

BASIC MEDICATION CALCULATIONS



SELF-DIRECTED INSTRUCTIONAL HANDBOOK

CREATED BY:

L. KELLY KIRK, III, AAS, BS, PARAMEDIC

PRESIDENT/CEO 911 E-LEARNING SOLUTIONS, LLC

INSTRUCTIONAL PACKAGE

Introduction:

This lesson is designed to help you learn the basics of drug calculations.

Objective 1:

At the end of this lesson you will be able to accurately convert within the metric system between kilograms, grams, milligrams, and micrograms.

Objective 2:

At the end of this lesson the learner will be able to accurately convert patient weight from pounds into Kilograms.

Objective 3:

At the end of this lesson the learner given a medication mixed into a solution, will be able to determine the proper medication concentration.

Instructions:

To complete this packet you should read through the material.

Whenever you see this icon:



Your Turn to Practice

You will be given the opportunity to practice that which you just learned. Try to complete each problem without looking up the answers. Once you have completed the problem, you should check your answers with the "Answer Key" provided at the end of the packet. You will also find some additional resources for you to review and study further by going to the internet. Once you feel comfortable with the topics, you can proceed to the final quiz.

Success:

Successful completion of this packet will be awarded when the packet has been turned in to your Training Officer and you have scored a minimum of 70% on the Final Quiz.

Lesson 1: Basic Conversions

Objective 1:

At the end of this lesson you will be able to accurately convert within the metric system between kilograms, grams, milligrams, and micrograms.

Introduction:

You have just received orders to administer an extremely toxic medication to your critically ill patient. This medication is so toxic that the dosing is given in milligrams per microgram of weight. Your patient weighs 356 kilograms. How many micrograms does he weigh?

Tough scenario right? We don't often have to convert from kilograms into micrograms. This is one of the easier conversions however.

Let's review the units of measurement from largest to smallest:

- ◆ Kilograms (kg) **LARGER UNITS**
- ◆ Grams (g)
- ◆ Milligrams (mg)
- ◆ Micrograms (mcg) **SMALLER UNITS**

Each unit is 1000 times smaller than the next. So for example, 1 kg is 1000g and 1g is 1000mg. In order to convert one to the other you simply put the original number in its location and move your decimal three (3) places to the RIGHT for each space you move if you are going from Larger units to Smaller units or three (3) places to the LEFT for each space you move if you are going from smaller units to larger units.

Look at the example below:

- ◆ 1 Kilogram
- ◆ 1000 Grams
- ◆ 1000000 Milligrams
- ◆ 1000000000 Micrograms

So now lets go back to our original scenario and determine how many micrograms are in 356 kilos.

- ◆ 356kg
- ◆ 356000g
- ◆ 356000000mg
- ◆ 356000000000mcg

So you now know that there are 356 million micrograms in 356 kilograms! As you will see, moving items within the metric system is one of the more simple conversions compared to household measures and converting within other systems.

Objective 2:

In the USA we commonly use pounds (lbs) to measure weight while most other countries use the metric system and weigh in kilograms (kg). Now of course moving from pound to kilograms or kilograms to pounds is not as easy as converting within the metric system. Instead, you have to use a little more math, but overall, it is still very simple math. The only thing you need to be aware of is the constant (2.2). There are 2.2 pounds in every kilogram. Therefore $1\text{kg} = 2.2\text{lbs}$. Fortunately for us, we normally only convert from pounds to kilograms and seldom ever the other way around.

The Formula:

Kilograms equals the weight in pounds divided by 2.2

$$kg = lbs / 2.2$$

Therefore a 220lb man weighs exactly 100kg

$$220/2.2 = 100$$

To convert from kilograms to pounds, you simply multiply the weight in kilograms by 2.2

$$lbs = kg * 2.2$$

Therefore a 70kg woman would weigh 154lbs

$$70 * 2.2 = 154$$

When you are performing your calculations, it is EXTREMELY IMPORTANT that you pay attention to what unit of measure (lbs/kg/mg/g) you are working with and what unit your order is in. Generally the order is in kg but don't assume that! ASSUMPTIONS will cost someone their job and possibly a life!



