Chapter 7: Practice Problem Answers

CONCENTRATIONS AND DILUTIONS

1. How much desoximetasone is in 100 g of 0.15% desoximetasone ointment (in grams)?

   100 g mixture x $\frac{0.15 \text{ desoximetasone}}{100 \text{ g mixture}}$ = 0.15 g desoximetasone

2. How much ketoconazole (in grams) is in 12 oz of 15% compounded ketoconazole lotion?

   l oz = 30 g

   12 oz ketoconazole x $\frac{30 \text{ g}}{1 \text{ oz}}$ x $\frac{15 \text{ g ketoconazole}}{100 \text{ g mixture}}$ =

   12 ~~oz~~ ketoconazole x $\frac{30 \text{ g}}{1 \text{ ~~oz~~}}$ x $\frac{15 \text{ g ketoconazole}}{100 \text{ g mixture}}$ = $\frac{5{,}400 \text{ g}}{100 \text{ g}}$ = 54 g ketoconozole

3. A prescription is written: Give Stacy promethazine with codeine 6.25 mg/10 mg/5 mL. How much codeine is in 150 mL of promethazine with codeine 6.25 mg/10 mg/5 mL?

   150 mL mixture x $\frac{10 \text{ mg codeine}}{5 \text{ mL mixture}}$ =

   150 ~~mL mixture~~ x $\frac{10 \text{ mg codeine}}{5 \text{ ~~mL mixture~~}}$ = $\frac{1{,}500 \text{ mg codeine}}{5}$ = 300 mg codeine

4. How much ethanol is in 480 mL of a solution of 60% ethanol (in milliliters)?

   480 mL mixture x $\frac{60 \text{ mL ethanol}}{100 \text{ mL mixture}}$ =

480 ~~mL mixture~~ x $\frac{60 \text{ mL ethanol}}{100 \text{ ~~mL mixture~~}} = \frac{480 \times 60 \text{ mL ethanol}}{100} = \frac{28{,}800 \text{ mL ethanol}}{100}$

= 288 mL ethanol

5. An IV bag currently contains 150 mL of 50% KCl; the recipe provided to you says to add 50 mL of sterile water to the bag. What is the final concentration of KCl in the bag?

   150 mL solution x $\frac{50 \text{ g KCl}}{100 \text{ mL solution}}$ =

   150 ~~mL solution~~ x $\frac{50 \text{ g KCl}}{100 \text{ ~~mL solution~~}} = \frac{7{,}000 \text{ g KCl}}{100}$ = 75 g KCl in a 150 mL solution

   If you add 50 mL to 150 mL, there is 75 g in 200 mL.
   Now, solve for the concentration shown in the formula.

   $\frac{75 \text{ g KCl}}{200 \text{ mL solution}} = \frac{Z \text{ g KCl}}{100 \text{ mL solution}}$

   Z g KCl x 200 mL solution = 75 g KCl x 100 mL solution

   $\frac{Z \text{ g KCl} \times \text{~~200 mL solution~~}}{\text{~~200 mL solution~~}} = \frac{75 \text{ g KCl} \times \text{~~100 mL solution~~}}{\text{2~~00 mL solution~~}}$

   Z g KCl = $\frac{75 \text{ g KCl}}{2}$

   Z g KCl = 37.5 g KCl

   Therefore, 37.5 g KCl in 100 mL = 37.5% KCl

   OR,

   $\frac{75 \text{ g}}{200 \text{ mL}} / \frac{2}{2} = \frac{37.5 \text{ g KCl}}{100 \text{ mL}}$ = 37.5% solution

6. The pharmacy stocks a 25% solution of oxybutinin and you receive a prescription for 120 mL of 4% oxybutinin; write a recipe for this prescription that involves diluting down the stock solution with water to the required concentration.

   Determine amount of oxybutinin contained in 120 mL of 4% solution.

120 mL final solution x $\frac{4 \text{ mL oxybutinin}}{100 \text{ mL final solution}}$ = 12~~0 mL final solution~~ x $\frac{4 \text{ mL oxybutinin}}{10~~0 \text{ mL final solution}~~}$

$\frac{48 \text{ mL oxybutinin}}{10}$ = 4.8 mL oxybutinin

Then determine amount of stock solution needed.

4.8 mL oxybutinin x $\frac{100 \text{ mL stock solution}}{25 \text{ mL oxybutinin}}$ = 4.8 ~~mL oxybutinin~~ x $\frac{100 \text{ mL stock solution}}{25~~\text{ mL oxybutinin}~~}$

$\frac{480 \text{ mL stock solution}}{25}$ = 19.2 mL stock solution

Finally, determine the amount of water needed.

