



Equivalences and Conversions

Study Development Worksheet

Example

A patient is prescribed 4000 micrograms of a drug. The concentration of the drug in liquid form is 2mg/ml. What volume of the drug in liquid form should the patient take?

Answer

We look for the important information first. This question requires the formula for calculating a liquid dose, which is as follows:

$$\text{Liquid dose (ml)} = \frac{\text{dose prescribed (mg)}}{\text{dose in stock (mg)}} \times \text{stock volume (ml)}$$

We have the dose in stock (2mg) and the stock volume (1ml). We are given a dose prescription of 4000 micrograms, but the formula requires it to be in mg.

We know that 1mg = 1000 micrograms (you can look these up if you're not sure you know the right equivalence), so, in order to convert from micrograms into mg, we must divide the mass in micrograms by 1000.

$$\text{Mass in mg} = \frac{\text{mass in micrograms}}{1000} = \frac{4000 \text{ micrograms}}{1000} = 4\text{mg.}$$

We now have the correct units for the dose prescribed, so we can proceed with the liquid dose calculation:

$$\text{Liquid dose (ml)} = \frac{\text{dose prescribed (mg)}}{\text{dose in stock (mg)}} \times \text{stock volume (ml)} = \frac{4 \text{ mg}}{2 \text{ mg}} \times 1\text{ml} = 2\text{ml.}$$

Note: if you haven't come across liquid dosage calculations yet, don't worry! The point of this question is that you are able to convert between micrograms and mg. You can come back to it later when you have studied liquid dosages.



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Questions

1. Convert 25.4mm into micrometres.
2. Convert 3.65kg into mg.
3. A patient has given their weight as 235lbs. In order to calculate their drug dosage, their weight must be measured in kg. What is the patient's weight in kg?
4. A drug is given in a concentration of 2500micrograms/3ml. What is the concentration of the drug when it is measured in mg/3ml?
5. A patient usually takes 2tbsp of a liquid pain medication orally. Your syringe only has measures in ml. How many ml of the pain medication should you give the patient?
6. Convert 6.5oz into metric mass units.
7. Convert 3mg/ml into micrograms/L.



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Answers

1. 1mm = 1000 micrometres. Therefore, we must multiply the length in mm by 1000 to get the length in micrometres:

$$25.4 \times 1000 \text{ micrometres} = 25400 \text{ micrometres.}$$

2. There are two ways to tackle this. If you prefer to only do one calculation, you can convert directly from kg to mg. If you prefer to take more steps, and only use conversions shown in the conversion table, you can convert from kg to g, and then from g to mg.

Direct conversion: $1\text{kg} = 1,000\text{g} = 1,000,000\text{mg}$. Therefore, we must multiply the amount in kg by 1,000,000:

$$3.65 \times 1,000,000 = 3,650,000\text{mg.}$$

Two step conversion: $1\text{kg} = 1,000\text{g}$. We multiply 3.65 by 1,000 to get the amount in grams:

$$3.65 \times 1,000\text{g} = 3,650\text{g.}$$

$1\text{g} = 1,000\text{mg}$. We multiply 3,650 by 1,000 to get the amount in mg:

$$3,650 \times 1,000\text{mg} = 3,650,000\text{mg.}$$

3. From the conversions table, we know that in order to get the patient's weight in kg we must multiply their weight in lbs by 0.454.

$$\text{Weight in kg} = \text{weight in lbs} \times 0.454 = 235 \times 0.454 = 106.69\text{kg.}$$

4. This can seem confusing because of the unfamiliar units, but this question is really asking you to isolate the mass and only convert that. We know that 1000 micrograms = 1mg, so we divide the mass in micrograms by 1000.

$$\text{Mass in mg} = \frac{\text{mass in micrograms}}{1000} = \frac{2500 \text{ micrograms}}{1000} = 2.5\text{mg.}$$

Therefore, the concentration is 2.5mg/3ml.

5. 1tbsp = 15ml.

$$2 \times 15\text{ml} = 30\text{ml.}$$

The patient needs 30ml of pain medication.

6. The metric units of mass are grams, mg, micrograms and kg. 1oz = 30g (approximately).

$$6.5 \times 30\text{g} = 195\text{g.}$$



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7. This is a two-step conversion. We will convert the mass first:

$$1\text{mg} = 1000\text{micrograms}$$

$$3\text{mg} = 3000\text{micrograms}$$

So, the concentration is 3000 micrograms/ml. If we want to know this per litre, we need to multiply by 1000, since there are 1000ml in 1L.

$$3000 \times 1000 = 3,000,000 \text{ micrograms/L.}$$

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