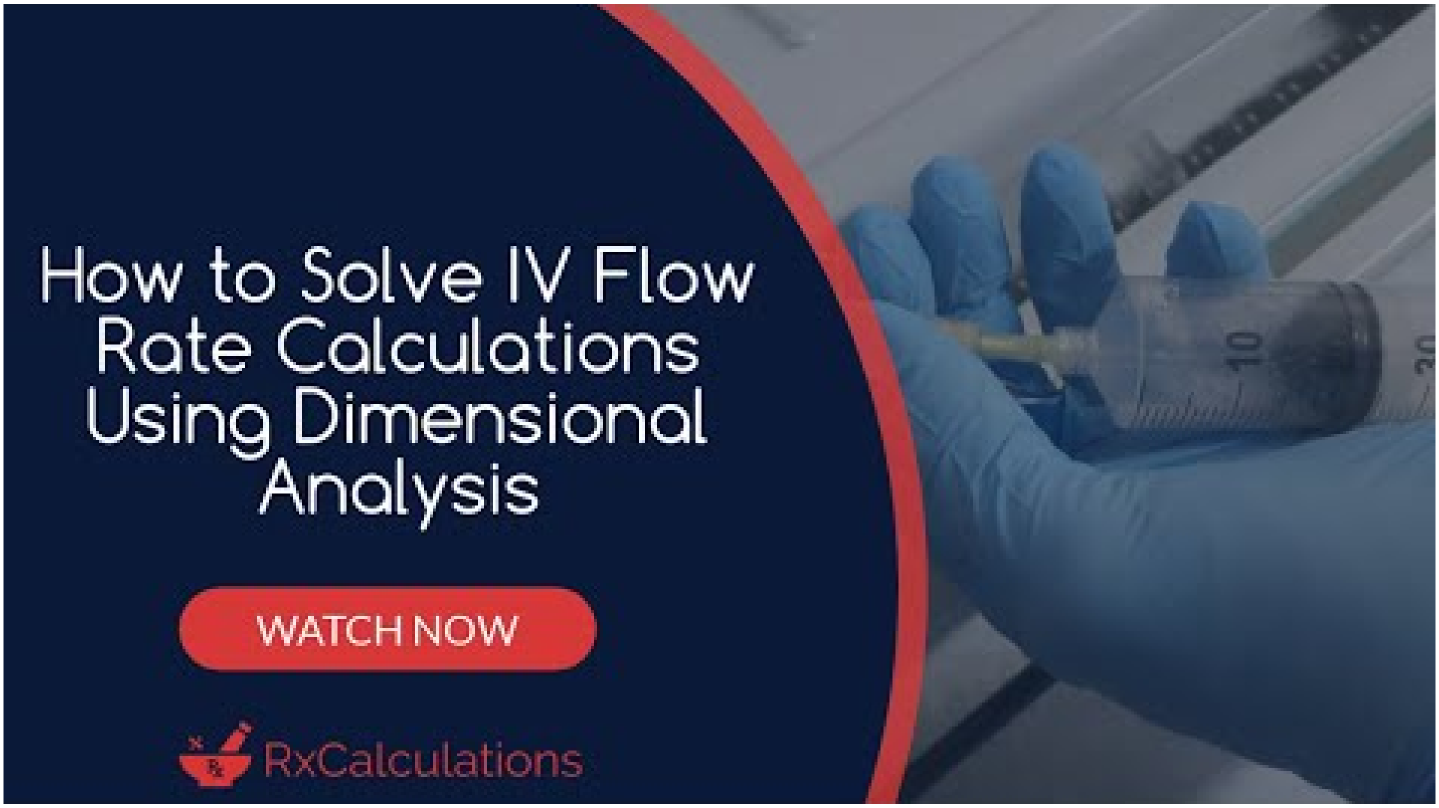
IV Flow Rate Calculations Using Dimensional Analysis

RxCalculations

Dimensional analysis is a powerful way of solving IV flow rate calculations and it is the method I recommend when I teach the topic to students.

