CHEMISTRY /PHYSICS LAB REPORT RUBRIC – 50 Points

The purpose of a lab report is to tell the reader about your scientific investigation; specifically, why you did it and what you learned. There is an example of a well written lab report at the end of the rubric.

Organization (5 points)

The report should be typed. Pages will be double spaced, have one inch margins on all sides, font style will be simple and clean, and font size will be 11 or 12 point. The report should be broken into the following 7 sections: 1) Title Page, 2) Introduction, 3) Equipment & Materials, 4) Procedure, 5) Data, 6) Data Analysis, and 7) Conclusions. With the exception of the title page, the other sections should be titled using bold type. The Introduction section should be at the start of a new page. Each subsequent section should start after the end of the previous section, but do not have the section title at the bottom of one page and the start of the section on the next page.

5.0 pts – all requirements met.

4.0-4.9 pts – one or two requirements not met.

3.0-3.9 pts – most of the requirements met.

0.0-2.9 pts – less than half of the requirements met.

Grammar & Sentence Structure (5 points)

Scientific reports are written in passive, past tense format. For example, instead of writing "we dissolved 5 grams of sugar in 250 mL of water" you would write "5 grams of sugar were dissolved in 250 mL of water". The report should be written with correct grammar and sentence structure.

5.0 pts – Report is written in the passive, past tense and grammatical and sentence structure errors do not detract from the readers understanding of the report.

4.0-4.9 pts – grammatical and sentence structure errors do not detract from the readers understanding of the report, but the report is not written in passive, past tense.

3.0-3.9 pts – grammatical and sentence structure errors detract from the readers understanding of the report or the report is not written in passive, past tense.

0.0-2.9 pts – grammatical and sentence structure errors do not detract from the readers understanding of the report and the report is not written in passive, past tense.

Title Page (1 point)

Use 14 or 16 point font. This should include the title of your experiment, the course title, your period, school name, the date, and names of all the lab partners. The title should be descriptive of the experiment and may be a few or several words long. The lab partner who compiled the lab report should have their name listed first. This is the person I'll talk to if I have questions about the report.

1 pt – all requirements met

0 pts – all requirements not met

Introduction (4 points)

This section will tell the reader about the research questions (RQs) of the experiment and your hypotheses for the experiment. An RQ is a scientific question you are trying to answer by doing the experiment. It is the reason for doing the experiment or investigation. An experiment may have one or more RQs. A hypothesis is an educated prediction and explanation of the outcome of the investigation. You should have a hypothesis for each RQ and your should explain why you predicted this outcome.

4.0 pts – RQs are accurately defined and the hypotheses are explained well and connected to the RQs.

3.0-3.9 pts – RQs are accurately defined and the hypotheses are connected to the RQs, but are not explained well.

2.0-2.9 pts – either the RQs are inaccurate or the hypotheses are not connected to the RQs.

0.0-1.9 pts – the RQs are inaccurate and the hypothesizes are not explained well and are not connected to the RQs.

Equipment & Materials (2 points)

This is a simple, bulleted list of all of the materials used in the lab. It should be: 1) specific (i.e. 10 ml graduated cylinder NOT graduated cylinder), 2) use the correct scientific terms, 3) complete and 4) someone who has not done the experiment should be able to read your list and know exactly what they need to perform the experiment.

2.0 pts – all requirements met.
1.5-1.9 pts – some requirements not met.
1.0-1.4 pts – most of the requirements met.
0.0-0.9 pts – less than half the requirements met.

Procedure (2 points)

This is the set of step by step instructions for performing the experiment. It is like a recipe in cooking. 1) The steps should be numbered, 2) written in full sentences, and 3) they must be detailed enough that someone who has not done the experiment should be able to read your procedure and perform the experiment.

2.0 pts – all requirements met.
1.5-1.9 pts – some requirements not met.
1.0-1.4 pts – most of the requirements met.
0.0-0.9 pts – less than half the requirements met.

