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Vijfde herziene druk

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Uitwerkingen

Hoofdstuk 14

Antwoord 1

$\sigma_{Totaal} = \sqrt{\sigma^2 + \sigma^2 + \sigma^2 + \sigma^2 + \sigma^2} = \sqrt{2^2 + 2^2 + 2^2 + 2^2 + 2^2}$ = **4,5 mL**

Antwoord 2

a.

m = 0,500 g; σ_m = 0,000141 g; V = 250 mL; σ_V = 0,05 mL

$$\left(\frac{\sigma_m}{m}\right)^2 = \left(\frac{0{,}000141}{0{,}5}\right)^2 = 8.10^{-8}$$

$$\left(\frac{\sigma_V}{V}\right)^2 = \left(\frac{0{,}05}{250}\right)^2 = 0{,}00000004$$

$$V * C * M = m \rightarrow C = \frac{m}{V * M}$$

$$\frac{\sigma_C}{C} = \sqrt{\left(\frac{\sigma_m}{m}\right)^2 + \left(\frac{\sigma_V}{V}\right)^2} = \sqrt{\left(\frac{0{,}00014}{0{,}500}\right)^2 + \left(\frac{0{,}05}{250}\right)^2} = 3{,}441.10^{-4}$$

C = 0,05 mol/L; σ_C = 3,441.10^{-4} * 0,05 = **1,73.10^{-5} mol/L**

b.

m = 0.250 * 0,0500 * 400 = 5,00 g; σ_m = 0,000141 g; V = 250 mL; σ_V = 0,05 mL

$$\left(\frac{\sigma_m}{m}\right)^2 = \left(\frac{0{,}000141}{5}\right)^2 = 8.10^{-10}$$

$$\left(\frac{\sigma_V}{V}\right)^2 = \left(\frac{0{,}05}{250}\right)^2 = 0{,}00000004$$

$$V * C * M = m \rightarrow C = \frac{m}{V * M}$$

$$\frac{\sigma_C}{C} = \sqrt{\left(\frac{\sigma_m}{m}\right)^2 + \left(\frac{\sigma_V}{V}\right)^2} = \sqrt{\left(\frac{0{,}00014}{5{,}00}\right)^2 + \left(\frac{0{,}05}{250}\right)^2} = 2{,}020.10^{-4}$$

C = 0,05 mol/L; σ_C = 2,020.10^{-4} * 0,05 = **1,01.10^{-5} mol/L**

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Antwoord 3

l = 70 cm; σ_l = 0,02; T = 1,67 s; σ_T = 0,01 s

$$\frac{\sigma_{T^2}}{T^2} = \left|2 * \frac{\sigma_T}{T}\right| = \left|2 * \frac{0{,}01}{1{,}67}\right| = 0{,}01198$$

$$\frac{\sigma_g}{g} = \sqrt{\left(\frac{\sigma_l}{l}\right)^2 + \left(\frac{\sigma_{T^2}}{T^2}\right)^2} = \sqrt{\left(\frac{0{,}02}{70}\right)^2 + (0{,}01198)^2} = 0{,}01198$$

$$g = \frac{4\pi^2 l}{T^2} = \frac{4\pi^2 * 0{,}70}{(1{,}67)^2} = \mathbf{9{,}91\ m.s^{-2}}$$

σ_g = 9,91 * 0,01198 = **0,12 m.s^{-2}**

Antwoord 4

a. d = 5 mm; σ_d = 0,2 mm

$$V = \frac{\pi d^3}{6} = \frac{\pi * 5^3}{6} = \mathbf{65{,}4\ mm^3}$$

$$\frac{\sigma_V}{V} = \frac{\sigma_{d^3}}{d^3} = \left|3 * \frac{\sigma_d}{d}\right| = \left|3 * \frac{0{,}2}{5}\right| = 0{,}12 \quad \rightarrow \quad \sigma_V = 0{,}12 * 65{,}4 = \mathbf{7{,}8\ mm^3}$$

b. ρ = 3,0 g.cm^3; σ_ρ = 0,2 g.cm^3

$m = \rho * V$ = 3,0 * 0,0654 = 0,196 g = **196 mg**

$$\frac{\sigma_m}{m} = \sqrt{\left(\frac{\sigma_V}{V}\right)^2 + \left(\frac{\sigma_\rho}{\rho}\right)^2} = \sqrt{(0{,}12)^2 + \left(\frac{0{,}20}{3{,}0}\right)^2} = 0{,}14$$

σ_m = 0,14 * 196 mg = **27 mg**

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