120 mL final solution – 19.2 mL stock solution = 100.8 mL water

OR,

$\frac{4.8 \text{ mL}}{Z} = \frac{25 \text{ mL}}{100 \text{ mL}}$

Z x 25 mL = 4.8 mL x 100 mL

$\frac{Z \text{ x } 25 \text{ mL}}{25 \text{ mL}} = \frac{480 \text{ mL}}{25 \text{ mL}}$

Z = 19.2 mL of the 25% solution needed

120 mL final solution – 19.2 mL stock solution = 100.8 mL water.

RECIPE:
Add 100.8 mL of water into 19.2 mL of the 25% stock solution to create 120 mL of 4% oxybutinin for dispensing.

7. How many grams of NaCl are in 1 L of normal (0.9%) saline (saline is NaCl dissolved in water)?

1,000 mL solution x $\frac{0.9 \text{ g NaCl}}{100 \text{ mL solution}}$ = ~~1,000 mL solution~~ x $\frac{0.9 \text{ g NaCl}}{~~100 \text{ mL solution}~~}$

10 x 0.9 g NaCl = 9 g NaCl

8. Write an appropriate recipe (provide the weight or volume of each ingredient) for compounding a lotion with 0.125 mg/ml using hydrocortisone powder that dissolves completely in any liquid; 6.25% Nystatin liquid; 93.5% diphenhydramine liquid and sterile water to total 480 ml.

   First, calculate the amount of each ingredient to add:

   Hydrocortisone:
   $480 \text{ mL mixture} \times \frac{0.125 \text{ mg hydrocortisone}}{1 \text{ mL mixture}} = 60 \text{ mg hydrocortisone}$

   Nystatin:
   $480 \text{ mL mixture} \times \frac{6.25 \text{ mL nystatin}}{100 \text{ mL mixture}} = 48\cancel{0 \text{ mL mixture}} \times \frac{6.25 \text{ mL nystatin}}{10\cancel{0 \text{ mL mixture}}}$

   $\frac{48 \times 6.25 \text{ mL nystatin}}{10} = \frac{300 \text{ mL nystatin}}{10} = 30 \text{ mL nystatin}$

   Diphenhydramine:
   $480 \text{ mL mixture} \times \frac{93.5 \text{ mL diphenhydramine}}{100 \text{ mL mixture}} = 48\cancel{0 \text{ mL mixture}} \times \frac{93.5 \text{ mL diphenhydramine}}{10\cancel{0 \text{ mL mixture}}}$

   $\frac{48 \times 93.5 \text{ mL diphenhydramine}}{10} = \frac{4{,}488 \text{ mL diphenhydramine}}{10} = 448.8 \text{ mL diphenhydramine}$

   Second, write out a recipe:

   Add 60 mg hydrocortisone powder to 30 mL of nystatin liquid and 448.8 mL of diphenhydramine. Then add 1.2 mL of sterile water to create a final compound that is 480 mL in total volume.

9. What is the final weight of a 2% salicylic acid ointment made by adding petroleum jelly to 25 g of 10% salicylic acid ointment?

   First, determine how much salicylic acid is in 15 g of a 10% ointment.

   $$25 \text{ g ointment} \times \frac{10 \text{ g salicylic acid}}{100 \text{ g ointment}} = 15 \cancel{\text{ g ointment}} \times \frac{10 \text{ g salicylic acid}}{100 \cancel{\text{ g ointment}}}$$

   $$\frac{25 \times 10 \text{ g salicyclic acid}}{100} = \frac{250 \text{ g salicylic acid}}{100} = 2.5 \text{ g salicylic acid}$$

   Next, determine the final weight if a 2% ointment is made with 2.5 g of salicylic acid.

   $$\frac{2 \text{ g salicylic acid}}{100 \text{ g ointment}} = \frac{2.5 \text{ g salicylic acid}}{Z \text{ g ointment}}$$

   $$2 \text{ g salicylic acid} \times Z \text{ g ointment} = 100 \text{ g ointment} \times 2.5 \text{ g salicylic acid}$$

   $$\frac{\cancel{2 \text{ g salicylic acid}} \times Z \text{ g ointment}}{\cancel{2 \text{ g salicylic acid}}} = \frac{100 \text{ g ointment} \times 2.5 \cancel{\text{ g salicylic acid}}}{2 \cancel{\text{ g salicylic acid}}}$$

   $$Z \text{ g ointment} = \frac{250 \text{ g ointment}}{2}$$

   $$Z \text{ g ointment} = 125 \text{ g ointment}$$

   Therefore, 125 g of 2% salicylic acid ointment can be made from 25 g of a 10% salicylic acid ointment.

