

# GETTING STARTED

## AN INTRODUCTION TO WHOOPS! UNEXPECTED DISCOVERIES IN CHEMICAL ENGINEERING

Science Alberta Foundation is pleased to make Whoops! Unexpected Discoveries in Chemical Engineering, one of our *Science-In-A-Crate* programs, available in your community!

Chemical engineering is often associated with fuel combustion and energy systems; however, today's chemical engineers are also spearheading new developments / advancements in materials, energy, manufacturing, consumer products, medicine, biotechnology, microelectronics, and environmental solutions. This crate will provide a window into the diverse world of chemical engineering, and introduce the notion that people working in the field of chemistry are part of a larger team working on industry related products.

Each of the activities in this crate is linked to a real chemical "engineer." The people and experiments highlighted in this crate represent a wide range of career possibilities available in the field of chemistry, illustrating that students can pursue a career in chemistry in many different ways. What each of the highlighted chemical "engineers" have in common is confidence in the process of inquiry along with knowledge of chemistry.

The other thing all of our highlighted chemical "engineers" has in common is that each has conducted a planned experiment that did not produce the hypothesized result. Rather, each "engineer" made a completely unexpected yet important discovery. (The 3<sup>rd</sup> activity is the exception. In this activity the "whoops" was made by a young boy; an example of a truly serendipitous experiment and discovery.)

Each activity has step-by-step instructions on how to complete the activity on the "What To Do" stand. You will need to provide students with paper towel at each station for clean up. All other materials are provided.

We have included a cleaning kit with this crate. **PLEASE MAKE SURE ALL MATERIALS ARE RETURNED CLEAN AND DRY.**

This activity guide provides all the information you need to set up the crate and have your students successfully complete each activity. An introductory script found in this guide may help you set the scene for the crate. Also, specific materials lists and set-up instructions can be found for each of the seven activities in this guide. Activities are designed so they can be used as stations in your class. Activities do not need to be completed in order.

The activities are design to be self-directed and students are encouraged to work independently as a group. The crate is designed for your class to be divided into seven groups. Each group will complete the activities and answer the questions provided in the student Lab Book. A black line master is provided at the end of the activity guide so you can photocopy it for each student. An Answer Key is also provided for your assessment of the Lab Books.

Students are also indirectly exposed to many careers that require a working knowledge of chemistry. Such careers are discussed in a later section of this Activity Guide.

The activity topics are as follows:

<b>Activity</b>	<b>Topic</b>
1 Silly Mixture Mysteries	Students use a magnifying lens and microscope to examine, recognize, and identify examples of different kinds of mixtures. They then apply their knowledge of mixtures to examine two mystery samples and determine if the mystery samples are true mixtures.
2 Sneaky Sand	Students are presented with a variety of equipment and tasked with designing a technique, then applying and evaluating their technique for separating sand from water based on hydrophobic and hydrophilic properties.
3 Deconstructing Popsicles®	Students look at common ingredients found in frozen treats and distinguish which ingredients will dissolve in a liquid from those that will not. Students then use chromatography as a way to recover different food colourings from three melted frozen treats.
4 Fool's Gold?	Students recreate Archimedes' "Eureka" moment by conducting an experiment designed to determine the volume and density of three "gold" objects. The experiment is based upon the interaction of water with other solids.
5 What a Gas!	Students use universal pH indicator to identify two different solutions as acidic or basic. Students then combine their two solutions to produce carbon dioxide gas, and demonstrate that it is different from air using a digital CO <sub>2</sub> gas sensor.
6 Chew on This!	Breakfast. Students examine what happens when they chew a cereal flake, and distinguish reversible from irreversible changes in the piece of cereal.
7 Chemical Reaction Detectives	Students complete three mini experiments; two are examples of chemical reactions, one is not. Students act as chemical reaction detectives, and examine the clues to determine which experiments are which.