Math Diversion Problem 899

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We must use time as a tool, not as a couch.
— John F. Kennedy

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Source: https://www.alvinisd.net/cms/lib03/TX01001897/Centricity/
                Domain/4240/practice%20test%20stoich.pdf
 Title:  Employing the Stoichiometric Proportion, Prob. 24, p.3
  Presenter: Patrick
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Definitions:

FW = Formula weight = molar mass
ppt = precipitate
At wt = atomic weight

1 Problem

$$6H^+ + 5H_2O_2 + 2MnO_4{}^- \rightarrow 5O_2 + 2Mn_2{}^+ + 8H_2O \tag{1}$$

According to the balanced equation above, how many moles of the permanganate ion are required to react completely with 25.0 ml of 0.100 M hydrogen peroxide?

a. 0.000500 mol b. 0.00100 mol c. 0.00500 mol
d. 0.00625 mol e. 0.0100 mol

Ans: b.

SOLUTION: Step 1.

There's more than one way to get to moles in the stoich diagram. Usually, we divide grams by grams/mole, but this time we multiply moles/liter by milliliters and convert units appropriately.

Step 2. Once again, a diagram.

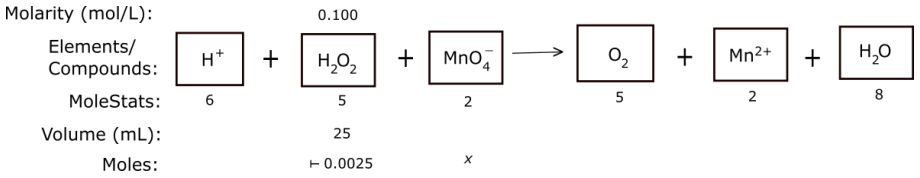

Figure 1. We can calculate x by employing the stoichiometric proportion between columns 2 and 3.

Step 3.

Next, we write down our fundamental proportion between columns 2 and 3:

$$\frac{2}{5} = \frac{\text{moles}\mathrm{MnO_4}^-}{\text{moles}\mathrm{H_2O_2}} = \frac{x}{0.0025} \tag{2}$$

Solving for x, we get a 0.001 mole, or, rather to three decimal places 0.00100 mole.