Dear Chemistry 103 On-Line Students,

The following is a sample report for the first experiment of the second laboratory experience for this course. I believe it is a good example of how your lab reports should be written, both in content and format. I did not include the second experiment, because I felt it would not add anything, as far as providing you, the student, with a sample. As you look over the following sample report, note at the top of the first page I include the instructor’s name, the student’s name, their 4-digit code for posting scores, and the date. Then, you need to include the name and number of the course, term/semester, year of the course, and the number of the laboratory.

Following this information, you should include sections in your report for the purpose of the experiment, the materials you used, the procedure you used, your experimental observations, your explanation of your results and observations, and the web search info. In addition, if there are any questions posed to you in the lab directions, make sure you answer those questions in your report.

Note: If you wish, you may copy the purpose of the experiment from the lab directions into your report, or you may change it and place it in your own words. And, this is about the only item you should copy and paste from the lab directions.

The next section lists the materials you used to do the experiment. I give you a list on the lab directions of the items you need, but you may always improvise. So, in this section tell me what you actually used to do your lab experiment.

Your procedure section should be next. In this section, you tell me how you actually did the experiment and you may list any observations you may during the experiment in this section, if you wish. Again, in the directions for the lab, I tell you the procedure to use, but how you actually do the experiment and what you observe can vary some from the lab directions. Remember that I am not there with you doing the experiment and the only way I will know what you did and what you experienced is by you telling me about it in your lab report.

In the results section, you should tell me what the results of your experiment were, what observations you made, and anything else pertinent for the person reading your report to know about what you did, the results you obtained, and what you observed.

In most cases, I will ask you to search the Web and find additional information regarding the experiment you did. Hopefully, from what I have written in the lab directions, and what you find on-line, you will be able to write an explanation of your results and observations. In the lab directions, I usually tell you what to expect and a simple explanation of why. The main reason I do this is because I am not there with you and assisting you with your lab, and so students feel comfortable with their results and observations. However, this section should be written by you and it should not be my words copied from the lab directions, and it should not be whatever you found on-line directly. Your report should be in your own words. Use the resources available to you in order to better understand your experimental results and observations, and to explain them to others.

Some students like to combine the explanation of results and the Web search into one section and others write two separate sections. You should do whatever makes sense to you when you are writing your report. Please look at this sample lab report for Lab #2 and let me know if you have any questions about content or format. And, the sample of content and format listed below can be used to assist you in writing the lab reports for Lab 2 to Lab #10.
Purpose: I am doing these experiments to better understand the differences between physical changes and chemical changes. I remember we went over and discussed physical and chemical changes in Chapter 3 of the text and the instructor’s corresponding lecture notes, DVD material, and Chapter 3.

Experiment 1 of Lab 2: Physical Change

Purpose: In the first experiment, I am going to observe a physical change, the lowering of the freezing point of water by adding salt to an ice water solution.

Materials: From the photo below, you can see the items I used for this experiment. In the lab directions, I was asked to use a small metal can, and as you can see I was able to use a Campbell’s Cream of Mushroom soup can. I used an outdoor thermometer, one that has Fahrenheit and Centigrade scales, water, crushed ice, and I used a lot of salt. The directions said to use a tablespoon or 2 of salt. I used about 2 tablespoons for my container.
Procedure:

1) I filled my soup can about three fourths of the way full with the crushed ice.

2) I added cold water to the soup can and made sure to cover all of the crushed ice I had in it. I stirred the ice and water a quite a few times to make sure that the ice water was at a constant temperature.

3) I placed my outdoor thermometer in the ice water in the container to measure the temperature of the ice water mixture.

4) I waited a couple of minutes and kept stirring the ice water mixture to make sure the temperature was constant. After this time, I measured the temperature of just the ice water mixture, without the salt added. You can see the temperature of the ice water solution in the photo below.

![Temperature of ice water mixture](image1)

After about 120 seconds: 34 °F = 1.1 °C (no salt)

5) I removed the thermometer from the ice water solution and added about 2 tablespoons of salt to the ice water solution. I stirred this really well to dissolve as much of the salt in the ice water.

6) After stirring for a couple of minutes to make sure I had the salt mixed in the ice water and the solution was at a constant temperature, I placed the thermometer back in the ice water with salt solution and waited for a minute or so before reading it. I read and recorded the temperature of the salt-ice water solution.

