

## Experiment C-29 Relative Humidity Conditions



### Objectives

- To learn about factors that affect relative humidity.
- To decrease the relative humidity in a box by means of a hygroscopic material to understand this phenomenon.

### Modules and Sensors

- PC + NeuLog application
- USB-200 module 
- NUL-207 Relative humidity logger sensor 

### Equipment and Accessories

- |  |
|--|
| ▪ Perforated box (Vacuum box)          |
| ▪ Sample container                     |
| ▪ Cable holder                         |
| ▪ Sealing stickers                     |
| ▪ 12 g of silica gel (yellow to green) |

- The items above are included in the NeuLog Environmental chamber kit, HUM-KIT.

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## Introduction

Relative humidity is the most common way for describing atmospheric moisture, but it does not describe the actual amount of water vapor in the air. Instead, it indicates how close the air is to being saturated. The relative humidity (RH) is the ratio between the amount of water vapor actually in the air, and the maximum amount of water vapor required for saturation at that specific temperature (and pressure).

Silica gel is a hygroscopic material (captures water). It is a granular and porous form of silicon dioxide. In spite of its name, silica gel is a solid. It is usually found as small spheres packed in breathable bags. In this form, it is used as a drying agent to control local humidity and avoid deterioration of goods.

In this experiment we will use silica gel in order to observe changes in relative humidity.

## Procedure

### Experiment setup

#### Caution:



It is recommended to wear personal protective equipment. Material Safety Data Sheets (MSDS) are available online.

1. Set up the experiment as shown in the picture below.



2. Make sure you have a sample container with 12 g of silica gel (around 4 teaspoons). Before you start the experiment, keep the container closed.
3. Place the relative humidity sensor connected to the USB-200 module in the perforated box (an RF module can be used instead of the USB-200 module in a sealed box).
4. Insert the USB cable into the cable holder and place the cable holder in the hole that is on the lid of the box. The cable holder will seal the box.
5. Connect the USB cable to the USB-200 module.

## Sensor setup



6. Connect the USB-200 module  to the PC.
7. Check that the relative humidity sensor  is connected to the USB-200 module.

### Note:



The following application functions are explained in short. It is recommended to practice the NeuLog application functions (as described in the user manual) beforehand.

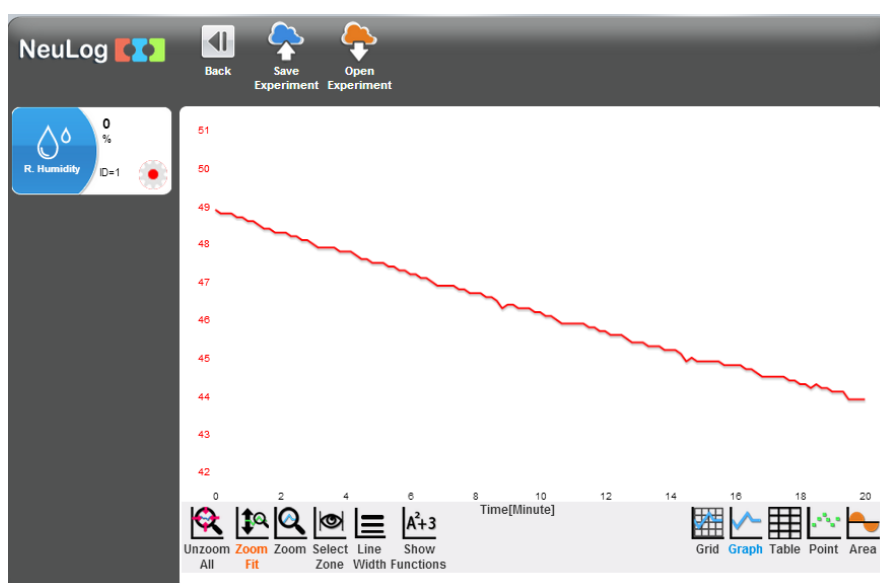
8. Run the NeuLog application and check that the relative humidity sensor is identified.

## Settings


9. Click on the **On-line Experiment** icon  in the NeuLog main icon bar.
10. Click on the **Experiment Setup** icon  and set the:  
Experiment duration to 20 minutes  
Sampling rate to 6 per minute

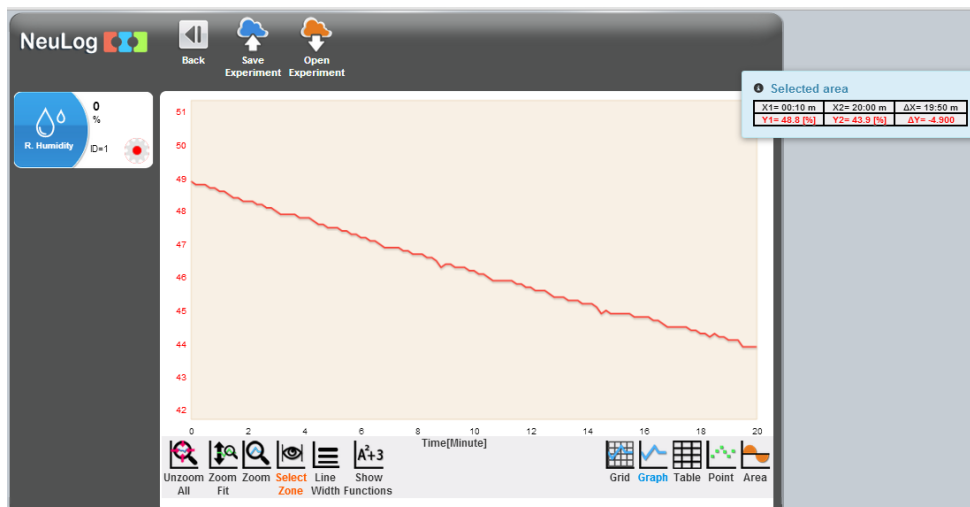
## Testing and measurements

11. Open the sample container and place it in the box. Close the box as quickly as you can and make sure it is sealed.
12. Click on the **Run experiment** icon  to start the measurement.
13. Click on the **Zoom fit** icon .
14. Your graph should be similar to the following:



15. Save your graph.
16. We can see that the silica gel captured water molecules from the air and the relative humidity in the box decreased.

17. In order to calculate the relative humidity change, click on the **Select Zone** icon  and move the two cursors to the beginning and end of the measurement.



Selected area		
X1= 00:10 m	X2= 20:00 m	$\Delta X= 19:50$ m
Y1= 48.8 [%]	Y2= 43.9 [%]	$\Delta Y= -4.900$

18. Look at the data in the table on the right, the relative humidity decreased from 48.8 % to 43.9% (a 4.9 % decrease). In order to reach stabilization, a longer measurement is required.

## Summary questions

1. Give two more examples of hygroscopic materials.
2. Point out another way to change relative humidity.