Module 1: What is Chemistry?
Topic 1 Application: Nuts and Bolts Scientific Investigation

Before you begin the scientific investigation below, make sure to download the Nuts and Bolts Scientific Investigation Report. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental Module.

Introduction

All matter can be classified as either a mixture or a pure substance. A pure substance can only contain one type of matter. Copper, is a pure substance because it is an element. Carbon dioxide is also a pure substance because it contains carbon and oxygen bonded together to form a molecule. Air contains many different gases and is therefore a mixture. Sometimes, chemists use other items to represent or model matter in their experiments and studies. The idea behind this scientific investigation is that one item - in this case, one nut, one bolt or one washer - represents one type of atom. From there, the combinations of the items represent different situations to classify. Some will be mixtures; some will be pure substances.

Objectives

In this scientific investigation, you will:

- explore models of different types of matter.
- analyze and interpret the composition of matter to classify it.

Hypothesis

Using the Procedure and Data Collection section below, read through the procedural information for this scientific investigation. After considering the Procedure and Data Collection section, develop your own hypotheses which describe your expected results. Specifically, how do you think mixtures and pure substances will be represented using the items in the simulation (i.e. nuts, bolts, and washers). Record your hypotheses in the Hypothesis section of your Nuts and Bolts Scientific Investigation Report.

Required Simulation

Nuts and Bolts Interactivity Simulation

Procedure and Data Collection

1. Access the Nuts and Bolts Scientific Investigation interactivity.
2. Using the interactivity, click on the tab for Petri Dish 1. Using the Data section of your Nuts and Bolts Scientific Investigation Report, record what you observe in the image provided in row one of the data table.
3. Repeat Step 2 for each of the ten Petri dish images in the interactivity.

Data

Use the notes area and data table in the Data section of your Nuts and Bolts Scientific Investigation Report to record your data from this scientific investigation. The data table is also shown below:

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	List Types of Matter Present (Atoms and/or Molecules)	Mixture or Pure Substance	If it is a pure substance, is it an element or a compound?
Example	1 type of atom (washers) 2 types of molecules (nut/bolt and bolt/washer)	Mixture	N/A
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Data Analysis

In the Data Analysis section of your Nuts and Bolts Scientific Investigation Report, provide responses to the following questions based on the data you collected throughout the simulation. Make sure to completely answer each question.

1. What is the difference between a pure substance and a mixture? How were they represented in this scientific investigation?
2. What is the difference between an element and a compound? How are they similar? How were they represented in this scientific investigation?

Conclusion

Using the Conclusion section of your Nuts and Bolts Scientific Investigation Report, compose three to four sentences describing an overall conclusion based on your data. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your simulation experience to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

Experimental Sources of Error

On your Nuts and Bolts Scientific Investigation Report, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?

Once you have completed the Nuts and Bolts Scientific Investigation Report, please submit your work to the dropbox.