Data (8 points)

This section includes all your data from the experiment. Your data, whether they are quantitative measurements or qualitative observations, should be presented in tables. Each table should be numbered and include a descriptive title, i.e. Table 1 – Solubility of Sugar at Various Temperatures. All tables must be accurately and clearly labeled. You must include units in your column headers and your data must be reported in significant figures.

8.0 pts – all requirements met
7.0-7.9 pts – one or two requirements not met
5.0-6.9 pts – most requirements met
0.0-4.9 pts – less than half the requirements met

Data Analysis (8 points)

This section is where you crunch the numbers from your experiment to support your conclusions. It consists of any graphs, percent error measurements, statistical data, or other calculations as required by the lab. All numbers should be in significant figures and with proper units. All results should be clearly set off from the equation and underlined or boxed for extra clarity. In instances when calculations are performed multiple times you should only show one example for each type of calculation. The results should be summarized in a results table. Each table should follow the same format used for data tables. Each graph should be numbered and include a descriptive title, i.e. Figure 1 – The Effect of Temperature on the Solubility of Sugar.

8.0 pts – all requirements met
7.0-7.9 pts – one or two requirements not met
5.0-6.9 pts – most requirements met
0.0-4.9 pts – less than half the requirements met

Conclusions (15 points)

In this section you 1) answer the research questions of the experiment, and 2) discuss the errors and/or limitations of your data. Your answers to the RQs must be supported by your data. For each answer, you must clearly reference specific data and logically explain why it supports your answer. For the second part of this section you should discuss: 1) specific errors you may have made and how they affected your data, 2) limitations of the experimental design, lab equipment and/or measuring devices and how they affected your data; and 3) what you would change the next time to improve the experiment.

15.0 pts – all requirements met
13.5-14.9 pts – one or two requirements not met
9.0-13.4 pts – most requirements met
0.0-8.9 pts – less than half the requirements met

Intermolecular Forces

Lab Report

48.5/50

Absolutely awesome!

Chemistry

Period 8

Annville-Cleona High School

Lab Partners: [redacted]

Instructor: Mr. Good

Title 1/1

Org 5/5

Grammar 5/5

Experiment Performed: April 5th, 2013

Report Written: April 21st, 2013

Introduction

4/4

Excellent hypotheses and supporting rationale

In this investigation there was an attempt to further understand which molecular forces were stronger by observing the surface tension and melting point of various substances. Solids and liquids were used which had each of the intermolecular forces as their strongest force. It was hypothesized that London dispersion forces would be the weakest due to the fact that they are only temporary forces and the rest are permanent. It was also thought that dipole-dipole attraction would be stronger than hydrogen bonding simply because it seemed that vegetable oil would have higher surface tension than water. Finally, it was thought that ionic bonding would be the strongest force because it has a very high difference in electronegativities between the individual atoms and the creation of full charges.

Equipment and Materials

2/2

- Toluene
- Vegetable Oil
- Water
- Paraffin Wax
- Para dichlorobenzene
- Sugar
- Salt
- Bunsen Burner
- Pennies
- Scupula
- Ring Stand
- Paint Can Lid

Procedure

2/2

1. Place pennies heads up on paper towels.
2. Drop one of the liquids onto the penny at close range one drop at a time.
3. Record number of drops held before liquid bursts.
4. Clean penny and repeat steps 2 and 3 for two more trials.
5. Repeat steps 1-4 with other two liquids.

6. Gather samples of each solid with scupula and place equidistant from center of paint can lid.

7. Place on ring stand and allow Bunsen burner to heat solids.

8. Record times at which solids melt.

9. Cool off paint can lid and ring stand and repeat for two additional trials.

Data **8/8**

Excellent data tables!

