Chemical Reactions

Answer Key

1. B

Explanation: Aside from the techniques discussed in the reviewer, another technique you can use is to simply substitute the choices to the given chemical reaction. Whichever set of coefficients balances the reaction is the correct answer!

2. E

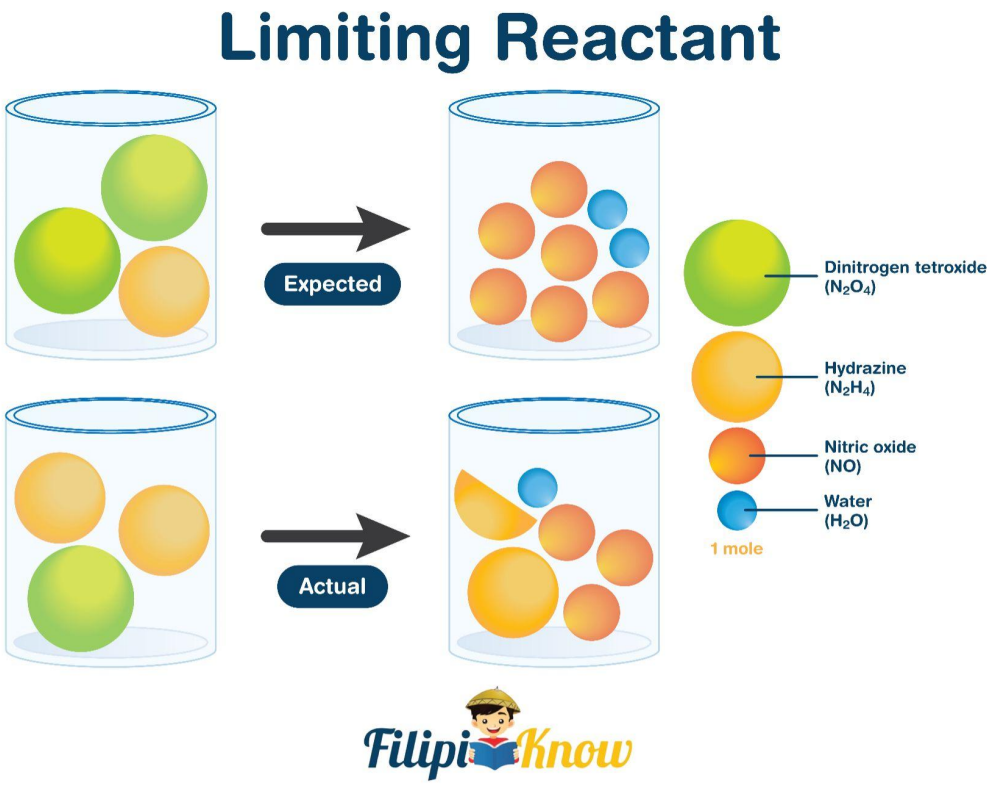
Explanation: Option A is incorrect because the species that undergoes oxidation is the reducing agent (remember GEROA). Option B is also incorrect because reducing agents undergo oxidation; hence, their oxidation number increases after a redox reaction. Lastly, option C is incorrect because, as you've seen in our examples in balancing redox reactions using the ion-electron method, electron/s is/are written in the product side of OHR. This makes sense because electrons are lost during oxidation, therefore, it should be written on the product side.

3. A

Explanation: Remember that when dealing with these kinds of problems, the first thing to do is to check if the reaction is balanced or not. In this case, the reaction given to us is not balanced as written. Therefore, we should balance the reaction first to obtain the balanced chemical reaction which was given below:

$$2N_2O_{4(l)} + 1N_2H_{4(l)} \rightarrow 6NO_{(g)} + 2H_2O_{(g)}$$

Based on the balanced chemical reaction, 2 moles of N_2O_4 will react with 1 mole of N_2H_4 to form 6 moles of NO and 2 moles of H_2O. In other words, for every mole of N_2H_4, the reaction will need 2 moles of N_2O_4 to proceed to completion. Using the same logic, since the student placed 2 moles of N_2H_4 in the reaction chamber, it follows that the reaction will require 4 moles of N_2O_4 for it to proceed to completion. Unfortunately, there's only 1 mole of N_2O_4 in the reaction chamber. Therefore, the limiting reactant is N_2O_4. The illustration below further demonstrates the difference between the expected (based on the balanced chemical reaction) and the actual scenario (based on the given problem).



4. C

Explanation: We've already determined that the limiting reactant in this experiment is N_2O_4. Under normal conditions based on the balanced chemical reaction, 2 moles of N_2O_4 will yield 6 moles of NO. In this case, however, the amount of N_2O_4 was reduced to half. The effect of this change is for the amount of NO produced to be reduced to half. Therefore, only 3 moles of NO will be produced instead of 6.

5. C

Explanation: The balanced reaction tells us that for every 2 moles of N_2O_4, it will need 1 mole of N_2H_4 for the reaction to proceed to completion. In other words, the mole ratio is 2:1. In the example, the student only used 1 mole of N_2O_4. Because of the 2:1 ratio, this amount of N_2O_4 will consume only 0.5 moles of N_2H_4. Since the amount of N_2H_4 used is 2 moles, the unreacted N_2H_4 is 1.5 moles.