Your Turn to Practice

Order:	Answer: Answers are provided in the "Answer Key" in the back of this manual.
1. Weight: 150lbs Conversion: lbs to kg	
2. Weight: 130lbs Conversion: lbs to kg	
3. Weight: 25kg Conversion: kg to lbs	
4. Weight: 98kg Conversion: kg to lbs	
5. Weight: 130lbs Conversion: lbs to mg	
6. Weight: 1800g Conversion: g to kg	
7. Weight: 2500mg Conversion: mg to g	

Review and Remediate:

After completing all of the above problems, flip to the answer key in the back of this training manual to compare your answers. Here you will find the answers to the questions with detailed rationale as to why the answers are what they are.

More Help:

You can go online for more practice and remediation at the following sites:

<http://www.screencast.com/t/DuOls2rG9Of>

<http://youtu.be/ScvuRb6vsz4>

<http://mathcasts.org/ev/nursing/muc/length-a-muc.htm>

<http://mathcasts.org/ev/nursing/muc/length-b-muc.htm>

Objective 3:

At the end of this lesson you will be able to determine the proper medication concentration in an IV solution.

Introduction: You are treating a 48 year old male with chest pain and polymorphic PVCs over 12 a minute. After giving him a 150mg bolus of Lidocaine, you are ordered to hang a drip. After you mixed 20% Lidocaine into 250cc of D5W, what is your concentration of Lidocaine?

Now we are getting to the tougher stuff, wouldn't you say? Never fear, you took that last lesson so well, this one will be a breeze for you! To complete this problem you simply need to take it step by step until you get to the final answer.

In order to determine the concentration of a solution (how much medication is in each ml) you must know two values.

- ◆ How much medication is in the entire amount(ml) of solution.
- ◆ How much solution (ml) do you have on hand.

With this first problem you have 250 cc of fluid (D5W) and 2g (20%) of Lidocaine on hand. Now all we need is the proper formula and we are set!

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The Formula:

NOTE of Interest: Pay close attention to what the order is given in, most of the time the order is given in a smaller unit of measure than the concentration you have on hand.

For example: Lidocaine ordered in mg and is on hand in grams

This means you have to CONVERT your units of measure before you start working your problems otherwise you will come up with the wrong answer!

So in this instance we have 2g of Lidocaine and have to convert that into mg. As we learned earlier, 2g of Lidocaine is 2000mg of Lidocaine.

To determine the concentration of a medication you must use the formula:
Medication divided by fluid on hand

M (Medication)

F (Fluid on hand)

Now it is simply knowing where the numbers go and then working the problem.

The Fluid (F) is 1 on hand is 250cc of D5W

The Medication (M) on hand is 2 grams of Lidocaine (remember...the order is in mg)

2g/250ml

convert the grams to mg:

2000mg / 250 ml

Now work the problem:

8mg/ml



Your Turn to Practice

Order:	Answer: Answers are provided in the "Answer Key" in the back of this manual.
8. Medication: 2g of Lidocaine Volume of Fluid: 500ml Order is in: mg	
9. Medication: 800mg of Dopamine Volume of Fluid: 500ml Order is in: mcg	
10. Medication: 400mg of Dopamine Volume of Fluid: 250ml Order is in: mcg	
11. Medication: 2g of Lidocaine Volume of Fluid: 1000ml Order is in: mg	
12. Medication: 5g of Bretylium Volume of Fluid: 500ml Order is in: mg	
13. Medication: 1600mcg Dopamine Volume of Fluid: 1000ml Order is in: mcg	
14. Medication: 2mg of Lidocaine Volume of Fluid: 250ml Order is in: mg	

Review & Remediation:

After completing all of the above problems, flip to the answer key in the back of this training manual to compare your answers. Here you will find the answers to the questions with detailed rationale as to why the answers are what they are.

