pH, pOH, H3O+, OH- Worksheet

1. What is the pH scale? How does it tell you what solutions are acidic and what are basic?
2. Calculate the pH of solutions having the following ion concentrations at 298 K.
   1. [H+] = 1.0 x 10-2 M
   2. [H+] = 3.0 x 10-6 M
   3. [OH-] = 4.2 x 10-9 M
   4. [OH-] = 2.5 x 10-3 M
3. How do the concentrations of hydrogen ions and hydroxide ions determine whether a solution is acidic, basic, or neutral?
4. If the pOH of a solution is 4.52, calculate the pH, the [H+] and the [OH-].
5. Complete the following table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **pH** | **[H+]** | **pOH** | **[OH–]** | **Acidic, basic, or neutral?** |
| (a) |  | 5.4 x 10–4 |  |  |  |
| (b) |  |  |  | 7.8 x 10-10 |  |
| (c) | 10.75 |  |  |  |  |
| (d) |  |  | 5.00 |  |  |

pH, pOH, H3O+, OH- Worksheet Key

1. What is the pH scale? How does it tell you what solutions are acidic and what are basic?

*The pH scale is a logarithmic scale representing a strength, or “power,” to the concentration of hydrogen ions in a solution. On the scale, a pH of 7 is neutral, while a pH below 7 is acidic, and above 7 basic. The scale is inversely proportional to the concentration of hydrogen ions.*

1. Calculate the pH of solutions having the following ion concentrations at 298 K.
   1. [H+] = 1.0 x 10-2 M

*pH = -log [H+] pH = -log (1.0 x 10-2 M) = 2*

* 1. [H+] = 3.0 x 10-6 M

*pH = (3.0 x 10-6 M) = 5.52*

* 1. [OH-] = 4.2 x 10-9 M

*pOH = -log [OH-] pOH = -log(4.2 x 10-9 M) = 8.37*

*pH + pOH = 14 pH + 8.37 = 14 pH = 5.63*

* 1. [OH-] = 2.5 x 10-3 M

*pOH = -log(2.5 x 10-3 M) pOH = 2.60*

*pH = 11.40*

1. How do the concentrations of hydrogen ions and hydroxide ions determine whether a solution is acidic, basic, or neutral?

*In a solution, the concentration of hydrogen and hydroxide ions may come from an acid, base, or water. The more hydrogen ions that are present, the more acidic a solution is. If more hydroxide ions are present, the solution is basic.*

1. If the pOH of a solution is 4.52, calculate the pH, the [H+] and the [OH-].

pH = 14 – 4.52 = **9.48**

[H+] = 10-pH = **3.3 x 10-10 M**

[OH-] = 10-pOH = **3.0 x 10-5 M**

1. Complete the following table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **pH** | **[H+]** | **pOH** | **[OH–]** | **Acidic, basic, or neutral?** |
| (a) | 3.27 | 5.4 x 10–4 | 10.73 | 1.85 x 10–11 | acidic |
| (b) | 4.89 | 1.3 x 10–5 | 9.11 | 7.8 x 10-10 | acidic |
| (c) | 10.75 | 1.8 x 10-11 | 3.25 | 5.6 x 10–4 | basic |
| (d) | 9.00 | 1.0 x 10–9 | 5.00 | 1.0 x 10–5 | basic |