# Math Diversion Problem 827

P. Reany

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> You may have to fight a battle more
> than once to win it.
> — Margaret Thatcher

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Source: http://www.msduncanchem.com/Unit_9/unit_9_ws_reg.pdf
Title: Moles-to-Grams
  Presenter:  Web authors
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PROBLEM 5, p, 3

Titanium is a transition metal used in many alloys because it is extremely strong and lightweight. Titanium tetrachloride ($TiCl_4$) is extracted from titanium oxide using chlorine and carbon.

$$\_\_TiO_2 + \_\_C + \_\_Cl_2 \longrightarrow \_\_TiCl_4 + \_\_CO_2\,. \tag{1}$$

If you begin with 1.25 moles of $TiO_2$, what mass of $Cl_2$ gas is needed? (Ans: 178 g $Cl_2$.)

Once again, a diagram.

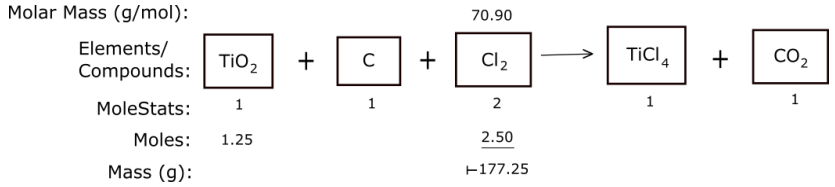


Figure 24. Another sparse graphic that only displays relevant data. Remember that the rule for the underline markup is to imply that at least one piece of data was used from a different column to derive the underlined number.

The work is already finished. The value for $x$ the grams of chlorine is 177 g to three decimal places.

SOLUTION:

We begin by balancing Eq. (1).

$$\mathrm{TiO_2 + C + 2Cl_2 \longrightarrow TiCl_4 + CO_2}\,. \tag{2}$$

# 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).