Table 1 – Surface Tension in Liquids with Various Intermolecular Forces

Liquid	Intermolecular Force	Trial 1 (# of drops)	Trial 2 (# of drops)	Trial 2 (# of drops)
Toluene	London Dispersion Forces	9	8	7
Vegetable Oil	Dipole-Dipole Attraction	22	19	18
Water	Hydrogen Bonding	32	27	31

Table 2- Melting Time of Solids of Various Intermolecular Forces

Solid	Intermolecular Force	Trial 1 Time (s)	Trial 2 Time (s)	Trial 3 Time (s)
Paraffin Wax	London Dispersion Forces	12	16	18
Para dichloro-benzene	Dipole-Dipole Attraction	59	29	43
Sugar	Hydrogen Bonding	112	110	77
Salt	Ionic Bonding	Over 120	Over 120	Over 120

8/8

Excellent graphs they quickly and clearly tell the story of your data!

Data Analysis

Figure 1 - Surface Tension in Liquids with Various Intermolecular Forces

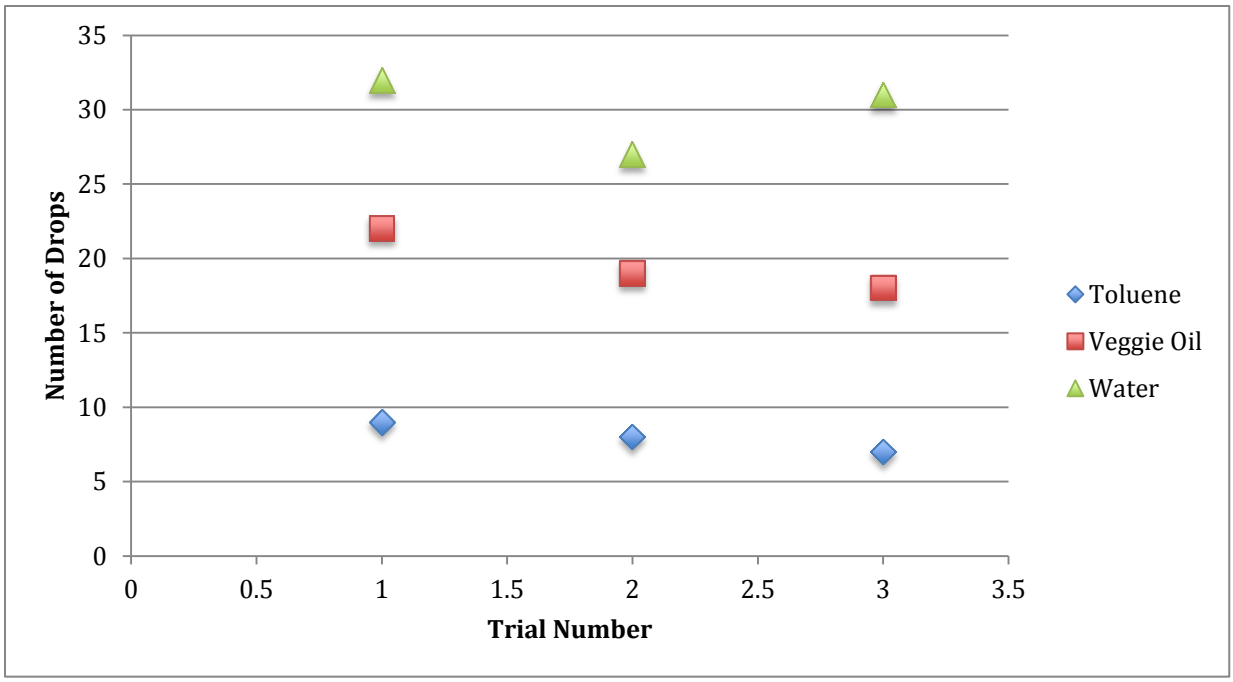
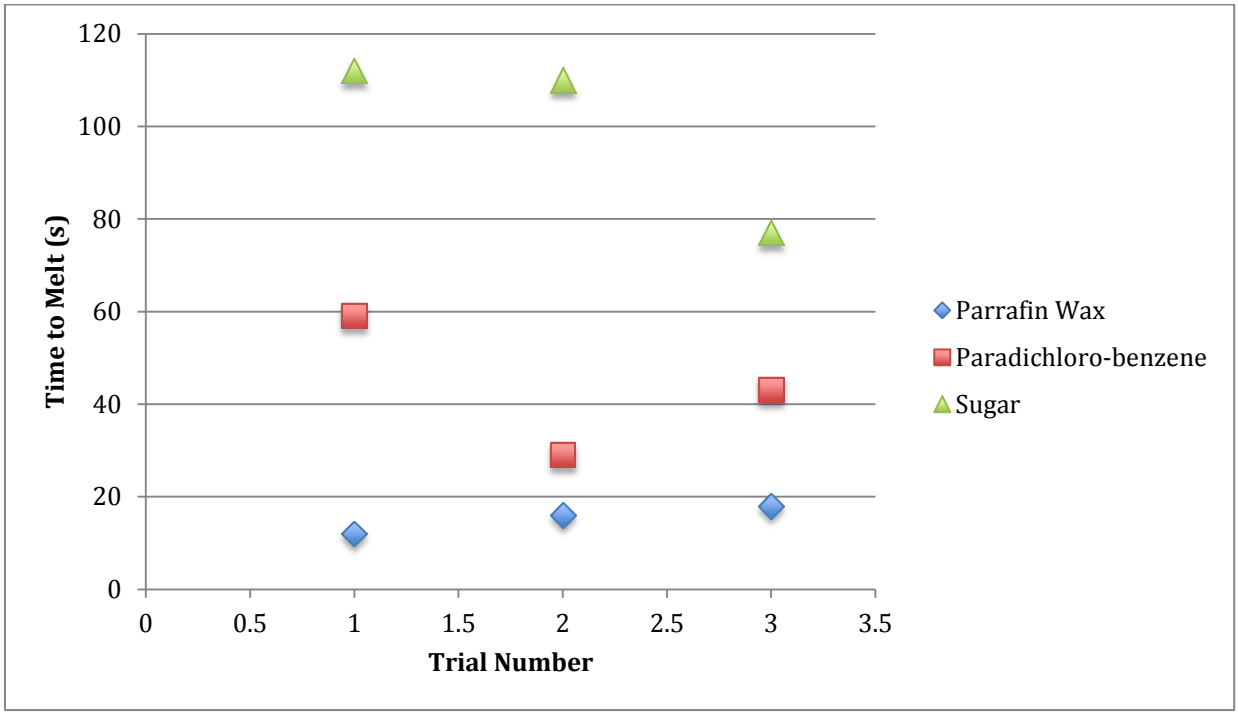