More Help:

You can go online for more practice and remediation at the following sites:

http://www.davesems.com/files/drug_dose_calculations.pdf

<http://www.gaems.net/download/drugcalc.pdf>

<http://youtu.be/pYzhj2TinXs>

<http://youtu.be/Afreski0vDs>

After you have prepared yourself, you will be ready to take the final quiz below.
Complete the quiz without using any notes or additional support.

Assessment:

Instructions: Complete each order below writing your final answer in the Answer" column on the right. Be sure to include the proper unit of measure. If the unit of measure is not correct or not included, the answer will be marked wrong.

Final Quiz:

Order:	Answer:
1. Weight: 110lbs Conversion: lbs to kg	
2. Weight: 160lbs Conversion: lbs to kg	
3. Weight: 205kg Conversion: kg to lbs	
4. Weight: 97kg Conversion: kg to lbs	
5. Weight: 13lbs Conversion: lbs to mg	
6. Weight: 180g Conversion: g to kg	
7. Weight: 200mg Conversion: mg to g	
8. Weight: 8750g Conversion: g to mg	
9. Weight: 85mg Conversion: mg to g	
10. Weight: 125lbs Conversion: lbs to mg	
11. Medication: 2g of Lidocaine Volume of Fluid: 1000ml Order is in: mg	
12. Medication: 5g of Bretylium Volume of Fluid: 500ml Order is in: mg	
13. Medication: 1600mcg Dopamine Volume of Fluid: 1000ml Order is in: mcg	
14. Medication: 2mg of Lidocaine Volume of Fluid: 250ml Order is in: mg	

Answer Key

Answers to practice problems 1-14

Order:	Answer:
1. Weight: 150lbs Conversion: lbs to kg	$150 / 2.2 = \mathbf{68.2kg}$
2. Weight: 130lbs Conversion: lbs to kg	$130 / 2.2 = \mathbf{59.1kg}$
3. Weight: 25kg Conversion: kg to lbs	$25 * 2.2 = 55lbs$
4. Weight: 98kg Conversion: kg to lbs	$98 * 2.2 = 216$
5. Weight: 130lbs Conversion: lbs to mg	$130 / 2.2 = 59.1 \text{ kg}$ LOOK at the order...you need to convert to mg. 59.1kg is 59100g or 59100000mg 59100g is 59100000mg Final Answer: 59,100,000 mg
6. Weight: 1800g Conversion: g to kg	1800 g is 1.8kg (Move decimal 3x to left)
7. Weight: 2500mg Conversion: mg to g	2500mg is 2.5g (move decimal 3x to right)
8. Medication: 2g of Lidocaine Volume of Fluid: 500ml Order is in: mg	$2000mg / 500ml$ (Converting to mg) 4mg/ml
9. Medication: 800mg of Dopamine Volume of Fluid: 500ml Order is in: mcg	$800000mcg / 500ml$ 1600mcg/ml
10. Medication: 400mg of Dopamine Volume of Fluid: 250ml Order is in: mcg	$400000mcg / 250ml$ 1600mcg/ml
11. Medication: 2g of Lidocaine Volume of Fluid: 1000ml Order is in: mg	$2000mg / 1000ml$ 2mg/ml
12. Medication: 5g of Bretylium Volume of Fluid: 500ml Order is in: mg	$5000mg / 500ml$ 10mg / ml
13. Medication: 1600mcg Dopamine Volume of Fluid: 1000ml Order is in: mcg	$1600mcg / 1000$ NOTICE: Order is in mcg and concentration is in mcg therefore there is no need to convert the medication. 1.6mcg/ml
14. Medication: 2mg of Lidocaine Volume of Fluid: 250ml Order is in: mg	$2mg / 250ml$ Same here...no need to convert! 0.008mg/ml