - log [H3O+]Calculate the pH of 10 mL of 0.015M HNO3 if 20 mL of water is added to it.The concentration of diluted HNO3 is 1/3rd of 0.015 = 0.015/3 = 5 x 10-3pH = - log [5 x 10-3] = 2.30 |
| Kw = 1 x 10-14 = [H3O+] [OH-]Calculate [OH-] of the diluted HNO3 solution[H3O+] is the concentration in mol L-1 of the strong acid[OH-] = 1 x 10-14 = 2.00 x 10-12 mol L-1 5 x 10-3 |

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| Ka = [H3O+] [A-] [HA]pKa = - log KaCalculate the pH of 20 mL of 0.05M ethanoic acid if 20 mL of water is added to it.Ka(CH3COOH) = 1.78 x 10-5 *Ka value describes the extent that the acid will react with water.* *CH3COOH is a weak acid so the Ka value is low, indicating that it is only slightly reactive with water so the Ka value must be used in the calculation*The concentration of diluted ethanoic acid is 1/2 of 0.05 = 0.05/3 = 0.025 mol L-1**CH3COOH + H2O ⇌ CH3COO- + H3O+**Ka = [CH3COO-] [H3O+] [CH3COOH]1.78 x 10-5 = x . x  0.025 √ (1.78 x 10-5) (0.025) = x 6.67 x 10-4 = x (this is the concentration of H3O+)pH = - log (6.67 x 10-4)pH = 3.175**The answer is 3.18** *to 3 sig figs* | Kb = [H3O+] [A-] [HA]Kb = Kw KaCalculate the pH of a 0.55M solution of ammoniaKa (NH4+) = 5.75 x 10-10Kb = Kw =1 x 10-14  = 1.739 x 10-5 Ka  5.75 x 10-10**NH3 + H2O ⇌ NH4+ + OH-**Kb = [NH4+] [OH-] [NH3]1.739 x 10-5 = x . x 0.55√ (1.739 x 10-5) (0.55) = x3.092 x 10-3 = x (this is the concentration of OH-)[H3O+] = 1 x 10-14 3.092 x 10-3[H3O+] = 3.233 x 10-12 pH = - log 3.23 x 10-12  = 11.49**The answer is 11.5** *to 3 sig figs*© <https://www.chemical-minds.com> |

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