Collision Theory Worksheet

1) Explain why all reactions have an activation energy, using your knowledge of collision theory.

2) Describe how the activation energy of a reaction affects the overall rate of the chemical reaction.

3) A rule of thumb used by organic chemists is that the rate of a chemical reaction can be doubled by increasing the reaction temperature by ten degrees Celsius. Explain this drastic increase in reaction rate using your knowledge of collision theory.

4) It has been observed that more gas station fires occur on hot days than on cold days. Explain this phenomenon using your knowledge of collision theory. (Hint: It's not just the temperature increase that causes this!)

5) It has been observed with one variety of paint that the rate of paint drying can be drastically increased by adding a small amount of "accelerant". Based on what you know of catalysts, is it reasonable to think of this accelerant as being a catalyst? Explain.

Collision Theory Worksheet Answers

1) Explain why all reactions have an activation energy, using your knowledge of collision theory.
All reactions have an activation energy because energy is required to make the reactants combine in a way that will cause the reaction. No chemical process can take place without having at least a little energy to get things started.

2) Describe how the activation energy of a reaction affects the overall rate of the chemical reaction.
The smaller the activation energy, the faster the reaction.

3) A rule of thumb used by organic chemists is that the rate of a chemical reaction can be doubled by increasing the reaction temperature by ten degrees Celsius. Explain this drastic increase in reaction rate using your knowledge of collision theory.
For many chemical reactions, the amount of energy available at room temperature is only slightly less than the activation energy for the reaction. By adding only a small amount of energy, you can get a huge increase in reaction rate because you add that last little bit of energy required to make the reaction proceed.

4) It has been observed that more gas station fires occur on hot days than on cold days. Explain this phenomenon using your knowledge of collision theory. (Hint: It's not just the temperature increase that causes this!)
The increased temperature itself plays a very small role – there is enough energy at even freezing temperatures for gasoline to burn easily. The reason more gas station fires occur at high temperatures is that the gasoline evaporates, and the vapor tends to explode. According to collision theory, this corresponds to an increase in concentration.

5) It has been observed with one variety of paint that the rate of paint drying can be drastically increased by adding a small amount of "accelerant". Based on what you know of catalysts, is it reasonable to think of this accelerant as being a catalyst? Explain.
No, because the accelerant is used up during the reaction.

