

Ratio Strength

- Very occasionally, drug strengths are expressed as ratio strengths.
- These calculations have similarities to percent strength calculations.
 - The units are always g and mL.
 - Solutions may be w/w, w/v, v/v, or v/w.
- The conventional format is 1:another number, where the other number is the amount of final product. Examples: 1:100, 1:500, 1:10,000.
 - A 1:100 w/w preparation is 1 g active ingredient in 100 g of final product.
It is not 1 g of active ingredient mixed with 100 g of inactive ingredient.
 - A 1:100 w/v solution is 1 g active ingredient in 100 mL solution.
 - A 1:100 v/v solution is 1 mL of active ingredient in 100 mL solution.
 - A 1:100 v/w solution is 1 mL of active ingredient in 100 g of product.
- Keys to performing calculations involving ratio strengths.
 - Determine the type of solution (w/w, w/v, v/v, v/w).
 - Assign the units of g to w and mL to v.
 - Convert from the colon format into the fraction format with the units attached.
Example: 1:1000 w/v becomes 1 g/1000 mL.
 - Proceed with calculations using DA or RP.

Example: How many mg of epinephrine are in 45 mL of a 1:10,000 solution of epinephrine?

- This is a **w** (mg) of epinephrine in **v** (45 mL) solution.
- 1:10,000 w/v is 1 g:10,000 mL
- 1 g:10,000 mL converted to fraction format is $\left(\frac{1 \text{ g}}{10,000 \text{ mL}}\right)$.
- Proceed with calculations using DA.

$$45 \text{ mL} \left(\frac{1 \text{ g}}{10,000 \text{ mL}} \right) \left(\frac{1000 \text{ mg}}{\text{g}} \right) = 4.5 \text{ mg}$$

Important: Many fatalities have resulted from incorrect calculations involving ratio strength, with epinephrine being one of the most common drugs involved. Be very careful when performing ratio strength calculations. Most drugs labeled with ratio strength will include the strength listed in mg/mL, which is safer to use.

Ratio Strength Exercise

- 1) How many grams of active ingredient are in 500 mL of a 1:10,000 solution?
- 2) How many grams of active ingredient are in 40 mL of a 1:200 solution?
- 3) How many grams of active ingredient are in 600 g of a 1:25 w/w preparation?
- 4) How many mg of active ingredient are in 800 mL of a 1:10,000 solution?
- 5) How many mcg are in 10 mL of a 1:100,000 solution?
- 6) You have a 10 mL vial which is labeled 1:10,000 and are asked to draw up 0.4 mg of drug. How many mL would you draw?
- 7) You are asked to make 200 g of a 1:100 HC ointment preparation. How many grams of HC powder and how many grams of ointment base would you use?
- 8) You have a solution which is 1:10,000 w/v. What is the percentage strength?
- 9) What is the percentage strength of a 1:100 w/v solution?
- 10) You have a 100 mL vial which is labeled 1:1000. How many mg are in 25 mL of the solution?

Ratio Strength Exercise Answers

1) How many grams of active ingredient are in 500 mL of a 1:10,000 solution?

$$500 \text{ mL} \left(\frac{1 \text{ g}}{10,000 \text{ mL}} \right) = 0.05 \text{ g}$$

2) How many grams of active ingredient are in 40 mL of a 1:200 solution?

$$40 \text{ mL} \left(\frac{1 \text{ g}}{200 \text{ mL}} \right) = 0.2 \text{ g}$$

3) How many grams of active ingredient are in 600 g of a 1:25 w/w preparation?

$$600 \text{ g prep} \left(\frac{1 \text{ g AI}}{25 \text{ g prep}} \right) = 24 \text{ g AI}$$

4) How many mg of active ingredient are in 800 mL of a 1:10,000 solution?

$$800 \text{ mL} \left(\frac{1 \text{ g}}{10,000 \text{ mL}} \right) \left(\frac{1000 \text{ mg}}{\text{g}} \right) = 80 \text{ mg}$$

5) How many mcg are in 10 mL of a 1:100,000 solution?

$$10 \text{ mL} \left(\frac{1 \text{ g}}{100,000 \text{ mL}} \right) \left(\frac{1000 \text{ mg}}{\text{g}} \right) \left(\frac{1000 \text{ mcg}}{\text{mg}} \right) = 100 \text{ mcg}$$

6) You have a 10 mL vial which is labeled 1:10,000 and you are asked to draw up 0.4 mg of drug. How many mL would you draw?

$$0.4 \text{ mg} \left(\frac{10,000 \text{ mL}}{1 \text{ g}} \right) \left(\frac{1 \text{ g}}{1000 \text{ mg}} \right) = 4 \text{ mL}$$

7) You are asked to make 200 g of a 1:100 HC oint preparation. How many grams of HC powder and how many grams of ointment base would you use?

$$200 \text{ g HC Oint} \left(\frac{1 \text{ g HC powder}}{100 \text{ g HC oint}} \right) = 2 \text{ g HC Powder}$$

Since you are making a total of 200 g of HC Ointment and the HC powder is 2 g, you would need **198 g** of ointment base.

8) You have a solution which is 1:10,000 w/v. What is the percentage strength?

$$\left(\frac{1 \text{ g}}{10,000 \text{ mL}} \right) 100\% = 0.01\% \frac{\text{g}}{\text{mL}} = 0.01\% \frac{\text{w}}{\text{v}}$$

9) What is the percentage strength of a 1:100 w/v solution?

$$\left(\frac{1 \text{ g}}{100 \text{ mL}} \right) 100\% = 1\% \frac{\text{g}}{\text{mL}} = 1\% \frac{\text{w}}{\text{v}}$$

10) You have a 100 mL vial which is labeled 1:1000. How many mg are in 25 mL of the solution?

$$25 \text{ mL} \left(\frac{1 \text{ g}}{1000 \text{ mL}} \right) \left(\frac{1000 \text{ mg}}{\text{g}} \right) = 25 \text{ mg}$$