>> Diane Jewell: You titrate 25.0 milliliters of acetic acid with 17.5 milliliters of .50 molar magnesium hydroxide. What is the concentration of the acid? Okay first off, we have to write our equation, here's our acetic acid, here's our base, our magnesium hydroxide. Together they'll form water plus a salt, the salt is coming from the magnesium and this here without the hydrogen which is coming off as an acid. So we end up with CH3C00 and magnesium, so here's our salt. Now we have to balance that and remember how to balance it we're looking at the hydrogen, there's one hydrogen, two hydroxides. So that means we have to have a two coefficient here to give us two of the hydrogens plus two of the hydroxides to give us now two waters. So we can go ahead and balance the waters also here. Okay, so this is now a balanced equation, this has already been balanced against that just naturally. We can go ahead and start doing the actual problem. This is a situation where we do not have a one-to-one ratio between our acid and base, which means we're going to have to work this out in the long way. First thing we want to do though is change these volumes from milliliters, we have this one here, we have this one here, we want to change those to liters so it makes them easier to work with. So we've changed 25 milliliters to liters here using 1,000 milliliters as 1 liter, it cancels out. We end up with .0250 liters. We want to retain this zero because there's three significant figures here we want to use all three of them here. The 17.5 milliliters cancels out the milliliters, 17.5 divided by the 1,000 we have .0175 liters here. So now that we've put our volumes into liters we can go ahead and work the problem out. We're starting now with the 17.5 milliliters of the magnesium hydroxide. You might, when you're looking at the numbers you might be confused about where do I start. Usually we have two numbers, we have a number that we're going to start with, and we have a number that gives us a conversion factor, which a molarity always gives us a conversion factor of moles over liters. But in this situation, we have a third number, so you're asking yourself possibly which of those numbers am I starting with. Well look at your conversion factor, the conversion factor has to do with magnesium hydroxide. This needs to be used on volume of magnesium hydroxide, so we need to start with this one right here. So since this one became .0175 liters that's what we're starting with here. Now I've put in these for bases which is your magnesium hydroxide and A for acid simply to make sure I could fit this all in here. So don't get confused and ask yourself where the Bs and As come from. The .10175 milliliters of the base. Now we're going to multiply by the molarity in moles per liter. You can see, oops sorry that's supposed to be a liter, you can see the liters are going to cancel, leaving us with moles of our base. And so we have .10175 times the .50 gives us this number here .00875 moles of our base, which is the magnesium hydroxide okay. Second step now is to look at our moles of base and remember once we find the moles of one thing we can calculate the moles of the other by using our ratio of the coefficients. So we have .00875 moles of our base, now our coefficient says we have two moles of acid for every one mole of base. So here's two moles of acid for every one mole of base. See those one mole, the bases are going to cancel, leaving us with moles of acid. So .00875 times the two will give us .0175 moles of our acid, that's our acetic acid. We're almost there. We might be thinking

okay we're done, we figured out moles of acid. We're not done because we're not being asked what are the moles we're being asked what is the concentration. Concentration is always moles divided by liters. Where are we going to get the liters? Right here, remember we took that 25.0 milliliters and we changed it into liters. Now we can use that to finish our problem. So we have our .0175 moles divided by the .0250 liters gives us our answer of .700 moles per liter or molar acetic acid.