Figure 2 – Melting Time in Solids with Various Intermolecular Forces*



*Salt was not included due to its melting time not actually being found

13.5/15

Very good discussion of results, specifically using your numerical data in the discussion would have made it a better discussion. Good error analysis.

Conclusion

The hypotheses were partially correct. The liquid with London dispersion forces as its strongest intermolecular force had the lowest surface tension as shown in Figure 1, and the solid with London dispersion forces as its strongest intermolecular force melted in the shortest time. The next weakest force was dipole-dipole attraction. This was contrary to the hypothesis, which predicted hydrogen bonding to be weaker a weaker force than dipole-dipole attraction. The substances with hydrogen bonding had higher surface tensions (see Figure 1) and longer melting times (see Figure 2) than the substances with dipole-dipole attraction, which proves that hydrogen bonding is stronger than dipole-dipole attraction. Ionic bonding was correctly predicted to be the strongest intermolecular force. Table 2 shows that the salt, which has ionic bonding as its strongest intermolecular force, did not melt within 120 seconds.

From this lab it was learned that ionic bonding is the strongest intermolecular force, followed by hydrogen bonding, dipole-dipole attraction, and London dispersion forces. The degree to which each is greater than the others was also discovered, and this was employed in the worksheets and problems we did in class.

Possible sources of error in the lab were the inability to keep the Bunsen burner at the same temperature for each trial, and the inability to get even sized drops from the dropper. A method could have been devised to calculate and calibrate the temperature of the Bunsen burner, and we could have recorded the amount of liquid in the dropper before and after each trial so that units could have been used as well.