\documentclass{article}

%Float & Graphics

\usepackage{float}

\usepackage{graphicx}

%Chemistry Equations

\usepackage [version = 3] {mhchem}

%Document

\begin{document}

\begin{titlepage}

\title{Solubility of \ce{C\_{12}H\_{22}O\_{11}\_{(s)}} and \ce{NaCl\_{(s)}} in 50 mL of \ce{H\_2O\_{(l)}} at $25^o C$ and $100^o C$ in 1 ATM}

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\date{1-8-2014}

\maketitle

\thispagestyle{empty}

\end{titlepage}

\setcounter{page}{1}

%Sections

\section\*{Abstract}

\pagebreak

\section\*{Introduction} %Introduction

\subsection\*{Purpose} %Purpose

The purpose of this experiment was to determine the solubility of Sucrose and Sodium Chloride, by adding the solutes into water, until even after vigorous and prolonged stirring, the solute remained undissolved.

\subsection\*{Background} %Background

For the purposes of this experiment, only two types of bonds will be discussed: ionic and polar-covalent. Ionic bonds, generally, occur between metals and nonmetals; furthermore, between atoms with low and high electronegativity's. Polar-covalent bonds occur between two non-metals and generally occur with atoms of varying electronegativity's. These two types cause compounds to have certain, very different, properties. \\\\

%Ionic Bonds

In an ionic bond molecules are not shared, they are transferred from the least electronegative molecule to the most electronegative molecule. There is an electrostatic attraction between the oppositely charged ions. Cations and an anions are formed due to this process. \\\\

%Properties of Ionic compounds

Ionic compounds have high melting and boiling points as the molecules are arranged in a crystal lattice. Most ionic compounds, in the solid state, form crystals. Ionic compounds do conduct electricity, only if the ions in the compound are free to move; therefore, ionic compounds conduct electricity only when they are dissolved in water or melted. If an ionic compound is soluble in water, a salt forms when the compound reacts with an alkali in an acid reaction. \\\\

%Polar-covalent Bonds

Polar-covalent bonds are a particular type of covalent bonds. Polar covalent bonds are covalent bonds with two different non-metals, which unequally share electrons between them. In a polar covalent bond, the electrons shared by the atoms are attracted to the more electronegative molecule; therefore, the less electronegative molecule has to share its electrons to satisfy the needs of the more electronegative molecule: having a full outer shell (octet). Polar-covalent bonds have different molecular geometry's depending on the electronegativity's of the molecules in the compound. \\\\

%Properties of Polar-covalent Compounds

Polar-covalent compounds have low melting points- relative to ionic compounds. Polar-covalent compounds, however, have higher melting points than non-polar covalent bonds. They are generally poor electrical conductors- in all phases. Polar-covalent compounds are only soluble in other polar compounds, such as water. \\\\

%Solubility Preamble

The solubility of a substance is the amount of a substance that will dissolve in a given amount of solvent. Many factors effect solubility, but intermolecular forces either promote or prevent the formation of a solution. A solution either forms, or does not form, depending on the types of intermolecular forces present in both solute and solvent. Entropy, energy dispersed in a system, is also a factor in deterring if two substances form a solution. The greater the entropy, the more likely a solution will be formed. \\\\

The following table illustrates the conditions in which a solution will either form or not form:\\

%Chart showing when a solution forms or not

\begin{figure}[H]

\centering

\includegraphics{lr21.png}

\end{figure}

%Miscibility

Two substances are said to be miscible if they are soluble in each other in all proportions. In general, similar substances form solutions and dissimilar solutions do not. For example, polar solvents dissolve many polar ionic solutes, and non-polar solvents dissolve non-polar solutes. If two substances are dissimilar they may still form a solution, if and only if, the disparities are diminutive, if they are too large then they will not form a solution.

\pagebreak

%Sodium Chloride preamble

\begin{figure}[H]

\centering

\includegraphics{ncl.png}

\caption{Three-dimensional molecular structure of Sodium Chloride}

\end{figure}

%Description

\ce{NaCl\_{(s)}}, commonly referred to as table salt, is an ionic crystalline compound with a 1:1 ratio of Sodium ions and Chloride ions. \ce{NaCl} is bounded in a cubic lattice, as depicted above.The substance is a small, solid, colorless crystal. \ce{NaCl} has a boiling point of $1465^o C$ and a melting point of $800.7^o C$. \ce{NaCl} has a theoretical solubility of $\frac{36.0g \ce{NaCl}}{100.0mL \ce{H\_2O}}$ at $25^o C$. \\\\

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%Sucrose Preamble

\begin{figure}[H]

\centering

\includegraphics{s22.png}

\caption{Three-dimensional structure of Sucrose}

\end{figure}

\begin{figure}[H]

