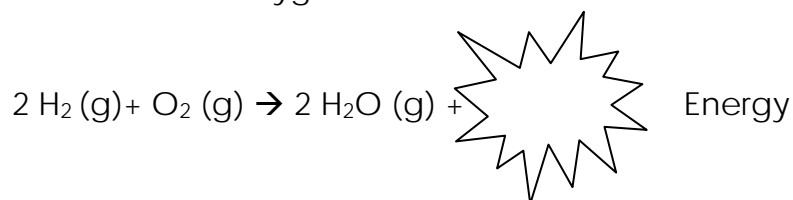


Demonstration Follow-Along (Kris):

1. Combustion is the reaction with some kind of fuel source and an oxidant. In our case we are going to use hydrogen as our fuel source and oxygen in the air as our oxidant. The air is made of mostly nitrogen, N_2 (79%) and oxygen O_2 (20%). So when you see this reaction imagine what would happen if we had a more oxygen rich air.



"Oh yeah, you had to walk to school in the snow up hill both ways.... Well, to get water in my day we had to take two hydrogens and one oxygen and squeeze 'em together!"

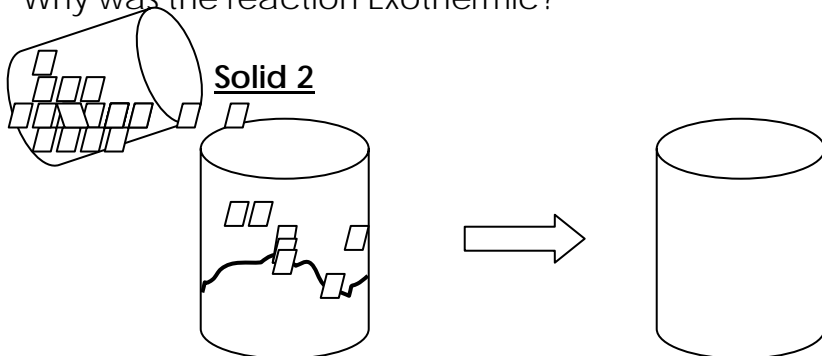
So-- it took two hydrogen molecules in the balloon to find and react with one oxygen molecule and there was only one oxygen molecule in every five air molecules!

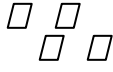
Was the reaction exothermic or endothermic? Why?

2. So... We just saw an example of an exothermic spontaneous reaction. Now, let's see what molecules can make an endothermic spontaneous reaction:

- * Here we have two solids $Ba(OH)_2 \cdot 8H_2O$ (Barium Hydroxide octahydrate) and NH_4Cl (Ammonium Chloride).
- * If we place a small amount of water in a petri dish and set a beaker onto the dish, we can then add 20 grams $Ba(OH)_2 \cdot 8H_2O$ and 10 grams of NH_4Cl .
- * Note the temperature change and note what happens to the Petri dish when we lift the beaker.

Why was the reaction Exothermic?





Solid 1

3. On our vocabulary sheet there is a definition for Adenosine Triphosphate (ATP) as the molecular currency for energy.
 - * The process of converting food energy to kinetic energy or mechanical energy is called glycolysis. Our bodies are electrical power plants producing and using energy in amazingly large quantities on a very small and difficult-to-see scale.
4. It is hard for us chemists to demonstrate actual glycolysis based on its small scale. So-- instead we like to show the energy power of sugars.
 - * To do this we are going to imagine that HClO_4 (perchloric acid) is our metabolic cycle and that the gummy bear is the sugar.
 - * Just as we would our own bodies, we are going to heat the perchloric acid to make it liquid (a mere phase change, the chemical properties have not been altered at all) to ensure a full reaction with the gummy bear. Now, add the gummy bear!

Was the process endothermic or exothermic? WHY?