Chem1311Ch4Ep7Transcript

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Hello and welcome to the 7th episode of Reactions in Aqueous Solutions.

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Previously in reactions in aqueous solutions.

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We learned to recognize five types of redox reactions.

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We practiced assigning oxidation states.

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And we learned to predict.

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Whether a single displacement reaction will take place or not.

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In today's episode we will learn to use the molarity and dilution formulas to calculate masses and volumes.

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The concentration of a solution is the amount of solute present in a given quantity of solution.

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One of the most popular ways to measure concentration is molarity.

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Molarity is defined as the moles of solute per liter of solution.

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It is popular because it's easy.

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But it is not the only way to measure concentration.

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For other ways to do that.

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Sign up for Gen Chem 2.

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If you are given a molarity in a stochiometric problem.

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You will use this formula to solve for.

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n, the number of moles.

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Like this.

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When preparing a solution of a known molarity, volumetric flasks are often used.

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Because they are more accurate than graduated cylinders.

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Full disclosure, you would never place a solid directly in a flask as shown in this illustration.

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You would first dissolve it in a small amount of solvent and you also would not try to shake the flask as you will snap the neck like your Chuck Norris.

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This is a typical solution making scenario.

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You know how much solution and what percentage you want, and you're asked.

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To solve for the mass of solute.

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Starting with a molarity formula.

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You will rearrange it to solve for moles.

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You will substitute in the given values but pay attention to the units.

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Milliliters will not cancel liters.

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So you must convert the volume to liters.

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Then you can carry out the calculation.

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And once you know the number of moles.

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You can use it as the given quantity.

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This problem is about potassium chromate.

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The ask is grams.

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So you will use the molar mass from the periodic table.

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And the given has units of moles.

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So next you place the given quantity in the 1st frame.

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And the conversion factor in the 2nd frame.

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So that the unit of moles or potassium chromate cancels.

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And the final answer is 159 grams of potassium chromate.

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That's how much you will need.

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Here's a second stochiometric problem.

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They ask for milliliters of glucose, so we will need to solve for volume.

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Starting with a molarity formula.

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We first multiply both sides of the equation by the volume so that volume cancels on the right.

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Resulting in this equation.

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Next, we divide both sides by the molarity.

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So that it cancels on the left.

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Leaving us with this equation.

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This is the finished formula we will be using.

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To get the volume we only need the molarity.

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Which we were given.

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And the number of moles which we will need to calculate.

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So, moles is the ask.

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And grams of glucose is the given quantity.

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Here's glucose.

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S,o we can work out our conversion factor.

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We place the given quantity in the 1st frame.

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And the conversion factor in the 2nd frame.

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Making sure that grams of glucose cancels.

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Give giving us an answer of 0.0212 moles.

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To get the volume, we divide the number of moles by the molarity.

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And that gives us 0.00836 liters.

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But a final check reveals.

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That the problem specifically requested milliliters.

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So we convert.

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I hate it when the problem gets picky.

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[mockingly] “May I have microliters please?”

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Making a solution from scratch is not always very convenient.

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In some cases, having a concentrated solution that can be diluted down to a desired concentration is a better idea.

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In a dilution.

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Solvent is simply added to the stock solution to achieve the desired concentration.

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The key thing to keep in mind is that the number of moles of solute is unchanged.

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You're really adding more solvent.

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That will result in the dilution formula.

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How is this possible?

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I'll show you.

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As just stated, the number of moles of solute “n”.

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Remains unchanged.

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Before and after the dilution.

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The molarity formula applies to both of these solutions.

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Both formulas can be solved for the unchanging number of moles n.

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Because both expressions are equal to n.

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They must be equal to each other.

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And that's how the dilution formula came about.

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When applying the dilution formula, the number of variables has the potential to become migraine inducing.

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But fear not.

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A few highlighters.

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Can keep you from becoming another statistic.

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All you have to do is identify one variable at a time before you start to solve.

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This variable has units of volume, so it is going to be either initial volume or final volume.

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From the context we are preparing.

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We are preparing the solution, so it must be the final volume.

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Next, this variable has units of moles per liter.

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That's what the capital M stands for.

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And it is part of the description for the solution we are making.

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So it must be the final molarity.

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The last variable has units of moles per liter.

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And it is referred to as a stock solution.

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So that's pretty much hint enough, that screams initial molarity.

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And so, it turns out we need to find the initial volume.

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So we divide both sides of the equation by the initial molarity.

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To solve for the initial volume.

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And this is what we get.

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Now we substitute in the color-coded values we were given.

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Making sure that units of moles per liter cancel.

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And the answer is 102 milliliters.

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So we will take 102 milliliters and add enough water.

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To dilute it down to 500.

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Here we have a few questions that by now we should be able to classify.

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This one is a decomposition reaction, but it's not a redox.

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Heck, it's not even in solution.

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Who put this reaction in the list?

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This one is not one of the eight reactions we learned.

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Ah, this is a net Ionic equation of a precipitation reaction.

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Don't be fooled into thinking combo, it's not a combo.

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This is a molecular equation of a neutralization reaction.

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And this is the only redox of the bunch.

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And a decomposition reaction.

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And that's all there is.

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There isn't any more.