ANSWERS: pH calculations using Ka and Kb

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2019** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | CH3COOH + H2O ⇌ CH3COO– + H3O+ | Correct process for determining [CH3COOH]. (*correct substitution into formula)*OROne correct step | Correct [CH3COOH]. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2018** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  |  | Correct process to determine pH. | Correct answer, including significant figures. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2017** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| 1. (i)(ii) | pH = 9.94 p*K*a = 9.24 | One step correct. | Correct answer, with minor error e.g. sig figs | Correct answer, including 3 sig figs |
| **2016** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| (i)(ii) | CH3CH2NH2 + H2O  CH3CH2NH3+ + OH–[H3O+] = √ (*K*a × *K*w ÷ [CH3CH2NH2])[H3O+] = √ (2.51×10-11 × 1.00×10-14 ÷ 0.109)[H3O+] = 1.52×10-12molL-1pH = -log [H3O+] = 11.8 | * Correct equation with equilibrium arrow.
* ONE step correct.
 | Correct answer, with minor error, e.g. sig. fig. or rounding error. | * Correct answer, including significant figures.
 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2015** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  |  [H3O+] = 5.90 × 10–7 mol L–1pH = –log 5.90 × 10–7 = 6.23 | Correct process. | Correct pH |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2014** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | Hydrofluoric acid is a stronger acid/more acidic/dissociates more because it has a smaller p*K*a (larger *K*a) than hypochlorous acid. So HF will therefore have a higher [H3O+]. As [H3O+] increases, the pH decreases, so HF will have a lower pH than HOCl.(pH HF = 2.09, HOCl = 4.27) | Any two correct relationships.  | Complete comparison. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2013** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  |  | Correct process | Correct pH |  |

© <https://www.chemical-minds.com>

NCEA questions and answers reproduced with permission from NZQA