

What will be the final concentration of alcohol mixture made by combining 50mL of alcohol 70% and 60mL of alcohol 95%?

$$Q_1 = 50mL \quad C_1 = 70\%$$

$$Q_2 = 60mL \quad C_2 = 95\%$$

$$Q_f = 110mL \quad C_f = ?$$

$$Q_1C_1 + Q_2C_2 = Q_fC_f$$

$$\frac{Q_1C_1 + Q_2C_2}{Q_f} = C_f = \frac{50mL \times 70\% + 60mL \times 95\%}{110mL} = \underline{\underline{83.6\%}}$$

How many mL of 15% w/v boric acid and 2.5% w/v boric acid solution are required to prepare 200mL of 5% w/v boric acid solution.

$$Q_1 = ?(x) \quad C_1 = 15\% w/v$$

$$Q_2 = ?(200mL - x) \quad C_2 = 2.5\% w/v$$

$$Q_f = 200mL \quad C_f = 5\% w/v$$

$$Q_1C_1 + Q_2C_2 = Q_fC_f$$

$$xC_1 + (200mL - x)C_2 = Q_fC_f$$

$$xC_1 + 200mLC_2 - xC_2 = Q_fC_f$$

$$xC_1 - xC_2 = Q_fC_f - 200mLC_2$$

$$x(C_1 - C_2) = Q_fC_f - 200mLC_2$$

$$x = \frac{Q_fC_f - 200mLC_2}{(C_1 - C_2)} = \frac{200mL \times 5\% w/v - 200mL \times 2.5\% w/v}{15\% w/v - 2.5\% w/v} = \underline{\underline{40mL}} = Q_1$$

$$Q_2 = (200mL - x) = 200mL - 40mL = \underline{\underline{160mL}}$$

A pharmacist needs to prepare 28g of 10% ZnO cream using 2% and 20% creams. How much of each cream should be used?

$$\begin{aligned}Q_1 &= ?(x) & C_1 &= 2\% \\Q_2 &= ?(28g - x) & C_2 &= 20\% \\Q_f &= 28g & C_f &= 10\%\end{aligned}$$

$$Q_1C_1 + Q_2C_2 = Q_fC_f$$

$$xC_1 + (28g - x)C_2 = Q_fC_f$$

$$xC_1 + 28gC_2 - xC_2 = Q_fC_f$$

$$xC_1 - xC_2 = Q_fC_f - 28gC_2$$

$$x(C_1 - C_2) = Q_fC_f - 28gC_2$$

$$x = \frac{Q_fC_f - 28gC_2}{(C_1 - C_2)} = \frac{28g \times 10\% - 28g \times 20\%}{2\% - 20\%} = \underline{\underline{15.6g}} = Q_1$$

$$Q_2 = (28g - x) = 28g - 15.6g = \underline{\underline{12.4g}}$$

Belladonna tincture		20mL (67% alcohol)
Elixir Phenobarbital		70mL (15% alcohol)
Alcohol USP	qs	
Simple syrup	qs ad	180mL

How much alcohol (USP=95%) is needed so the final solution has 20% alcohol?

$$\begin{array}{ll}
 Q_1 = 20mL & C_1 = 67\% \\
 Q_2 = 70mL & C_2 = 15\% \\
 Q_3 = ? & C_3 = 95\% \\
 Q_f = 180mL & C_f = 20\%
 \end{array}$$

$$Q_1C_1 + Q_2C_2 + Q_3C_3 = Q_fC_f$$

$$Q_3C_3 = Q_fC_f - Q_1C_1 - Q_2C_2$$

$$Q_3 = \frac{Q_fC_f - Q_1C_1 - Q_2C_2}{C_3} =$$

$$Q_3 = \frac{180mL \times 20\% - 20mL \times 67\% - 70mL \times 15\%}{95\%} = \underline{\underline{12.7mL}} = Q_3$$

How many mL of syrup 80% w/v sucrose should be mixed with 300mL of syrup 50% w/v sucrose to prepare 70% syrup?

$$\begin{aligned}Q_1 &= ?(x) & C_1 &= 80\% w/v \\Q_2 &= 300mL & C_2 &= 50\% w/v \\Q_f &= ?(300mL + x) & C_f &= 70\% w/v\end{aligned}$$

$$Q_1C_1 + Q_2C_2 = Q_fC_f$$

$$xC_1 + Q_2C_2 = (300mL + x)C_f$$

$$xC_1 + Q_2C_2 = 300mLC_f + xC_f$$

$$xC_1 - xC_f = 300mLC_f - Q_2C_2$$

$$x(C_1 - C_f) = 300mLC_f - Q_2C_2$$

$$x = \frac{300mLC_f - Q_2C_2}{(C_1 - C_f)} = \frac{300mL \times 70\% w/v - 300mL \times 50\% w/v}{80\% w/v - 70\% w/v}$$

$$x = Q_1 = \underline{\underline{600mL}}$$

A pharmacist wants to prepare 200mL of ammonia solution, 10% w/v. How many mL of strong ammonia solution (28.5%w/w, sp g = 0.9) should be used?

