Textbook Page 372 #1, 2, 4, 5, 6

1. (a) The reaction rate decreases when the acid is cooled to 1°C.

   (b) Stirring the mixture will increase the rate of reaction because stirring prevents localized decreases in acid concentration around the zinc where the acid is being consumed.

   (c) Increasing the concentration of the acid increases the reaction rate.

   (d) Using powdered zinc will increase the reaction rate because powdered zinc has a greater surface area in contact with the acid.

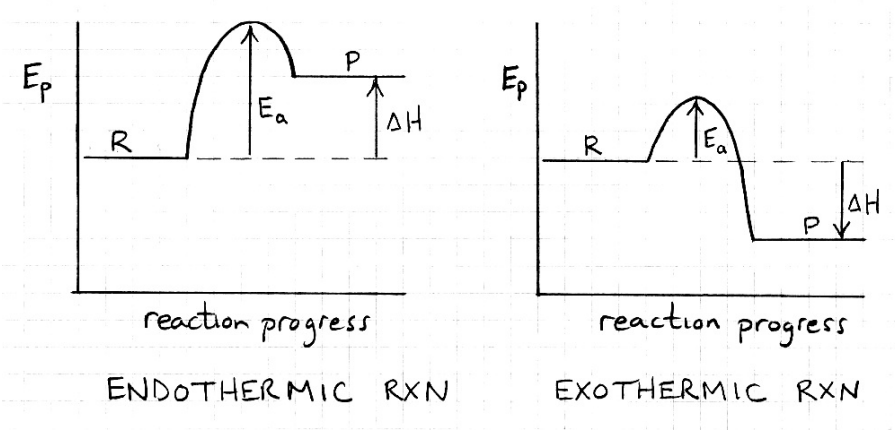
   (e) Carrying out the reaction in a darkened room will have no effect on the reaction rate.

2. (a) The collision theory states that chemical reactions occur because reactant molecules (atoms, ions) collide. During these collisions, old bonds break and new bonds form producing product molecules (atoms, ions).

   (b) Not every collision results in the formation of products because the orientation of the colliding molecules must be correct and the collision must be energetic enough to reach the activated complex.

   (c) Increasing the temperature of the reactants mean that the molecules (atoms, ions) are moving faster. Faster moving particles will collide more frequently. Faster moving particles will collide with more energy increasing the probability of reaching the activated complex.

4.



5. (a) A catalyst speeds up a chemical reaction without being consumed by the reaction. The catalyst provides an alternative reaction mechanism with lower activation energies.

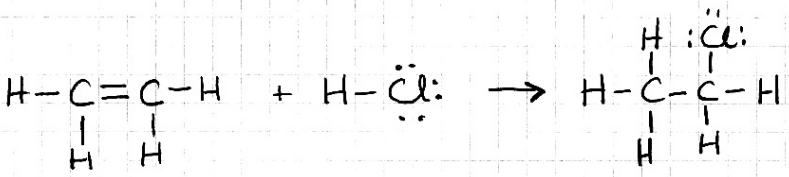
   (b) See (a).

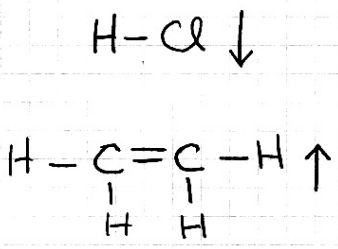
   (c) Manganese dioxide is a heterogenous catalyst.

   (d) Perform the reaction with and without manganese dioxide. Measure the reaction rate in each case — monitoring the rate at which oxygen is produced is probable the best way to do this. Recover the MnO_2 (filtering) to verify that none was consumed by the reaction.

6.

(a) $C_2H_4 + HCl \longrightarrow C_2H_5Cl$

(b) 

(c) 

(d)