

Poppers

Design of Experiment

IB Chemistry 11 (Higher Level)



The technique of 'Design of Experiments' is a statistical approach to reaction optimization that allows the variation of multiple factors simultaneously in order to screen 'reaction space' for a particular process. Importantly, this enables the evaluation of a large number of reaction parameters in a relatively small number of experiments.

Murray, P. M.; Bellamy, F.; Benhamou, L.; Bucar, D.K.; Tabor, A. B.; Sheppard, T. D. *Org. Biom. Chem.*, **2016**, *14*, 2373-2384.

The rate (speed) of chemical reactions can be influenced by manipulating the conditions under which the reaction is done.

In this lab you'll be designing and carrying out a plan to test 3 variables and how they affect reaction rate.

- Temperature
- Concentration
- Surface Area

Materials:

Graduated Cylinder

Water

2 Alka-Seltzer Tablets (*this is ALL you'll get*)

Film Case (*with cover*)

Vinegar

Stopwatch

1. Your group is to carefully design 3 experiments.
 - (a) Effect of Temperature
 - (b) Effect of Concentration
 - (c) Effect of Surface Area
2. Each experiment should be designed to control all variables except the factor being examined.
3. Each factor should have at least 3 data points (i.e. 3 *trials*).
- 4. Write out your procedure for each experiment, then present your plan to me. Once you have my approval, you may proceed to data collection.**

Helpful Hint:

The volume of liquid in the canister cannot change, or you will be changing another variable - the space above the liquid where the gas will collect. This build up of pressure will cause the film case cover to “pop” off!

**** For this reason, wear splash goggles during the experiment.****