gridlocks – can you unlock the grid?

pH, H⁺ and pOH values

pH values can be calculated from [H⁺] and conversely [H⁺] can be calculated from pH values using the equations below. But before you dive for your calculator it is worth knowing how reasonably convenient numbers convert so you get a 'feel' for the type of answer you are expecting. Before you answer the gridlocks below fill in the table of pH values – see how many you can do without using the calculator. All pHs here to 1 d.p. ($\log 2 \approx 0.3$ and $\log 5 \approx 0.7$).

$$pH = -\log_{10}[H^+] \qquad [H^+] = 10^{-pH} \qquad pOH = \log_{10}[OH^-] \qquad pOH + pH = 14 = pK_w$$

[H⁺]	pH	pOH	[H₂SO₄]	[Ba(OH)₂]
2	−0.3	14.3	1	N/A
0.5		13.7	0.25	N/A
0.2	0.7			N/A
	4.3	9.7		N/A
1×10^{-7}	7	7	0	0
5×10^{-11}	10.3		N/A	1×10^{-4}
2×10^{-12}	11.7		N/A	
5×10^{-15}	14.3	−0.3	N/A	1

Gridlock 1

Each row, column and 2 x 2 box contains information about the first four [H⁺] listed above. Use your problem solving skills and the answers in the table above to fill in the blank boxes.

[H⁺]		pH	
0.5			
		4.3	
		1	
	13.3		
pOH		[H₂SO₄]	

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Gridlock 2

Each row, column and 2 x 2 box contains the last four [H⁺] listed above.

[H$^+$]		pH	
	1×10^{-7}		14.3
			7
3.7			2.5×10^{-3}
pOH		[Ba(OH)$_2$]	

Gridlock 3

Work out the pH values in this gridlock contains and then solve it.

pH		[H$_2$SO$_4$]	
14.3		0.1	
		0	
		14.3	
	N/A		7
[Ba(OH)$_2$]		pOH	

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pH, H⁺ and pOH values – answers

pH values can be calculated from [H⁺] and conversely [H⁺] can be calculated from pH values using the equations below. But before you dive for your calculator it is worth knowing how reasonably convenient numbers convert so you get a 'feel' for the type of answer you are expecting. Before you answer the gridlocks below fill in the table of pH values – see how many you can do without using the calculator. All pHs here to 1 d.p. (log 2 ≈ 0.3 and log 5 ≈ 0.7).

$$pH = -log_{10}[H^+] \qquad [H^+] = 10^{-pH} \qquad pOH = -log_{10}[OH^-] \qquad pOH + pH = 14 = pK_w$$

[H⁺]	pH	pOH	[H₂SO₄]	[Ba(OH)₂]
2	−0.3	14.3	1	N/A
0.5	0.3	13.7	0.25	N/A
0.2	0.7	13.3	0.1	N/A
5×10^{-5}	4.3	9.7	2.5×10^{-5}	N/A
1×10^{-7}	7	7	0	0
5×10^{-11}	10.3	3.7	N/A	1×10^{-4}
2×10^{-12}	11.7	2.3	N/A	2.5×10^{-3}
5×10^{-15}	14.3	−0.3	N/A	1

Gridlock 1 – answers

Each row, column and 2 x 2 box contains information about the first four [H⁺] listed above. Use your problem solving skills and the answers in the table above to fill in the blank boxes.

[H⁺]		pH	
0.5	5×10^{-5}	0.7	−0.3
0.2	2	4.3	0.3
9.7	13.7	1	0.1
14.3	13.3	0.25	2.5×10^{-5}
pOH		[H₂SO₄]	

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Gridlock 2 – answers

Each row, column and 2 x 2 box contains the last four [H⁺] listed above.

[H⁺]		pH	
2×10^{-12}	1×10^{-7}	10.3	14.3
5×10^{-15}	5×10^{-11}	11.7	7
7	2.3	1	1×10^{-4}
3.7	−0.3	0	2.5×10^{-3}
pOH		$[Ba(OH)_2]$	

Gridlock 3 – answers

Work out the pH values in this gridlock contains and then solve it.

pH		$[H_2SO_4]$	
14.3	7	0.1	1
0.7	−0.3	0	N/A
0	1	14.3	13.3
N/A	N/A	−0.3	7
$[Ba(OH)_2]$		pOH	