In this blog post, I show you how to quickly solve two NAPLEX type IV flow rate calculations questions using dimensional analysis. I also demonstrate how to properly analyze iv flow rate calculations questions so you can solve them accurately and expeditiously.

Watch the Video



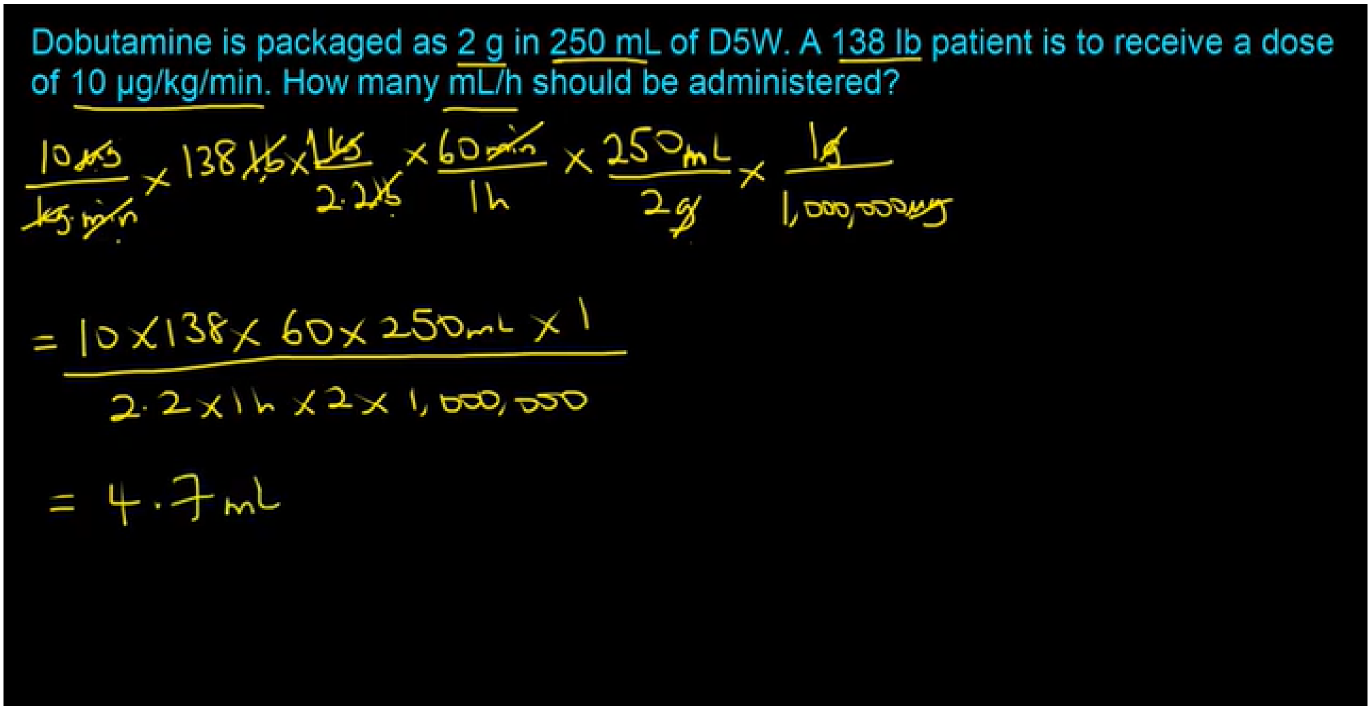
I'm going to show you how to solve two interesting IV flow rate calculation questions using dimensional analysis. And we are starting right now.

Hello, this is Dr. Danquah. I already did a video on IV flow rate calculations. So if you need a thorough review, just check the video I'll put a link in the description and a card should be showing up pretty soon.

