

gridlocks – can you unlock the grid?

pH values 1

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 the nice round 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.

	$pH = -\log_{10}[H^+]$	$[H^+] = 10^{-pH}$	
$[H^+]$	pH	$[H^+]$	pH
1	0	1×10^{-7}	
0.1		1×10^{-9}	
1×10^{-3}			12
	5	1×10^{-14}	

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	
	1		5
			0
1			1×10^{-3}
	pH		$[H^+]$

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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^{-9}			
		14	
		1×10^{-7}	
	12		
pH		[H ⁺]	

Gridlock 3

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

[H ⁺]		pH	
1×10^{-4}			10
	13		0.01
pH		[H ⁺]	

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pH values 1 – answers

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$[H^+]$	pH	$[H^+]$	pH
1	0	1×10^{-7}	7
0.1	1	1×10^{-9}	9
1×10^{-3}	3	1×10^{-12}	12
1×10^{-5}	5	1×10^{-14}	14

Gridlock 1 – answers

$[H^+]$		pH	
1×10^{-3}	1	1	5
1×10^{-5}	0.1	3	0
0	3	1×10^{-5}	0.1
1	5	1	1×10^{-3}
pH		$[H^+]$	

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Gridlock 2 – answers

[H ⁺]		pH	
1×10^{-9}	1×10^{-14}	12	7
1×10^{-12}	1×10^{-7}	14	9
14	9	1×10^{-7}	1×10^{-12}
7	12	1×10^{-9}	1×10^{-14}
pH		[H ⁺]	

Gridlock 3 – answers

[H ⁺]		pH	
1×10^{-4}	0.01	13	10
1×10^{-13}	1×10^{-10}	2	4
10	13	1×10^{-4}	0.01
2	4	1×10^{-10}	1×10^{-13}
pH		[H ⁺]	