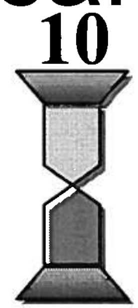
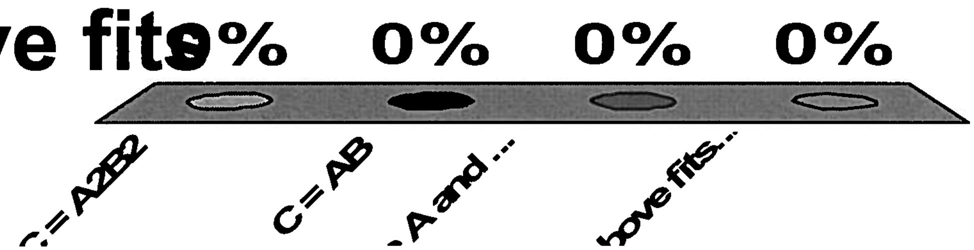
J·GRIFFIN 11-19-07 @

If 1 l. of gas A combines entirely with 1 l. of gas B to form 2 l. of the gaseous compound C (and all gases are at STP), we can conclude that



a) $C = A_2B_2$
b) $C = AB$
c) $C = AB$, & the A and B gases' particles are diatomic molecules.
d) None of the above fits the data given.



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The correct answer is (c): {C = AB, and A and B gases consist of diatomic molecules} because:

- 1) The equal volumes of A and B imply the same number of A particles as of B's so that in C = A_nB_m n must be the same as m. But if n = m =1 then the C-volume would be 1 l., and not 2 l. as specified. But n=m =2, 3, 4,… makes this discrepancy worse, yielding ½, $^1/_3$, …l. as the final volume. The hypothesis of diatomic A and B molecules provides a resolution by yielding 2 atoms per particle (molecule), twice as many as the same volume of monatomic gas. This provides the needed factor of two in the final 2 l. volume.
- 2) Also, answer (a), {C = A_2B_2} would yield ½ l. of C, as noted above, not 2 l., and answer (b), C =AB would yield a final C volume of 1 l., not 2 liters.
- 3) Note that {diatomic molecules and the formula, C = A_2B_2}, yield a final C-volume of 1 l., the same as {C=AB and monatomic A and B}, so that these resolutions are sometimes not unique. Then other knowledge is needed to resolve the ambiguity. (E.g., What happens if A were diatomic and B monatomic?)