![Temperature of salt-ice water solution](image2)

After about 120 seconds: about 28 °F = -2.2 °C (salt added)
Results: As the lab directions hinted, I saw a significant decrease in temperature. The temperature went from 34 °F to 28 °F, or a 6 °F change. In centigrade, this went from 1.1 °C to –2.2 °C, or a 3.3 °C change. I am not sure if I had used a different container or more salt if the results would have been more dramatic, but I did see a definite and significant decrease in the temperature when I added the two tablespoons of salt to the ice water solution. When I poured out the ice water solution with the salt in it, I noticed I still had un-dissolved salt in the solution. I thought I stirred this really well, though when I saw the salt in the bottom of the container, I am not sure if I did not stir it enough or if I could not get any more salt dissolved in the ice water.

Web Search and Explanation of Results: I was able to find a couple of really cool web sites, which discussed something called Freezing Point Depression. Basically, these sites discussed this phenomenon and said that adding another substance to the ice water will interfere with the water molecules getting close enough together to freeze, which lowers the freezing point of a solution, such as ice water. They talked about the fact that the salt particles will get in the way of the water coming together to freeze and so it takes more energy to freeze the water and thus the freezing point is lowered. The really cool part was if more salt is added, then the freezing point is even lower. The freezing point is directly proportional to the number of particles added, in this case, salt. So, if I had added even more salt, I would have observed the freezing point or the temperature of the salt and ice water solution go down even lower. There are some very common and practical uses of the freezing point depression. They also talked about the fact that this works for other solutions and other substances. What I mean is that we would observe the same type of thing occurring with ice water if we used a different substance than salt. We would see the lowering of the freezing point of ice water if we added a different type of substance to the ice water than salt. And, this will also happen for other solutions. For example, if we had rubbing alcohol at its freezing point and added something that could be dissolved in the rubbing alcohol, then we would observe a lowering of the freezing point of rubbing alcohol.

The addresses to the couple of web sites I visited are listed below. They really helped me better understand what I observed in this experiment and I was much more confident in my ability to explain what happened and why it happened after reading the information and examples at these web sites.

http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/meltpt.html


I grew up in Montana and where I lived it snowed a lot and there were times where there was a significant amount of snow on the roads and sidewalks, and sometimes they were covered with ice. After a big snowfall, there were snowplows that went around and scraped all of the snow off the roads and there were other worked that cleared the snow off the sidewalks. But, it was impossible for them to get all of the snow off the roads and sidewalks, and in some cases there would be ice under the snow on the roads and sidewalks. After the plows went through and cleared the roads, they were followed by large trucks, which poured salt on the roads and spayed it up on the public sidewalks downtown. So, even if there was some snow and ice left after the initial clearing, they were able to melt the rest of it by the very light covering of salt.

I also remember another use of ice in salt water from when I was a kid. During the summer, we always had some great parties at our house. We had our family and most of my parent’s brothers and sisters and their kids lived in the same town. It seemed like every couple of weeks, we had aunts and uncles and cousins coming over to our house for a big barbecue. The adults would hang out and play cards or games,
have great food, drink beer, and just have a great time enjoying each other’s company. And, all of the other kids and me would run around and play. We had so much property on the ranch and there were always things for us to get into. But, the favorite time of all this was making homemade ice cream. We had some of the best ice cream, but I remember all the work of cranking the crank on the ice cream maker. The ice cream maker had a wooden bucket and inside the wooden bucket would sit the metal container that had all of the fixings for the ice cream. There was space between the metal container and the wooden bucket. I remember my Dad adding ice, some water, and rock salt to this space and at the time I didn’t know why he added the rock salt. But, now I know that the rock salt lowered the freezing point of the ice water to less than the normal freezing point of 32 degrees F and this is why we were able to make the ice cream. The salt made the temperature of the ice water mix low enough to freeze the cream and the other items in the metal container as you turned the crank. I remember how you could tell when you were getting close to having the ice cream ready to eat because it would get so hard to turn the crank. The cream and other items would get so thick as they froze, as a little kid I would not be able to turn the crank when this happened.

I really enjoyed this experiment a lot and now I have a better understanding of why adding salt to snowy and ice covered roads helps to melt it. That is, the freezing point becomes lower with the salt and now the outside temperature is not cold enough to keep the snow or ice from melting. This is definitely a physical property of water since we were just observing a change in the freezing point of water and we were not having a chemical change occur.