Answer on Question #83803, Physics / Mechanics | Relativity

Question:

An alloy of gold and silver has a mass of 93g and volume of 10 cm³. If density of gold is 2.5g/cm³ and density of silver is 10.5g/cm³, calculate
(i) mass of gold only
(ii) volume of silver only

Decision:

Let's x is volume of gold in cm^3

Let's y is volume of silver in cm^3

So total volume of alloy piece is

$$x + y = 10\ cm^3$$

Total mass of alloy piece is

$$2.5 \cdot x + 10.5 \cdot y = 93\ g$$

let's make a system of equations:

$$\begin{cases} x + y = 10 \\ 2.5 \cdot x + 10.5 \cdot y = 93 \end{cases}$$

$$\begin{cases} 5 \cdot x + 5 \cdot y = 50 \\ 5 \cdot x + 21 \cdot y = 93 \cdot 2 \end{cases}$$

$$\begin{cases} x + y = 10 \\ 21 \cdot y - 5 \cdot y = 186 - 50 \end{cases}$$

$$\begin{cases} x = 10 - y \\ 16 \cdot y = 136 \end{cases}$$

$$\begin{cases} x = 10 - 8.5 = 1.5 \\ y = 8.5 \end{cases}$$

Mass of gold

$$2.5 \cdot 1.5 = 3.75\ g$$

Answer:

(i) mass of gold only is 3.75 g

(ii) volume of silver only is 8.5 cm^3

$$\begin{cases} 21 \cdot y - 5 \cdot y = 186 - 50 \\ 5 \cdot x + 21 \cdot y = 93 \cdot 2 \end{cases}$$

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