

Suppose that (2 l. H + 1 l.) yielded (2/3) l. of steam (water vapor) (instead of the 2 l. which it actually yields). Then water would have, instead of H_2O , the chemical formula,

1. H_2O
2. H_2O_3
3. H_4O_2
- ✓ 4. H_6O_3
5. H_8O_4
6. None of the above.

The correct answer is #4, H_6O_3 ;
as follows,

- To determine the integers, P and Q, in the formula, $H_P O_Q$, note that the volume ratio, (2 / 1), of the H to O volumes requires that $P = 2Q$: twice as many H atoms per water molecule as O atoms.
- Then the ratio of O volume to steam volume, (1 / 0.67) = 3/2 fixes the number ratio of water molecules to O molecules.
- Since each O molecule has two O atoms, there must be $2*(3/2) = 3$ O atoms per water molecule: H_6O_3 is the correct chemical formula.