Chemical Reactions – Experiment # 31:
THE AMAZING SPARKING BALLS

Objective: To create an exothermic reaction by reacting aluminum and rust.

Materials:

- Two rusty iron balls about 2-3 inches in diameter (available from a scrapyard or junkyard)
- Aluminum foil

Safety Precautions: Wear safety goggles. Do this experiment away from flammable materials, since sparks are produced.

Procedure:

1. Wrap one of the rusty balls with a single layer of aluminum foil.
2. In a dark room, strike the foil-covered ball with the other rusty ball. Glancing blows in which the balls are struck together as they pass one another work better than direct blows.
3. Practice this technique until you are able to produce showers of sparks.

Explanation: This is a truly spectacular experiment that is worth the time it takes to find some rusty iron balls. The sparks are produced as a result of the reaction between the rust (Iron(III) oxide – Fe_2O_3) and the aluminum foil. Striking the two balls together produces sufficient frictional energy to initiate the reaction. The products are aluminum oxide (Al_2O_3), iron, and heat (which we observe as sparks). The balanced chemical reaction is as follows:

$$Fe_2O_{3(s)} + 2Al_{(s)} \Rightarrow Al_2O_{3(s)} + 2Fe_{(s)} + \text{heat}$$

This is an example of a thermite reaction, which is an extremely exothermic reaction between aluminum and certain metal oxides. Thermite reactions can generate temperatures up to 2200° C. This is hot enough to melt iron, which has a melting point of 1530° C. Thermite reactions have been used in welding, and to make fireworks, rockets, and bombs.