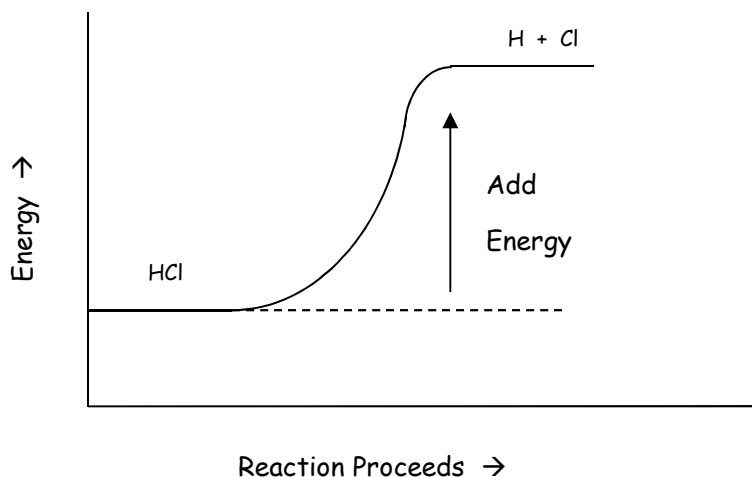
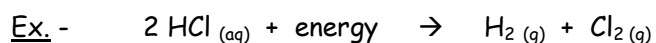
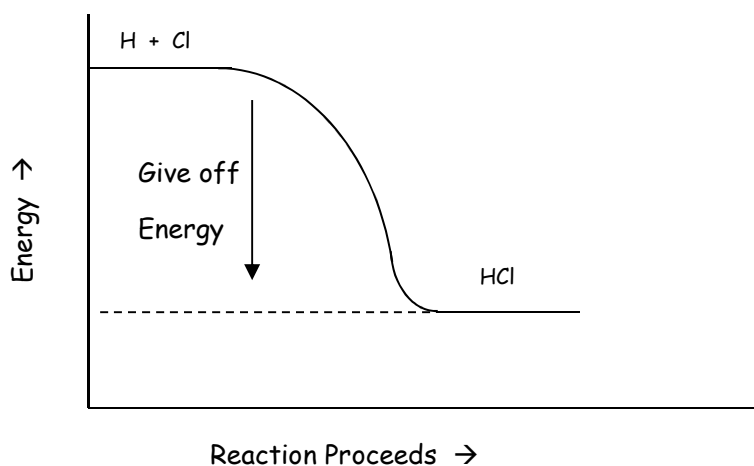
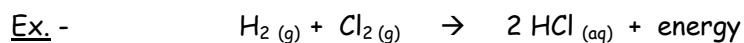


Energy Changes in Chemical Reactions

- The atoms of molecules are held together by bonds. Therefore to break apart molecules one needs to break the bonds. Bonds are broken by adding energy.



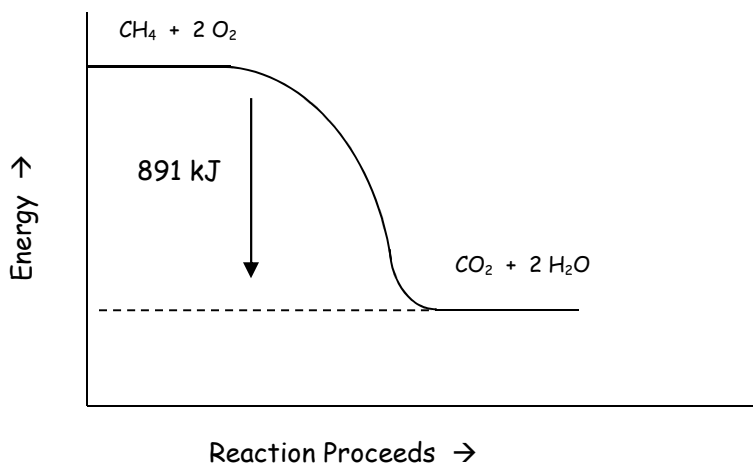
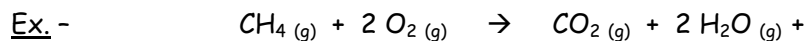
- If atoms join together, they must give off excess energy to allow them to "stick" rather than simply colliding and flying apart.



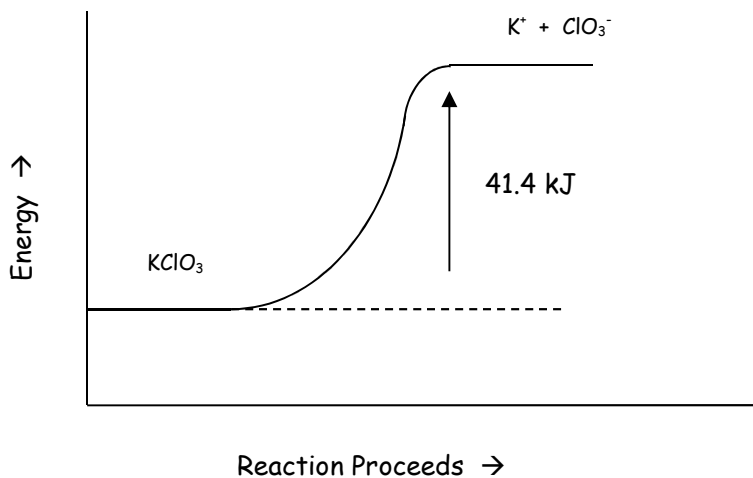
- *** If a reaction takes more energy to break bonds than it gives off to form bonds, then the reaction will require a **net** input of energy. ***

- *** If a reaction takes in less energy to break bonds than it gives off to form bonds the reaction will give off energy. ***

- An exothermic reaction **GIVES OFF ENERGY** (heat) to its surroundings. (energy on products side)



- An endothermic reaction **ABSORBS HEAT** from its surroundings. (energy on reaction side)



- Enthalpy, H, is the heat contained in a system.

- ΔH = change in enthalpy during a reaction.

- $\Delta H = H_{\text{products}} - H_{\text{reactants}}$ where $H_{\text{reactants}}$ is the energy of the reactants.
 H_{products} is the energy of the products.

- Endothermic - $A + 50 \text{ kJ} = B$



- Exothermic - $C \rightarrow D + 80 \text{ kJ}$



- *** Enthalpy can be + or - . We usually say + before - and if energy is on the left it is written before being on the right. So . . . + and energy on the left are both first and - and energy on the right are last. When energy is on the left (endothermic) ΔH is +. ***