10. In a country of 1.2 billion people, there are 20 people with typhoid fever. How could one express the concentration of typhoid fever in the country in parts per million (ppm)?

    $$\frac{20 \text{ typhoid fever patients}}{1{,}200{,}000{,}000 \text{ people}} = \frac{Z \text{ typhoid fever patients}}{1{,}000{,}000 \text{ people}}$$

    $$1{,}200{,}000{,}000 \text{ people} \times Z \text{ t.f. patients} = 20 \text{ t.f. patients} \times 1{,}000{,}000 \text{ people}$$

    $$\frac{\cancel{1{,}200{,}000{,}000 \text{ people}} \times Z \text{ t.f. patients}}{\cancel{1{,}200{,}000{,}000 \text{ people}}} = \frac{20 \text{ t.f. patients} \times \cancel{1{,}000{,}000 \text{ people}}}{1{,}200{,}\cancel{000{,}000 \text{ people}}}$$

Z t.f. patients = $\frac{20 \text{ t.f. patients}}{1{,}200}$

Z t.f. patients = 0.0166 ppm rounded to 0.017 ppm

11. You receive a prescription that calls for adding sterile water to 150 mL of 19% acetic acid until 500 mL of solution is achieved. What is the final concentration of acetic acid after the dilution is performed?

150 mL solution x $\frac{19 \text{ mL acetic acid}}{100 \text{ mL solution}}$ = 15~~0 mL solution~~ x $\frac{19 \text{ mL acetic acid}}{10~~0 \text{ mL solution}~~}$

$\frac{15 \text{ x } 19 \text{ mL acetic acid}}{10}$ = $\frac{285 \text{ mL acetic acid}}{10}$ = 28.5 mL acetic acid

$\frac{28.5 \text{ mL acetic acid}}{500 \text{ mL solution}}$ = $\frac{Z \text{ mL acetic acid}}{100 \text{ mL solution}}$

500 mL solution x Z mL acetic acid = 28.5 mL acetic acid x 100 mL solution

$\frac{~~500 \text{ mL solution}~~ \text{ x } Z \text{ mL acetic acid}}{~~500 \text{ mL solution}~~}$ = $\frac{28.5 \text{ mL acetic acid x } 1~~00 \text{ mL solution}~~}{5~~00 \text{ mL solution}~~}$

Z mL acetic acid = $\frac{28.5 \text{ mL acetic acid}}{5}$

Z mL acetic acid = 5.7 mL

Therefore, 5.7 mL in 100 mL = 5.7% acetic acid solution

12. If you mixed 50 mL of a 10% solution to a 150 mL of a 40% solution, what is the final concentration?

For the 10% solution:

$\frac{10 \text{ g}}{100 \text{ mL}}$ x 50 mL = $\frac{10 \text{ g}}{10~~0 \text{ mL}~~}$ x 5~~0 mL~~ = $\frac{10 \text{ g x } 5}{10}$ = $\frac{50 \text{ g}}{10}$

= 5 g

For the 40% solution:

$\frac{40\ g}{100\ mL} \times 150\ mL = \frac{40\ g}{10\cancel{0\ mL}} \times 15\cancel{0\ mL} = \frac{40\ g \times 15}{10} = \frac{600\ \cancel{g}}{10} = 60\ g$

Add the two amounts together:

5 g + 60 g = 65 g

Add the two volumes together:

50 mL + 150 mL = 200 mL

Divide the calculated amount by the volume and multiply by 100 to get the percent solution:

$\frac{65}{200} \times 100 = 0.325 \times 100 = 32.5\%$

13. A 40% solution of isopropyl alcohol has been diluted to 100 mL of 16% isopropyl alcohol by adding sterile water. How much of the starting 40% solution must have been present to compound this final concentration?

$\frac{40\ g}{100\ mL} = \frac{16\ g}{Z}$

40 g x Z = 16 g x 100 mL

$\frac{\cancel{40\ g} \times Z}{\cancel{40\ g}} = \frac{\cancel{16\ g} \times 100\ mL}{\cancel{40\ g}}$

$Z = \frac{160\ mL}{4} = 40\ mL$

14. A massage therapist calls the pharmacy and asks if the pharmacist can mix up a batch of peppermint massage oil for him. Your pharmacist agrees and asks you, her technician, to collect the ingredients and mix up the batch. You find that you have a concentrated 65% oil of peppermint stock bottle with 480 mL of oil in it. The massage therapist needs a 25% oil packaged in 240 mL bottles; how many 240 mL bottles can you make with your stock bottle by diluting with jojoba oil?

First, determine the amount of peppermint oil in the 480 mL stock bottle of 80% peppermint oil.

480 mL solution x $\frac{65 \text{ mL peppermint oil}}{100 \text{ mL solution}}$ = 48~~0 mL solution~~ x $\frac{65 \text{ mL peppermint oil}}{10~~0 \text{ mL solution}}$

48 x $\frac{6~~5 \text{ mL peppermint oil}}{1~~0}$ = 48 x 6.5 mL peppermint oil = 312 mL peppermint oil

Next, determine how many mL of a 25% solution could be made with 384 mL peppermint oil.

