

>> Diane Jewell: If the hydroxide concentration is 4.0×10^{-4} molar, what is the hydronium ion concentration? And is the solution acidic, basic or is it neutral? So let's write down what we do know. They've given us the hydroxide ion concentration. They said it was 4.0×10^{-4} . What they asked us now is what is the hydronium ion concentration which is your H_3O^+ ; we don't know what that is. How can we find out that information? Well, we have one more piece of information that we can write down. The K_w , the ion product of water is going to be H_3O^+ times the OH^- and that's always going to give you a value of 1.0×10^{-14} . So, we have this and we have this; together, we can solve for the hydronium ion concentration. So, let's go ahead and work that over here. We have K_w equals the 1.0×10^{-14} , which equals hydronium ion times hydroxide ion. If we want to get hydronium ion by itself, we have to get rid of that hydroxide ion by dividing both sides by the OH^- . So now, rearrange, we have the hydronium ion concentration equals 1.0×10^{-14} , divided by hydroxide ion concentration. Okay? Now we can go ahead and plug in our value for how much hydroxide ion we have, which is your 4.0×10^{-4} . Using your scientific calculator, you want to do your division; you'll get that the hydronium ion concentration is 2.5×10^{-11} molar. So, now we have both amounts. We have this concentration, we have this concentration and we want to compare them. So I've written them down, and just looking at the powers, the exponents, we can see that this right here is the larger number. So I wrote in that this one is greater than this one. Well what is this one? This one's the hydroxide, this one is the hydronium ion. And therefore, there's much more hydroxide than hydronium ion, which means the solution will be basic.