	Exothermic reactions	Endothermic reactions
	Gives out heat to surrounding, Products more stable than reactants	Takes in heat from surrounding, Products less stable than reactants
Enthalpy change ΔH – energy (in form of heat) exchanged with surrounding at constant pressure kJ/mol	Negative Standard enthalpy change, ΔH°, enthalpy change for molar amounts of substance under standard conditions enthalpy change of reaction, ΔH_r, enthalpy change for molar amounts of reactants when chemical reaction occurred. Enthalpy change of formation, ΔH_f, heat given out or taken in when one mole of substance is formed from its elements in their standard states. $\Delta Hr = \sum \Delta Hf\ (\text{products}) - \sum \Delta Hf\ (\text{reactants})$ Bond enthalpy – heat taken in when one mole of covalent bonds, in a gaseous molecule, is broken $\Delta Hr = \sum (\text{bond broken}) - \sum (\text{bond formed})$	Positive
Entropy, S J/Kmol	Gas>liquids>solid Depends on the number of ways the energy can be distributed among the particles	
Gibbs free energy, G, $\Delta G = \Delta H - T\Delta S$ Help us to determine if the process will be spontaneous	If $\Delta S > 0$ and $\Delta G < 0$ the process is spontaneous at any temperatures	If $\Delta S < 0$ and $\Delta G > 0$ the process is nonspontaneous at any temperatures

HW 7 **Collision theory**

Not every molecular interaction will result in a chemical reaction.

A + B = C.

A and B have to collide with each other in order for them to react. For the reaction to proceed and this collision to be successful, two conditions should be present: 1. The energy of this 'hit' (collision of the molecules) should be big enough, and 2. the molecules must have proper orientation. Not all collisions result in a reaction. The collision must involve more than a certain amount of energy, known as activation energy (Ea). A collision that results in a reaction is called an effective collision. We can activate molecules to increase the number of molecules fitted to do the reaction; for example, we can heat a flask.

Each chemical reaction has its own energy barrier (activation energy). The lower the energy, the faster the reaction will proceed. If the Ea is too high, there are no molecules in the system that are able to overcome the barrier, and the reaction will not occur."

Questions:

1. Imagine a planet where the activation energy (Ea) for any chemical reaction equals zero. Would life on the planet be possible? Explain your answer.

2. Consider two reactions: the combustion of methane and the corrosion of an iron pipe. Which reaction has a larger Ea? What do you think, and why?