But in this video, we are going to take a look at two interesting IV flow rate calculation questions.

And the first one says dobutamine is packaged as 2 g in 250 milliliters of D5W. A 138 lb patient is to receive a dose of 10 micrograms per kg per minute, how many mL/h should be administered?

Example 1



So let's start by really analyzing this question. So our target is to determine the flow rate in milliliters per hour. And we've been given some kind of a rate, you know, it's 10 micrograms per kg per minute, we have the volume that is being infused, which is 250 milliliters. And we know the amount of the dobutamine in the 250 milliliter bag, that is two grams, and we have the patient's weight.

The first question that I normally get is, do we need all the information in the question? Yes, in this particular example, we will need to use all the information or the numbers that have been provided. But let's see how that works.

So the real strategy will be to start off with the 10 micrograms per kilogram minute, and this kilogram is basically a normalized dose with respect to the patient's weight.

So we can start off by taking care of the kilograms in the denominator by using the weight so we know notice from the question that the patient is 138 pounds, but the pounds can't get rid of the kilograms it cannot, right, so we need to convert this pounds to kilograms.

We take the conversion that 2.2 pounds is one kilogram and so now we can cancel the pounds.

The way it works is, for dimension analysis, you need to have the unit in the numerator and the same in the denominator, so the pounds can cancel out and the kilograms can also cancel out.

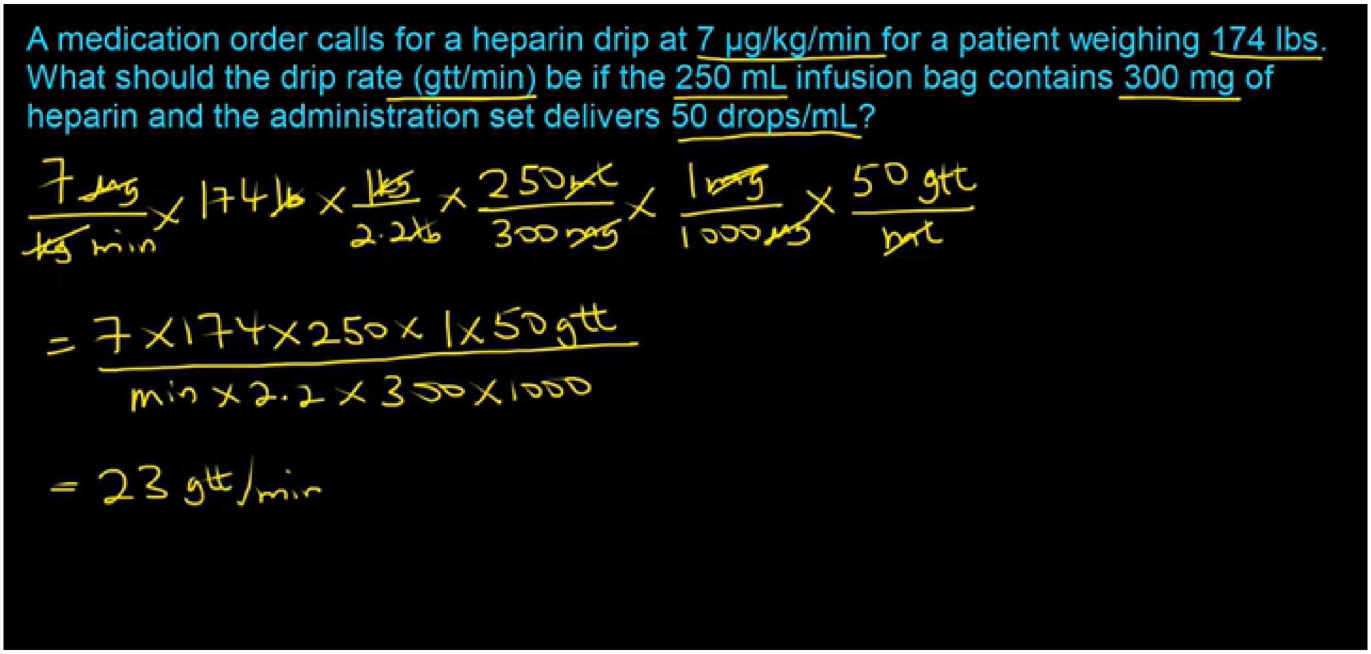
So as it stands now, you are in micrograms per minute, but we want to end up in milliliters per hour. So one of the things that we could do is we could convert the minutes to hours, and so we'll have 60 minutes is what you would need to make an hour. Okay, so now the minutes can cancel out and we are in micrograms per hour.