312 mL peppermint oil x $\frac{100 \text{ mL solution}}{25 \text{ mL peppermint oil}}$

312 ~~mL peppermint oil~~ x $\frac{100 \text{ mL solution}}{25 \text{ ~~mL peppermint oil~~}}$ = 312 x $\frac{100 \text{ mL solution}}{25}$

312 x 4 mL solution = 1,248 mL solution

Then, determine how many 240 mL bottles can be made from 1,536 mL.

1,248 mL solution x $\frac{1 \text{ bottle}}{240 \text{ mL solution}}$ = 1,248 ~~mL solution~~ x $\frac{1 \text{ bottle}}{240 \text{ ~~mL solution~~}}$

$\frac{1{,}248 \text{ bottles}}{240}$ = 5.2 bottles

15. A pharmacist asks a pharmacy technician to verify that his calculations are correct for the compound that he is about to mix up. You examine his recipe and label and find that an error has been made. Based on the following information, where is the error? What is (are) the corrected value(s)?

    The prescription reads:
    For Heather, mix:

    100 g of 2% ketoconazole cream
    90 g of 1% hydrocortisone cream
    Quantity sufficient coal tar to make the final compound 2% coal tar solution
    Quantity sufficient of a cream base to provide 454 g of finished compound

    Apply to red patches three times daily as needed for psoriasis. 454 g. 5 refills.

    Your pharmacist's recipe reads:

Mix:

100 g of 2% ketoconazole cream
90 g of 1% hydrocortisone cream
9.08 g of coal tar solution
234.92 g of cream base

Your pharmacist's label for the jar reads:

ketoconazole/hydrocortisone/coal tar 2%/1%/2% in a cream base.

Have Heather apply to red patches three times daily as needed for psoriasis. 454 g. 5 refills.

Answer: The label is not reporting the correct concentrations of each drug:

Ketoconazole:

$$100 \text{ g ingredient} \times \frac{2 \text{ g ketoconazole}}{100 \text{ g ingredient}} = 10\cancel{0 \text{ g ingredient}} \times \frac{2 \text{ g ketoconazole}}{10\cancel{0 \text{ g ingredient}}}$$

$$10 \times \frac{2 \text{ g ketoconazole}}{10} = \frac{20 \text{ g ketoconazole}}{10} = 2 \text{ g ketoconazole}$$

$$\frac{2 \text{ g ketoconazole}}{454 \text{ g mixture}} = \frac{Z \text{ g ketoconazole}}{100 \text{ g mixture}}$$

$$454 \text{ g mixture} \times Z \text{ g ketoconazole} = 2 \text{ g ketoconazole} \times 100 \text{ g mixture}$$

$$\frac{\cancel{454 \text{ g mixture}} \times Z \text{ g ketoconazole}}{\cancel{454 \text{ g mixture}}} = \frac{2 \text{ g ketoconazole} \times 100 \cancel{\text{ g mixture}}}{454 \cancel{\text{ g mixture}}}$$

$$Z \text{ g ketoconazole} = \frac{200 \text{ g ketoconazole}}{454}$$

$$Z \text{ g ketoconazole} = 0.44$$

Therefore, the final mixture has 0.4% ketoconazole.

Hydrocortisone:

$$90 \text{ g ingredient} \times \frac{1 \text{ g hydrocortisone}}{100 \text{ g ingredient}} = 9\cancel{0 \text{ g ingredient}} \times \frac{1 \text{ g hydrocortisone}}{10\cancel{0 \text{ g ingredient}}}$$

$$\frac{9 \text{ g hydrocortisone}}{10} = 0.9 \text{ g hydrocortisone}$$

$$\frac{0.9 \text{ g hydrocortisone}}{454 \text{ g mixture}} = \frac{Z \text{ g hydrocortisone}}{100 \text{ g mixture}}$$

454 g mixture x Z g hydrocortisone = 0.9 g hydrocortisone x 100 g mixture

$$\frac{\cancel{454 \text{ g mixture}} \times Z \text{ g hydrocortisone}}{\cancel{454 \text{ g mixture}}} = \frac{0.9 \text{ g hydrocortisone} \times 100 \cancel{\text{ g mixture}}}{454 \cancel{\text{ g mixture}}}$$

$$Z \text{ g hydrocortisone} = \frac{90 \text{ g hydrocortisone}}{454}$$

Z g hydrocortisone = 0.198

Therefore, the final mixture has 0.2% hydrocortisone.

