

Math Diversion Problem 895

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The ignorant always loud in argument.

— Charlie Chan

Source: <https://www.alvinisd.net/cms/lib03/TX01001897/Centricity/Domain/4240/practice%20test%20stoich.pdf>

Title: Mystery Metal, PROBLEM 13

Presenter: Patrick

Definitions:

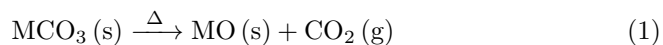
FW = Formula weight = molar mass

ppt = precipitate

At wt = atomic weight

1 Problem

11.2 g of metal carbonate, containing an unknown metal, M, were heated to give the metal oxide and 4.4 g CO₂.



What is the identity of the metal M?

- a. Mg b. Pb c. Ca
d. Ba e. Cr

Ans: e.

2 Solution

Once we know the molar mass, say m , of M, we can look up the most likely element in the periodic table.

Step 2.

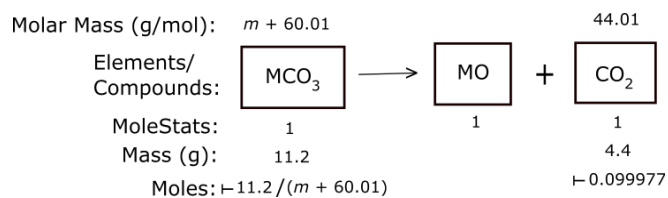


Figure 1. There's no need to clutter the diagram with superfluous information in column 2, as we only need one equation to calculate m , and that is furnished by the stoichiometric proportion between columns 1 and 3.

Next, we write down our stoichiometric proportion on columns 1 and 3:

$$\frac{1}{1} = \frac{\text{moles } MCO_3}{\text{moles } CO_2} = \frac{11.2/(m + 60.01)}{0.099977}. \quad (2)$$

Solving for m , we get a molar mass of about $52 \text{ g}\cdot\text{mol}^{-1}$. The closest-fit element is therefore Chromium, Cr.