

Intensive/Extensive Properties

Introduction

An important distinction in science is between intensive and extensive properties. Intensive properties are things that are in a substance no matter how much of it you have. For example, the density of a pure, homogeneous substance is the same whether you have 1 kg, 2 kg, 10,000 kg, or 10^9 kg. Intensive properties can't be added or subtracted when you add or take away some of the substance.

Extensive properties depend on how much of a substance you have. For example, an extensive property is length. An object 5 cm long is shorter than an object 10 cm long and if you lay each one end to end you have a total length of 15 cm. The same could be said of area, volume, and mass. Adding 24 g to 48 g gives you 72 g. Always ask yourself whether a property is extensive or intensive before trying to add to or subtract it from other data!

Group Activity

Make a list of properties under the following two headings, use your book as a guide:

Intensive Properties

Extensive Properties

Fill a 1000 mL beaker with water so that it reaches to about 800 mL. Take the temperature of the water and write it here:

Separate the water into three portions by pouring a third of it into each of two 300 mL beakers. The third portion will stay in the original beaker. Take the temperature of the water in each beaker. Find the approximate volume in each beaker and write your data here:

Add the volumes:

Add the temperatures:

Temp: 1)	2)	3)
Vol: 1)	2)	3)

Which of the two previous additions makes sense? Why?

Does the temperature you find by adding all three temperatures together equal the temperature of the original beaker?

What information do you get by adding the volumes of the separated liquid?

What information do you get by adding the temperatures of the separated liquid?