

## Unit 5 Energy Changes

What is an exothermic reaction?	An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases
State examples and uses of exothermic reactions	Examples: Combustion, respiration, many oxidation reactions Uses: Hand warmers and self-heating cans
What is an endothermic reaction?	An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases
State examples and uses of endothermic reactions	Examples: thermal decompositions and the reaction of citric acid and sodium hydrogencarbonate Uses: Cooling sports injury packs
Define activation energy	The minimum amount of energy that particles must have to react

Draw and label the reaction profile for an exothermic reaction		Draw and label the reaction profile for an endothermic reaction	
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HT ONLY – Describe an exothermic reaction in terms of bond energies	The energy released from forming new bonds is greater than the energy needed to break existing bonds
HT ONLY – Describe an endothermic reaction in terms of bond energies	The energy needed to break existing bonds is greater than the energy released from forming new bonds

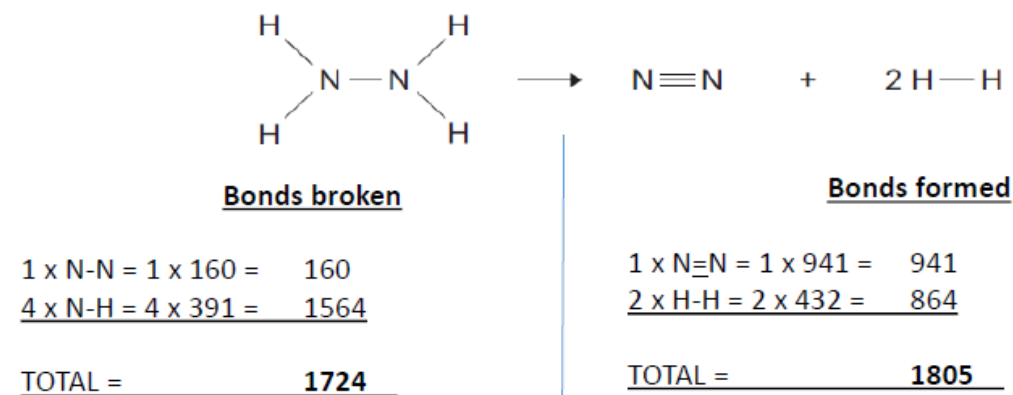
Breaking bond takes in energy therefore is endothermic reaction.  
Making new bonds releases (or gives out) energy therefore is exothermic.

Bond	Bond energy in kJ
N—N	160
N—H	391
N≡N	941
H—H	432

In exothermic reactions the energy released forming new bonds in products is greater than energy needed to break bonds in reactants.  
In endothermic reactions the energy needed to break bonds in reactants is greater than energy released forming new bonds in products

### Example

Calculate the overall energy change for the reaction using the diagram and the table of bond energies.



Overall energy change ( $\Delta H$ ) = Total energy taken in to break bonds – Total energy released forming new bonds  
 = 1724 – 1805  
 = **-81 kJ** (EXOTHERMIC since this is a negative value)