First way:

$$\begin{aligned}Q_1 &= ? & C_1 &= 28.5\% w/w \\ Q_2 &= 200mL & C_2 &= 10\% w/v\end{aligned}$$

$$Q_1 C_1 = Q_2 C_2$$

$$Q_1 = \frac{Q_2 C_2}{C_1} = \frac{200mL \times 10\% w/v}{28.5\% w/w} = \frac{200mL \times \frac{10g}{100mL}}{\frac{28.5g}{100g}} = 70.2g$$

$$\frac{70.2g}{0.9g} \times \left(\frac{1mL}{0.9g} \right) = \underline{\underline{78mL}}$$

second way:

$$\begin{aligned}Q_1 &= ? & C_1 &= 28.5\% w/w \\ Q_2 &= 200mL & C_2 &= 10\% w/v\end{aligned}$$

$$\frac{100g}{0.9g} \times \left(\frac{1mL}{0.9g} \right) = 111mL$$

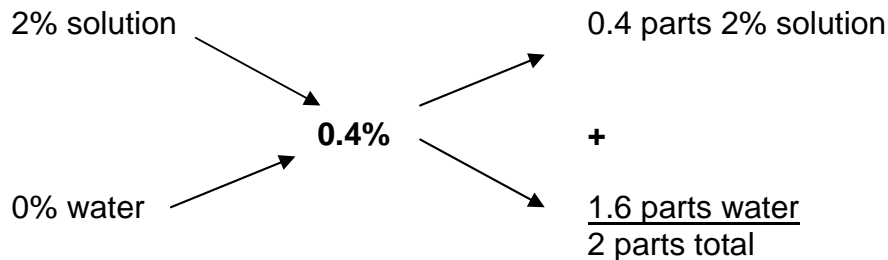
$$w/v = \frac{28.5g}{111mL} = 25.65\% w/v$$

$$Q_1 C_1 = Q_2 C_2$$

$$Q_1 = \frac{Q_2 C_2}{C_1} = \frac{200mL \times 10\% w/v}{25.65\% w/v} = \underline{\underline{78mL}}$$

How many mL of 2% solution should we mix with water (0%) to prepare 500mL of solution containing 4mg/mL.

$$\frac{4mg}{mL} = \frac{0.004g}{1mL} = 0.4\% w/v$$



$$\frac{500mL Rx}{1} \left(\frac{0.4 part 2\% so ln}{2 part Rx} \right) = \underline{\underline{100mL 2\% so ln}}$$

$$water = 500mL - 100mL = 400mL water$$

If we mix 20g of 2.5% ZnO ointment and 30g of 5% Zn ointment, what is the concentration of the final ointment?

$$Q_1 = 20g$$

$$C_1 = 2.5\%$$

$$Q_2 = 30g$$

$$C_2 = 5\%$$

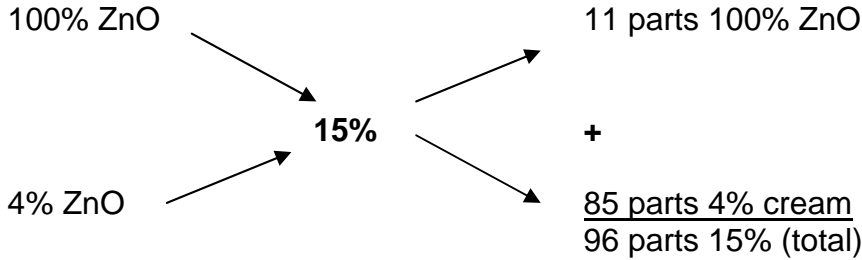
$$Q_f = 50g$$

$$C_f = ?$$

$$Q_1 C_1 + Q_2 C_2 = Q_f C_f$$

$$\frac{Q_1 C_1 + Q_2 C_2}{Q_f} = C_f = \frac{20g \times 2.5\% + 30g \times 5\%}{50g} = \underline{\underline{4\%}}$$