So we need the volume term in the numerator, and that's where the 250 milliliters becomes pertinent. So you have 250 milliliters, and in that 250 milliliters you have two grams. So we need to get rid of the micrograms but the micrograms and the grams they are not consistent in terms of the units, so we need to convert the grams to micrograms.

So we'll say one gram. In one gram, we have 1 million micrograms, so now the micrograms can cancel out. And then grams can also cancel out. And so our units is now milliliters per hour. The next step then would be to take all the numbers in the numerator, so you have 10 times 138 times 60 times 250 milliliters times one, and we divide that by everything in the denominator. So we have 2.2 times one hour times two times a million. And when we do the math, that will end up giving us 4.7 milliliters per hour.

Example 2

So now let's take a look at the second question. And the question says a medication order calls for a heparin drip at 7 microgram per kg per minute for a patient weighing 174 lbs. What should the drip rate (gtt/min) be if the 250 mL infusion bag contains 300 mg of heparin and the administration set delivers 50 drops/mL?



So let's start off once again by analyzing the question. Our goal is to determine the flow rate and the flow rate is in drops per minute.

What we've been given a some kind of a mass rate, which is the seven micrograms per kg per minute, we have the patient weight 174 pounds, we have the volume of the bag that is being infused, and we also have the amount of drug or amount of heparin, that would be in a 250 milliliter bag. We've also been given the drop factor or the calibration factor.

Now for this question, we will need all those values or all that information. And the way we want to set this up is to start off with the mass rate.

So we have seven micrograms per kilogram minute and the goal is to get to drops per minute okay, so we need to get rid of the kilogram in the denominator, and that's based on the weight of the patient.

We take the weight of the patient, in the question it is 174 pounds, the pounds cannot cancel the kilograms. So we need to convert the pounds to kilograms. So 2.2 pounds makes one kilogram and so the pounds cancel out and the kilogram cancels out.

We are now in micrograms per minute, but we need to be in drops per minute. So the next thing that we can really do is we can take the volume of the bag which is 250 milliliters, and from the question we understand that this 250 milliliters contains 300 milligrams of heparin.

Now we have a mass quantity in the denominator which is in milligrams and we have the mass quantity, in the numerator here which is in micrograms, so we need to make sure those units are consistent before they can cancel out. And so we will convert the milligrams to micrograms. One milligram is basically a 1000 microgram, so the milligrams cancel out, and the micrograms can also cancel out.

And so if you notice we are now in milliliters per minute, but we need to be in drops per minute. That's where the calibration factor becomes ultra important. And so we'll take the 50 drops, so let's just say gtt in one milliliter, so now the milliliter can cancel out and now we are in drops per minute.

So at this point, we'll take all the numbers in the numerator, so we'll do seven times 174 times 250 times one times 50 drops, we will divide that by everything that denominator okay, so we have basically the minute times 2.2 times the 300 times a 1000 and if we do the math correctly, we'll end up with 23 drops per minute.

So if this video really helped you just hit the like button. And if you want to receive more videos like this or get notified when I release new videos, just click the subscribe button and the notification bill.

Do you have any questions or strategies on how to solve IV flow rate calculations using dimensional analysis? Share them in the comments box below.

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