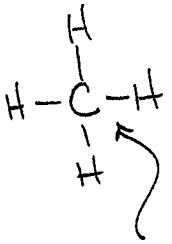
Chapter 6 Homework key

6.28 What is the difference between a calorie and a Calorie?

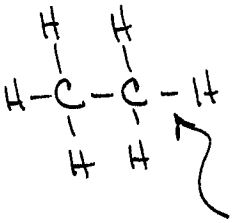
A Calorie is the unit used to measure energy in nutrition. 1 Calorie = 1000 calories.

6.42 Using the given bond dissociation energies, rank the indicated bonds in order of increasing strength.



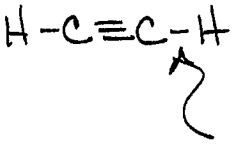
$\Delta H = +104$ kcal/mol

(2)



$\Delta H = +98$ kcal/mol

Weakest (3)

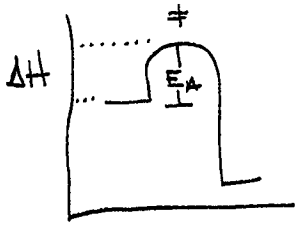


$\Delta H = +125$ kcal/mol

Strongest (1)

Bond dissociation is an endothermic process. It requires energy to break a bond.

6.58 Explain why a high energy of activation causes a reaction to be slow.



The activation energy is the energy barrier required for the reaction to proceed. The more energy required to get over the barrier, the ~~less~~ fewer molecules will have the required energy and the reaction will be slow.

6.74 Write an expression for the equilibrium constant for each reaction.

a. $HBr + H_2O \rightleftharpoons H_3O^+ + Br^-$

$$K = \frac{\text{Products}}{\text{Reactants}} = \frac{[H_3O^+][Br^-]}{[H_2O][HBr]}$$

b. $2HCl \rightleftharpoons H_2 + Cl_2$

$$K = \frac{[H_2][Cl_2]}{[HCl]^2}$$

6.80 Consider the following reaction:

$CO + Cl_2 \rightleftharpoons COCl_2 \quad K = 6.6 \times 10^{11}$

a. Write the expression for the equilibrium constant for the reaction

$$K = \frac{[COCl_2]}{[CO][Cl_2]}$$

b. Are the reactants or products favored in the reaction.

$K > 1$ therefore the numerator is larger and Products are favored.

c. Would you predict ΔH to be positive or negative?

A reaction which strongly favors products is most likely exotheric (but doesn't have to be).

ΔH for an exothermic reaction is negative $\Delta H = H_{prod} - H_{react}$

= Small value - large value

= negative value.

6.80 d. Are the products or reactants lower in energy?

If the reaction is exothermic than the products are lower in energy.

e. Would you predict this reaction to be fast or slow? Explain your choice

The reaction would most likly be fast due to the very large equilibrium constant.

6.86. Consider the exothermic reaction

$H_2 + I_2 \rightleftharpoons 2HI + \text{energy}$ ← Exothermic

what effect does each of the following changes have on the direction of equilibrium.

a. Decrease $[HI]$ ⟹ shift towards products

b. Increase $[H_2]$ ⟹ shift towards products

c. Decrease $[I_2]$ ⟹ shift towards reactants

d. Increase temp ⟹ Shift towards reactants

e. Decrease temp ⟹ Shift towards products

f. Increase pressure ⟹ No effect, both side 2 moles

* For gas rxn, pressure always shifts to side with lower total number of moles ⟹ Entropy effect.