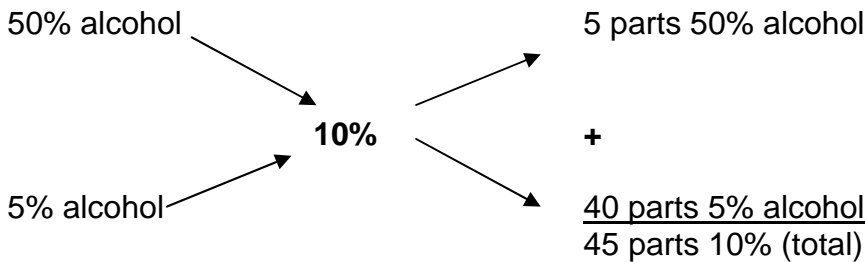
How much ZnO should we add to increase the concentration of the cream to 15% ZnO?
 (Consider solid ZnO has a concentration of 100%)



Remember that Q_f was determined to be 50g above.

$$\frac{50g\ 4\%}{\left(\frac{11\text{ parts } 100\%}{85\text{ parts } 4\%}\right)} = \underline{\underline{6.47g\ 100\%}}$$

How much alcohol 50% should be mixed with alcohol 5% to prepare 40mL of alcohol 10%?

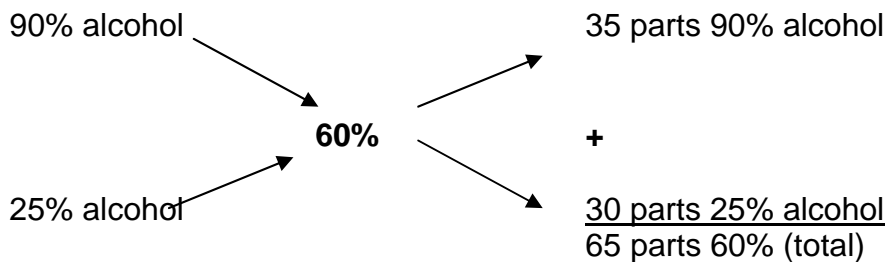


$$\frac{40mL\ 10\%}{\left(\frac{5\text{ parts } 50\%}{45\text{ parts } 10\%}\right)} = \underline{\underline{4.4mL\ 50\%}}$$

What's the total % of added 50% alcohol?

$$\left(\frac{5\text{ parts } 50\%}{45\text{ parts } 10\%}\right) = \frac{1}{9} = \underline{\underline{11\%}}$$

What's the ratio of alcohol 90%: alcohol 25% needed to prepare alcohol 60%?



35 parts 90% alcohol : 30 parts 25% alcohol

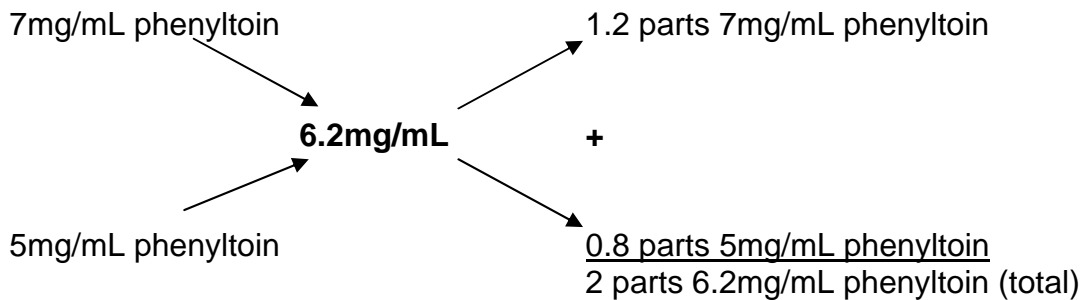
35 :30 **or**
7 :6

How many mL of phenytoin elixir containing 25mg/tsp and 35mg/tsp should be used to prepare 100mL of elixir containing 6.2mg/mL.

Because the concentrations are different, we need to determine a universal one. In class, Dr. Atef used mg/mL so that's what I'll do.

$$\frac{25\text{mg}}{\text{tsp}} = \frac{25\text{mg}}{5\text{mL}} = 5 \text{ mg/mL}$$

$$\frac{35\text{mg}}{\text{tsp}} = \frac{35\text{mg}}{5\text{mL}} = 7 \text{ mg/mL}$$



$$\frac{100\text{mL } 6.2 \text{ mg/mL}}{2 \text{ parts } 6.2 \text{ mg/mL}} \left(\frac{1.2 \text{ parts } 7 \text{ mg/mL}}{2 \text{ parts } 6.2 \text{ mg/mL}} \right) = \underline{\underline{60\text{mL } 7 \text{ mg/mL}}}$$

$$\frac{100\text{mL } 6.2 \text{ mg/mL}}{2 \text{ parts } 6.2 \text{ mg/mL}} \left(\frac{0.8 \text{ parts } 5 \text{ mg/mL}}{2 \text{ parts } 6.2 \text{ mg/mL}} \right) = \underline{\underline{40\text{mL } 5 \text{ mg/mL}}}$$