Answer on Question #54093 – Math – Algebra

The pharmacist has asked you to weigh out 20 grams of menthol and dissolve it in sterile water to make a 5% solution. Later you are asked to change the concentration to a 1% solution to fill an order that was just received. What will the final volume of a 1% solution be?

Solution

The volume concentration is defined as the volume of a constituent divided by the volume of the mixture. The volume of menthol is mass divided by density of menthol (density is 0.89 g/ml):

$$V = \frac{20g}{0.89g/ml} = 22.47ml$$

So concentration of solution is 5% (0.05).

Let's find the volume of mixture:

$$\frac{Vmenthol}{Vmixture} * 100\% = 5\%$$

$$Vmixture = \frac{Vmenthol * 100\%}{5\%} = 449ml.$$

Then we need to lower the concentration, to dilute a solution. To dilute a solution means to add more solvent without the addition of more solute. Mathematically this relationship between the concentration and the volume of solutions can be shown in the equation:

$$C_1 \times V_1 = C_2 \times V_2,$$

where

C_1 = initial concentration.

V_1 = initial volume.

C_2 =final concentration.

V_2 = final volume,

$$V_2 = \frac{C_1 \times V_1}{C_2} = \frac{0.05 \times 449}{0.01} = 2245ml$$

Answer: 2245 ml.