\centering

\includegraphics{s11.png}

\caption{Lewis Structure of Sucrose}

\end{figure}

%Discussion

\ce{C\_{12}H\_{22}O\_{11}\_{(s)}}, commonly referred to as sugar or sugar, is a polar covalent compound with a 6:11:5.5 ratio of carbon, hydrogen, and oxygen ions. \ce{C\_{12}H\_{22}O\_{11}\_{{(s)}}} is a white powdery solid. \ce{C\_12H\_{22}O\_1{(s)}} has a melting point of $185.5^o C$. \ce{C\_{12}H\_{22}O\_{11}\_{{{(s)}}}} has a theoretical solubility of $\frac{45g \ce{C\_{12}H\_{22}O\_{11}}}{50.0mL \ce{H\_2O}}$ at $25^O C$ \\\\

%Previous Studies

\subsection\*{Hypothesis} %Hypothesis

If Sucrose and Sodium Chloride are dissolved in water then Sucrose will have a greater solubility because it is a polar-covalent solute dissolving in a polar-covalent solvent. \\\\

\subsection\*{Safety Information} %Safety Information

Safety is paramount, and good laboratory practices should not only be informed, but also practiced. The risk of burn was apparent, all throughout the experiment. Simple measures must be taken to prevent any sort of burn injuries. The hot-plates used, and hot beakers should be stationed at an area, away from foot traffic. Proper equipment should be used to touch and move the hot equipment, and lastly, safety googles must be worn at all times, in case of splattering.

\section\*{Materials}

1. 50 mL Burette (1) \\

2 250 mL Beaker (1)\\

3. 140 mL Beaker (2) \\

4. Burette stand (1) \\

5. Hot Plate (1) \\

6. Timer (1) \\

7. Stirring rod (1) \\

8. Thermometer (1) \\

9. Tong (1) \\

10. Paper (1) \\

11. Pencil (1) \\

12. Weighing Dish (1) \\

13. Scale (1) \\

14. 650mL \ce{H\_2O} \\

15. 270g \ce{NaCl\_{s}} (apx.) \\

16. 500g \ce{C\_{12}H\_{22}O\_{11}\_{s}} (apx.)

\section\*{Procedure}

%Sodium and Sugar room temp.

Sodium Chloride was weighed in a weighing dish on an electronic scale. 50 mL of water was poured through a burette into a 140 mL beaker. A temperature probe was then inserted into the beaker to measure the temperature of the water. A soon as the probe read $25^o C$ Sodium Chloride was slowly poured into the beaker. While the salt was slowly poured into the solution, the resulting solution was being vigorously stirred. As soon as a small amount of salt stuck to the bottom of the beaker, no more salt was poured. The solution was stirred vigorously for 30 seconds. If the salt had not dissolved, the remaining Sodium Chloride in the weighing dish was subtracted from the initial value, and the ratios were calculated. This experiment was repeated 2 additional times .\\\\

%Sugar room temp

For Sucrose, only 25 mL of water was poured through a burette into a 140 mL beaker. A temperature probe was then inserted into the beaker to measure the temperature of the water. A soon as the probe read $25^o C$ Glucose was slowly poured into the beaker. While the sugar was slowly poured into the solution, the resulting solution was being vigorously stirred. As soon as a small amount of sugar stuck to the bottom of the beaker, no more sugar was poured. The solution was stirred vigorously for 30 seconds. If the sugar had not dissolved, the remaining Glucose in the weighing dish was subtracted from the initial value, and the ratios were calculated. The final ratios were then multiplied by two. This process was repeated 2 more times. \\\\

%Sodium and sugar boiling

A boiling plate was initially heated, while the boiling plate was heating, 50 mL of water was poured through a burette into a 140 mL beaker. A temperature probe was inserted into the beaker and the beaker was placed on top of the heating plate. The temperature was carefully monitored, as soon as the probe read $100^o C$ the beaker was immediately removed from the hot plate onto a flat lab-table surface. The Sodium Chloride was then slowly poured into the beaker until a minuscule amount stuck to the bottom. The solution was then stirred for 30 seconds and if the salt still failed to dissolve, the remaining amount of Sodium Chloride in the weighing dish was subtracted from the initial amount and the results were calculated. This experiment was repeated 2 additional times.

%Sugar Boiling

For Sucrose, only 25 mL of water was poured through a burette into a 140mL beaker.

\section\*{Results}

%Sodium (room temp) table

\begin{table}[H]

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\label{}

\begin{tabular}{ccccc}

Trail No. & Initial Weight (g) & Final Weight (g) & Solubility ($\frac{g}{50 mL}$) & Final Ratio ($\frac{g}{50 mL}$) \\ \hline

\end{tabular}

\end{table}

%Glucose (room temp.) Table

%Sodium (hundred deg.) Table

%Glucose (hundred deg.) Table

\subsection\*{Raw Data}

\subsection\*{Important Results}

\subsection\*{Calculations}

\subsection\*{Discussion}

\section\*{Results and hypothesis}

\subsection\*{Experimental Error}

\subsection\*{Improvements}

\section\*{References}

\end{document}