Coal tar:

$$\frac{9.08 \text{ g coal tar solution}}{454 \text{ g mixture}} = \frac{Z \text{ g coal tar solution}}{100 \text{ g mixture}}$$

454 g mixture x Z g coal tar solution = 9.08 g coal tar solution x 100 g mixture

$$\frac{\cancel{454 \text{ g mixture}} \times Z \text{ g coal tar solution}}{\cancel{454 \text{ g mixture}}} = \frac{9.08 \text{ g coal tar solution} \times 100 \cancel{\text{ g mixture}}}{454 \cancel{\text{ g mixture}}}$$

$$Z \text{ g coal tar solution} = \frac{908 \text{ g coal tar solution}}{454}$$

Z g coal tar solution = 2

Therefore, a 2% coal tar is achieved by using 9.08 g as noted by the pharmacist's recipe.

You discuss with your pharmacist that the recipe is correct but that the correct label reads: ketoconazole/hydrocortisone/coal tar 0.4%/0.2%/2% in a cream base. Apply topically to red patches three times daily as needed for psoriasis. 454 g. 5 refills. He agrees and asks you to retype the label while he starts weighing out the ingredients.

16. You receive an order to dissolve menthol crystals into sterile water to make 500 mL of 8% menthol solution. Shortly after compounding this prescription, the nurse calls back and apologizes for making an error; the prescription was for 3% menthol. How much of the 8% solution and how much sterile water is needed to make 500 mL of a

3% solution?

$500 \text{ mL solution} \times \frac{8 \text{ g menthol}}{100 \text{ mL solution}} = 50\cancel{0 \text{ mL solution}} \times \frac{8 \text{ g menthol}}{10\cancel{0 \text{ mL solution}}} =$

$\frac{50 \times 8 \text{ g menthol}}{10} = \frac{400 \text{ g menthol}}{10} = 40 \text{ g menthol}$

$50\cancel{0 \text{ mL solution}} \times \frac{3 \text{ g menthol}}{10\cancel{0 \text{ mL solution}}} = \frac{50 \times 3 \text{ g menthol}}{10} = \frac{150 \text{ g menthol}}{10} = 15\text{g menthol}$

$\frac{15 \cancel{\text{g menthol}}}{40 \text{ g menthol}} = \frac{Z}{500 \text{ mL solution}} = \frac{15}{40} = \frac{Z}{500 \text{ mL solution}}$

$\frac{15 \times 500 \text{ mL solution}}{40} = Z$

$\frac{7{,}500 \text{ mL solution}}{40} = Z$

$Z = 187.5 \text{ mL}$

Therefore, 187.5 mL of 8% menthol solution and 312.5 mL of sterile water are required to prepare 500 mL of 3% menthol solution.

17. A recipe for a compound asks the preparer to add 32 g ketoconazole into 473 mL ammonium lactate lotion. What percent of the resulting compound is ketoconazole?

$\frac{32 \text{ g ketoconazole}}{473 \text{ mL ammonium lactate lotion}} = 6.765$ round to 6.8% w/v ketoconazole

18. A prescription calls for triamcinolone suspension 15 mg/mL to be diluted down to 0.125 mg/mL by adding distilled water (this is used to treat mouth sores). How much triamcinolone suspension and how much water must be added to make 480 mL of the final product?

First, determine the amount of triamcinolone needed.

$480 \text{ mL total} \times \frac{0.125 \text{ mg triamcinolone}}{1 \text{ mL total}} = 60 \text{ mg triamcinolone}$

Next, determine the amount of 10g/mL suspension needed to equal 60 mg

triamcinolone.

$$60 \text{ mg triamcinolone} \times \frac{1 \text{ mL suspension}}{15 \text{ mg triamcinolone}} = 4 \text{ mL suspension}$$

Finally, subtract the volume of 4 mL from 480 mL to determine the amount of distilled water required.

480 mL total – 4 mL suspension = 476 mL distilled water

Therefore, 476 mL distilled water added to 4 mL of triamcinolone injectable suspension 15 g/mL will make 480 mL of 0.125 g/mL triamcinolone suspension.

19. A prescription arrives at the pharmacy and calls for 0.09% betamethasone diproprionate lotion to be applied to patient Dana's arms three times daily for 30 days. The specified quantity is two pounds (908 g). Betamethasone diproprionate lotion only comes as a 0.1% and 0.05% commercial product. Write a recipe for this compound.

    Using the Algebraic method:

    $\frac{F - L}{H - L} \times V = \frac{0.09\% - 0.05\%}{0.1\% - 0.05\ \%} \times 908\ g = \frac{0.0009 - 0.0005}{0.001 - 0.0005} \times 908\ g = \frac{0.0004}{0.0005} \times 908\ g$

    $\frac{0.3632\ g}{0.0005} = 726.4\ g$

    Add 726.4 g of the 0.1% lotion.

