

## Calculation Review

### Dimensional Analysis

- Rule 1:** Multiplying one side of an equation by a conversion factor will not change the value of an equation.
- Rule 2:** Set up the problem so that all labels (units) cancel from the numerator and denominator, except the label desired in the answer.
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### Calculating ml / hr

50 mg of Nitroglycerin in D5W has been prescribed for IV infusion at a rate of 15 mcg/min. The IV solution has a total volume of 500 ml. The IV should be infused at how many ml per hour?

You should memorize conversion factors, such as:

$$1g = 1,000 mg = 1,000,000 mcg$$

**What do we have?**

$$\frac{15 \text{ mcg}}{1 \text{ min}}, \quad \frac{500 \text{ ml}}{50 \text{ mg}}$$

**What do we need?**

$$\frac{\text{ml}}{\text{hr}}$$

**Multiply across:**

$$\frac{15 \text{ mcg}}{1 \text{ min}} \times \frac{1,000 \text{ mg}}{1,000,000 \text{ mcg}} \times \frac{500 \text{ ml}}{50 \text{ mg}} \times \frac{60 \text{ min}}{1 \text{ hr}}$$

$$\frac{15 \text{ mcg}}{1 \text{ min}} \times \frac{1,000 \text{ mg}}{1,000,000 \text{ mcg}} \times \frac{500 \text{ ml}}{50 \text{ mg}} \times \frac{60 \text{ min}}{1 \text{ hr}} = \frac{450,000,000 \text{ ml}}{50,000,000 \text{ hr}}$$

$$\text{Answer:} = \frac{9 \text{ ml}}{1 \text{ hr}} = \boxed{9 \text{ ml / hr}}$$

**Or you could reduce the fractions before you multiply:**

$$\frac{15 \text{ mcg}}{1 \text{ min}} \times \frac{1,000 \text{ mg}}{1,000,000 \text{ mcg}} \times \frac{500 \text{ ml}}{50 \text{ mg}} \times \frac{60 \text{ min}}{1 \text{ hr}} = \frac{450 \text{ ml}}{50 \text{ hr}}$$

$$\text{Answer:} = \frac{9 \text{ ml}}{1 \text{ hr}} = \boxed{9 \text{ ml / hr}}$$

## Calculating IV Drip Rate

The physician's order states: 1,000 ml LRS to infuse over 8 hours. The administration set delivers 15 drops per milliliter. What should the drip rate be?

What do we have?

$$\frac{1,000 \text{ ml}}{8 \text{ hr}}, \quad \frac{15 \text{ gtts}}{1 \text{ ml}}$$

What do we need?

$$\frac{\text{gtts}}{\text{min}}$$

Multiply across:

$$\frac{1,000 \text{ ml}}{8 \text{ hr}} \times \frac{15 \text{ gtts}}{1 \text{ ml}} \times \frac{1 \text{ hr}}{60 \text{ min}}$$

$$\frac{1,000 \text{ ml}}{8 \text{ hr}} \times \frac{15 \text{ gtts}}{1 \text{ ml}} \times \frac{1 \text{ hr}}{60 \text{ min}} = \frac{15,000 \text{ gtts}}{480 \text{ min}}$$

$$\text{Answer:} \quad = \quad 31.25 \text{ gtts / min} \quad = \quad \boxed{31 \text{ gtts / min}}$$

## Calculating Medication Dosages

The doctor orders 75 mg of Meperidine every 3 hours prn. The pharmacy has 100 mg in 1 ml. How much medication will you draw up in the syringe?

There are actually three methods for solving problems like this. You can use *dimensional analysis*, as above, or you can use *proportions*. We recommend *dimensional analysis*

### Method 1: Dimensional Analysis

What do we have?  $75 \text{ mg}, \frac{1 \text{ ml}}{100 \text{ mg}}$

What do we need?  $\text{mL}$

Multiply across:

$$\frac{75 \text{ mg}}{1} \times \frac{1 \text{ ml}}{100 \text{ mg}} = \frac{75 \text{ ml}}{100}$$

Answer: 0.75 mL

### Method 2: Proportions

$$\frac{75 \text{ mg}}{100 \text{ mg}} = \frac{x \text{ mL}}{1}$$

Cross multiply:

$$\begin{aligned} (100)(x) &= (75)(1) \\ 100x &= 75 \\ x &= \frac{75}{100} = 0.75 \text{ mL} \end{aligned}$$

### Method 3: Equation

$$\frac{\text{dose ordered (desired)}}{\text{dose on hand (have)}} \times \text{amount available (quantity)} = \text{amount to give}$$

$$\frac{75 \text{ mg}}{100 \text{ mg}} \times 1 \text{ ml} = \frac{75 \text{ ml}}{100}$$

Answer = 0.75 mL