Math Diversion Problem 662: Stoichiometry

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June 16, 2025

> Keep an open mind. That's the secret.
> — Doctor Who

The problem is found at:

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Source: Chemical Principles: The Quest for Insight
Title: Kilograms to kilograms
 Presenter:  P. Atkins and L. Jones.
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1 Problem 2: Titration of Oxalic Acid

This second problem is taken from the same textbook *Chemical Principles: The Quest for Insight* ([1], p. F84):

PROBLEM: (Paraphrased) 25.00 mL of oxalic acid is titrated with 0.100 M NaOH(aq) until all the acid is consumed. If it required 38.00 mL of base to reach this point, what was the molarity (moles/liter) of the acid?

SOLUTION: First, the base referred to is NaOH. The chemical equation for the reaction is

$$\mathrm{H_2C_2O_4} + 2\mathrm{NaOH} \longrightarrow \mathrm{Na_2C_2O_4} + 2\mathrm{H_2O} \tag{1}$$

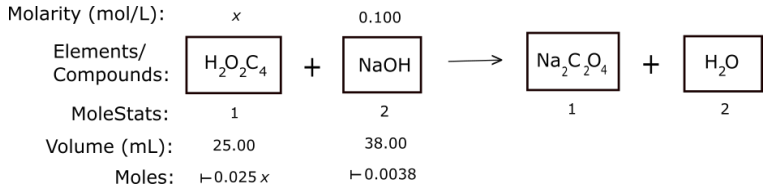

Figure 12. Oxalic acid titration by NaOH.

Next, we write down our mole proportion on columns 1 and 2:

$$\frac{1}{2} = \frac{\text{moles } \mathrm{H_2C_2O_4}}{\text{moles NaOH}} = \frac{0.025x}{0.0038}\,. \tag{2}$$

On solving for x (to three decimal places), we get

$$x = 0.0760\,\mathrm{mol}\cdot\mathrm{L}^{-1}\,. \tag{3}$$

References

[1] P. Atkins and L. Jones. *Chemical Principles: The Quest for Insight*, 3rd Ed. Freeman (2005).

[2] R. Blitzer. *Intermediate Algebra for College Students*, 3rd Ed. Prentice-Hall (2002).

[3] M. Hein and S. Arena *Foundations of College Chemistry*, alternate 12th ed, John Wiley & Sons (2007), 421–422.

[4] H. Rolf. *Finite Mathematics*, 5th Ed. Brooks/Cole (2002), p. 57.

[5] M. S. Silberberg. *Chemistry: The Molecular Nature of Matter and Change* 4th Ed. McGraw-Hill (2006).