    $\frac{H - F}{H - L} \times V = \frac{0.1\% - 0.09\%}{0.1\% - 0.05\%} \times 908\ g = \frac{0.001 - 0.00089}{0.001 - 0.0005} \times 908\ g = \frac{0.0001}{0.0005} \times 908\ g$

    $\frac{0.0908\ g}{0.0005} = 181.6\ g$

    Add 181.6 g of the 0.05% lotion.

    Check your work by adding the ingredients together to ensure that the parts add up to the whole:

    726.4 g (0.1 % lotion) + 181.6 g (0.05 % lotion) = 908 g of 0.09 % lotion

    Using the Allegation method:

H = 0.1		0.09 – 0.05 = 0.04 (PARTS H)	0.04 / 0.05 = 0.8 (%H)	0.8 x 908 = 726.4 g
	F = 0.09	**V** = 908 g	0.04 + 0.01 = 0.05 (Total PARTS)	726.4 g + 181.6 g = 908 g = V
L = 0.05		0.1 – 0.09 = 0.01 (PARTS L)	0.01 / 0.05 = 0.2 (%L)	0.2 x 908 = 181.6 g

    Add 726.4 g of the 0.1% lotion and 181.6 g of the 0.05% lotion to get 908 g of 0.09% lotion.

20. A prescription calls for 150 mL of 30% ethanol to be compounded from 25% ethanol and 50% ethanol. Write a recipe for this compound.

Using the Algebraic method:

$\frac{F - L}{H - L} \times V = \frac{30\% - 25\%}{50\% - 25\%} \times 150 \text{ mL} = \frac{0.3 - 0.25}{0.5 - 0.25} \times 150 \text{ mL} = \frac{0.05}{0.25} \times 150 \text{ mL} = \frac{5}{0.25} = 30 \text{ mL}$

Add 30 mL of the 50% ethanol.

$\frac{H - F}{H - L} \times V = \frac{50\% - 30\%}{50\% - 25\%} \times 150 \text{ mL} = \frac{0.5 - 0.3}{0.5 - 0.25} \times 150 \text{ mL} = \frac{0.2}{0.25} \times 150 \text{ mL} = \frac{30 \text{ mL}}{0.25} = 120 \text{ mL}$

Add 120 mL of the 25% ethanol.

Using the Allegation method:

H = 0.5		0.3 - 0.25 = 0.05 (PARTS H)	0.05 / 0.25 = 0.2 (%H)	0.2 x 150 mL = 30 mL
	F = 0.3	**V** = 150 mL	0.05 + 0.2 = 0.25 (Total PARTS)	30 mL + 80 mL = 100 mL = V
L = 0.25		0.5 – 0.3 = 0.2 (PARTS L)	0.2 / 0.25 = 0.8 (%L)	0.8 x 150 mL = 120 mL

Add 30 mL of the 50% ethanol and 120 mL of the 25% ethanol to achieve 150 mL of 30% ethanol.

21. A prescription to treat "strep throat" is written: Give Kristi 5 mL of a 250 mg/5 mL cefdinir suspension twice daily for 10 days. Upon reaching the shelf, you find that you are out of 250 mg/5 mL suspension but you have plenty of the 125 mg/5 mL suspension. Write out how this prescription would look using the 125 mg/5 mL suspension.

    First, determine how many mg cefindinir per dose for the 250 mg/5 mL suspension.

    $$\frac{5\ \text{mL}}{1\ \text{dose}} \times \frac{250\ \text{mg cefdinir}}{5\ \text{mL}} = \frac{5\ \cancel{\text{mL}}}{1\ \text{dose}} \times \frac{250\ \text{mg cefdinir}}{5\ \cancel{\text{mL}}} = \frac{1{,}250\ \text{mg cefdinir}}{5\ \text{doses}} =$$

    250 mg cefindinir/dose

    Next, determine how many mL per dose there would be in the 125 mg/5 mL suspension with 175 mg cefdinir per dose.

    $$\frac{250\ \text{mg cefdinir}}{1\ \text{dose}} \times \frac{5\ \text{mL}}{125\ \text{mg cefdinir}} = \frac{250\ \cancel{\text{mg cefdinir}}}{1\ \text{dose}} \times \frac{5\ \text{mL}}{125\ \cancel{\text{mg cefdinir}}} = \frac{250\ \text{mL}}{125\ \text{dose}}$$

    10 mL/dose

    Finally, determine the minimum mL of cefdinir needed for 10 days of the cefdinir 125/5 mL suspension.

    $$\frac{10\ \text{mL}}{1\ \text{dose}} \times \frac{2\ \text{doses}}{1\ \text{day}} \times \frac{10\ \text{days}}{1} = 200\ \text{mL}$$

    Your rewritten order will read: Cefdinir 125 mg/5 mL. Give Kristi 10 mL by mouth twice daily for ten days. Dispense a minimum of 200 mL.

