Catalysts

1. Name five factors that will affect the rate of reaction. Provide an example of each. Nature of reactants, temperature, surface area, concentration, catalyst.

2. Explain why if a lit match is applied to a lump of coal there is little effect, but if a lit match is applied to coal dust the result is an explosive reaction. There is more surface area in the coal dust for the oxygen to react.

3. The following reaction has a high activation energy, is exothermic, and self-sustaining.

$$2\ H_2\ (g) + O_2\ (g) \rightarrow 2\ H_2O\ (g)$$

Why is it unlikely the reaction occurs as a single step, and how can the reaction rate be increased?
Due to the high activation energy. A catalyst can be added to lower the activation energy therefore, a new mechanism will be the result.

4. How does a catalyst increase the rate of a reaction?
   It lowers the activation energy of the reaction by providing an alternate mechanism.

5. Indicate which of the following are heterogeneous or homogeneous catalysts.

   a) Rhodium and platinum metals are used in a car's catalytic converter to convert exhaust gases into safer gases.
   Heterogeneous
   b) Gaseous chlorofluorocarbons (CFCs) have been shown to catalyze the breakdown of ozone in the upper atmosphere.
   Homogeneous
   c) Aqueous sulfuric acid will catalyze the decomposition of aqueous formic acid into carbon monoxide and water.
   Homogeneous
   d) Powdered TiCl4 is used in the production of polyethylene polymer from gaseous ethylene. Heterogeneous