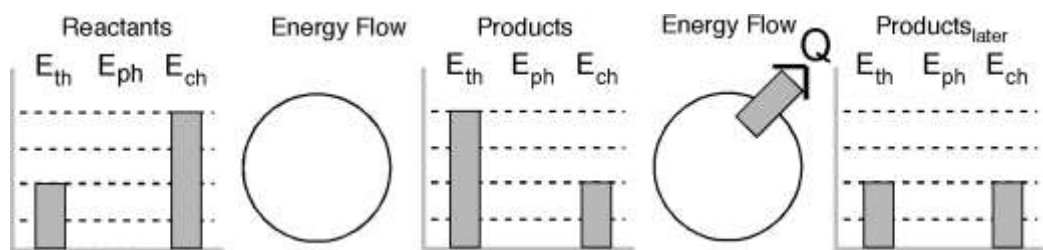


A N S W E R S

to two of the questions we whiteboarded on Friday.

1. When a small piece of sodium metal is dropped into a beaker of water, hydrogen gas and a solution of sodium hydroxide are products. The solution becomes warm.

Chemical equation including energy $2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2 + \text{energy}$

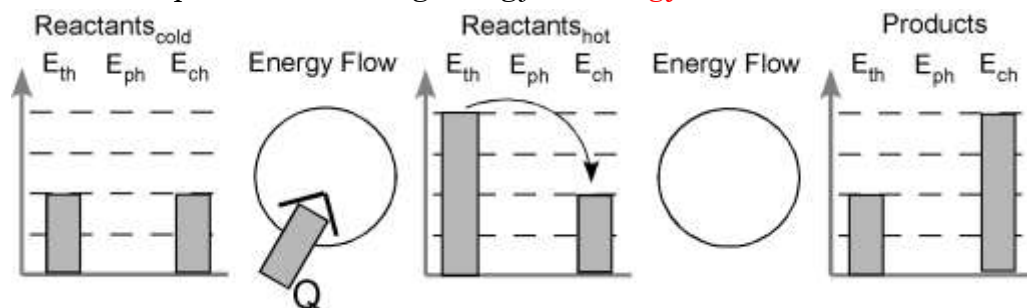


Reasoning for the above diagram:

- Exothermic – solution becoming warm means energy is flowing from warmer reaction system to cooler surroundings.
- The energy being released can be seen as one of the products. Because thermal energy left the system, the E_{ch} of reactants must be higher than the E_{ch} of products.
- Consequently, I drew 4 bars for E_{ch} of reactants and 2 bars for E_{ch} of products in the bar graph. With the increase in E_{th} , the system becomes warmer than the surroundings. Therefore energy flows out of system to surroundings and E_{th} returns to its original level of 2 bars.

2. Heating potassium chlorate powder produces potassium chloride and oxygen gas.

Chemical equation including energy $\text{energy} + 2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$



Reasoning for the above diagram:

- Endothermic – heating the reactant means energy flows from warmer surroundings to cooler reaction system.
- Because the total energy before and after reaction must be the same (or energy is conserved during chemical reactions), the chemical potential energy stored in the reactants plus the absorbed energy through heating is equal to the chemical potential energy stored in the products. Therefore, E_{ch} of reactants is lower than E_{ch} of products.
- Consequently, I drew 2 bars for E_{ch} of reactants and 4 bars for E_{ch} of products in the bar diagram.
- Since heating is required for the reaction to start, the rearrangement of atoms happens after energy is transferred from surroundings through collisions between faster surrounding molecules and slower system molecules. This means the added energy is stored in E_{th} first, then is transferred to E_{ch} when atoms rearrange to form products, thus increasing E_{ch} and decreasing E_{th} .