22. Your pharmacist presents you with a recipe for a compound that calls for grinding ibuprofen tablets (standard strengths are 200 mg, 400 mg and 800 mg tablets) and adding the resulting powder to petroleum jelly to form a topical ibuprofen ointment. If the 800 mg tablets are cheaper (by the milligram) than the 400 mg tablets and the 400 mg tablets are cheaper than the 200 mg tablets, how many of which strength tablets must be ground to make 454 g of 40% ibuprofen ointment to make the lowest cost compound possible?

    First, determine the total g of ibuprofen needed to make 454 g of the 30% ibuprofen ointment.

    $$454\ \text{g solution} \times \frac{40\ \text{g ibuprofen}}{100\ \text{g solution}} = 454\ \cancel{\text{g solution}} \times \frac{40\ \text{g ibuprofen}}{100\ \cancel{\text{g solution}}} = \frac{18{,}160\ \text{g ibuprofen}}{100}$$

181.6 g ibuprofen

Next, convert g to mg.

$$181.6 \text{ g ibuprofen} \times \frac{1{,}000 \text{ mg}}{1 \text{ g}} = 181{,}600 \text{ mg ibuprofen}$$

$$\frac{181{,}600 \text{ mg ibuprofen}}{800 \text{ mg tablet}} = 227 \text{ tablets (800 mg each)}$$

23. What is the weight (in milligrams) of active ingredient present in 30 g of a 12% ointment?

Remember to convert g to mg.

$$30 \text{ g ointment} \times \frac{12 \text{ g active ingredient}}{100 \text{ g ointment}} \times \frac{1{,}000 \text{ mg active ingredient}}{1 \text{ g active ingredient}} =$$

$$\frac{36{,}000 \text{ mg active ingredient}}{10} = 3{,}600 \text{ mg active ingredient}$$

24. There are 400.5 ppm of carbon dioxide currently in our atmosphere. If 999,000 parts of the atmosphere is nitrogen gases and oxygen gas, how much of the atmosphere is made up of chemicals other than the three main gases (carbon dioxide, nitrogen and oxygen)?

1,000,000 parts atmosphere – 400.5 parts CO_2 – 999,000 parts nitrogen and oxygen = 599.5 ppm other chemicals

25. You receive a prescription to compound 5% coal tar and 2% salicylic acid added to commercially available 0.005% calcipotriene cream (180 g tube) to treat psoriasis. If coal tar comes as a 200 mg/mL solution, how much coal tar solution (in milliliters) must be added to the 180 g tube of calcipotriene to make final compound be 5% coal tar?

$$180 \text{ g final compound} \times \frac{5 \text{ g coal tar}}{100 \text{ g final compound}} \times \frac{1{,}000 \text{ mg coal tar}}{1 \text{ g coal tar}} \times \frac{1 \text{ mL coal tar solution}}{200 \text{ mg coal tar}} =$$

$$\frac{18 \times 5 \times 10 \times 1 \text{ mL coal tar solution}}{10 \times 2} = \frac{900}{20} = 45 \text{ mL coal tar solution}$$

26. You receive a prescription that calls for giving 400 mg four times daily for seven days to a 12 year old with a mild penicillin allergy and a minor sinus infection. The patient's father is concerned that his son will not do well swallowing capsules and asks if there's a liquid available. You find that you have a 100 mL and a 200 mL bottle of 250 mg/5 mL cephalexin powder for suspension on the shelf. What is the total volume (in mL) that you will need to provide the full course of therapy, and do you have enough bottles in the pharmacy to provide the full course of therapy or will you need to send the patient home with what you have and order more?

$$\frac{400\ \cancel{\text{mg cephalexin}}}{\cancel{\text{dose}}} \times \frac{4\ \cancel{\text{doses}}}{\cancel{\text{day}}} \times \frac{7\ \cancel{\text{days}}}{1} \times \frac{5\text{ mL suspension}}{250\ \cancel{\text{mg cephalexin}}} = \frac{56{,}000\text{ mL suspension}}{250}$$

224 mL suspension: Yes, you have enough of the suspension if you provide both the 100 mL and 200 mL bottles (300 mL total) to the patient with instructions to discard the remaining 76 mL of suspension after finishing the seven-day course of therapy.

27. You receive a prescription for Sally Scratchins for an itch relieving topical cream with this recipe: combine 8 g 1% hydrocortisone, 25 g 1% diphenhydramine and acid mantle up to 30 g. How much diphenhydramine is in the final compound (expressed in grams)?

$$25\ \cancel{\text{g diphenhydramine commercial product}} \times \frac{1\text{ g diphenhydramine}}{100\ \cancel{\text{g diphenhydramine commercial product}}} =$$

0.25 g diphenhydramine

28. One of your fellow technicians sets out to make a compound when she begins to question herself. Before presenting her recipe to your pharmacist, she asks you to check her work because it just doesn't seem right. Based on the prescription presented, does the recipe she devised make sense?

