Question #37957, Math, Algebra

A hospital needs 10 L of a 10% solution of disinfectant. How many litters of a 25% solution and a 5% solution should be mixed to obtain this 10% solution?

Solution

Let x is the number of litres of 25% solution and y is the number of litres of 5% solution. Since the total amount of disinfectant is equal to 10 litres we get the first equation

$$x + y = 10. \quad (1)$$

Ten litres of 10% solution include $10 \cdot 0.1 = 1$ litre of pure disinfectant, x litres of 25% solution include $0.25x$ litres of pure disinfectant and y litres of 5% solution include $0.05x$ litres of pure disinfectant. The amount of pure disinfectant in the mixture must be equal to the sum of pure disinfectant in the mixed solutions, i. e.

$$0.25x + 0.05y = 1.$$

Thus we must solve the system of the equations (1) and (2)

$$\begin{cases} x + y = 10, \\ 0.25x + 0.05y = 1. \end{cases}$$

Since $y = 10 - x$ we have the linear equation for x

$$0.25x + 0.05(10 - x) = 1.$$

Multiplying to remove parentheses we obtain

$$0.2x = 0.5.$$

Hence $x = 2.5$ litres and $y = 10 - 2.5 = 7.5$ litres.

Check

$2.5 \cdot 0.25 + 7.5 \cdot 0.05 = 1.$

Answer

2.5 litres of a 25% solution and 7.5 litres of a 5% solution