Patient: Art Wright
DOB: 05/17/2007

Compound: Naproxen 25 mg/mL & Folic Acid 0.3 mg/mL
Give one teaspoonful twice daily
Q.S. 30 days / Ref: PRN

Dr. N. Ced

Your colleague's recipe: Grind 180 folic acid 1 mg tablets and mix with 450 mL of naproxen 125 mg/5 mL suspension through a mortar.

First, determine the total number of mLs needed of naproxen.

$$1 \text{ tsp} = \frac{5 \text{ mL}}{\cancel{\text{dose}}} \times \frac{2 \cancel{\text{doses}}}{\cancel{\text{day}}} \times 30 \cancel{\text{days}} = 5 \text{ mL} \times 2 \times 30 = 300 \text{ mL}$$

$$\frac{25 \text{ mg}}{\text{mL}} = \frac{Z}{300 \text{ mL}}$$

$$Z \text{ mL} = 25 \text{ mg} \times 300 \text{ mL}$$

$$Z = \frac{25 \text{ mg} \times 300 \cancel{\text{mL}}}{\cancel{\text{mL}}}$$

$$Z = 7{,}500 \text{ mg}$$

$$\frac{7{,}500 \text{ mg}}{Y} = \frac{125 \text{ mg}}{5 \text{ mL}}$$

$$125 \text{ mg} \times Y = 7{,}500 \text{ mg} \times 5 \text{ mL}$$

$$\frac{\cancel{125 \text{ mg}} \times Y}{\cancel{125 \text{ mg}}} = \frac{7{,}500 \cancel{\text{mg}} \times 5 \text{ mL}}{125 \cancel{\text{mg}}}$$

$$Y = \frac{7{,}500 \times 5 \text{ mL}}{125}$$

Y = 150 mL

Next, amount of folic acid 0.3 mg/mL needed.

0.3 mg/mL x 300 mL = 90 mg needed

Therefore, 90 (1 mg) tablets are required.

You inform your colleague that she might want to recalculate her recipe values. First, you found that she was going to put two times the right amount of folic acid into the mix (90 tablets of 1 mg folic acid are required for the compound). Second, you found that 300 mL of the naproxen suspension is needed – not the 450 mL recommended by your colleague.

29. The local headache clinic calls and asks if you can make a nasal spray of mupirocin and saline for a patient. You inform them that you don't see a recipe in your book of compounds but that your pharmacist says that she will help you write a new recipe and that the pharmacy can, indeed, complete this request. When the prescription arrives, it calls for adding 4.6 g of mupirocin ointment into 120 mL of 0.9% nasal saline with the compound to be dispensed in a clean nasal spray bottle. The mupirocin dissolves completely so the final compound's volume will be 120 mL. Your pharmacist starts writing up the recipe and asks you to prepare the label for the final compound. What is the concentration you will list for the mupirocin on the label (in mg/mL)?

$$\frac{4.6\ \cancel{\text{g mupirocin}}}{120\text{ mL final compound}} \times \frac{1{,}000\text{ mg mupirocin}}{1\ \cancel{\text{g mupirocin}}} = \frac{4{,}600\text{ mg mupirocin}}{120\text{ mL final compound}} = 38.33$$

$$\frac{38.33\text{ mg mupirocin}}{1\text{ mL final compound}}$$ rounded to 38 mg/mL

30. A prescription calls for 0.68% capsaicin cream to be applied to the skin after shingles sores have subsided but where pain persists. The physician believes that 90 g is appropriate for this patient to last one month and asks you to dispense a one-month supply. Unfortunately, your pharmacy only stocks 0.75% and 0.035% capsaicin. Your pharmacist reminds you that you were trained in the allegation method for combining mixtures and asks you to write him a recipe for mixing up this compound. What is the recipe to fill the prescription with the ingredients available (using the allegation method)?

H = 0.0075		0.0068 – 0.00035 = 0.00645 (PARTS H)	0.00645 / 0.00715 = 0.902 (%H)	0.902 x 90 = 81.18 g
	F = 0.0068	V = 90 g	0.00645 + 0.0007 = 0.00715 (Total PARTS)	81.18 + 8.82 = 90 g
L = 0.0003		0.0075 – 0.0068 = 0.0007 (PARTS L)	0.0007 / 0.00715 = 0.098 (%L)	0.098 x 90 = 8.82 g

Add 81.18 g of the 0.75% and 8.82 g of the 0.035% cream together to form 90 g of 0.068% capsaicin cream for this patient.