**Lesson Overview**

| Activity | Time (number of class periods) | Focus |
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| 1 | 2  (Intro + demo) | Introducing project Activity and scoping the problem   * After introduction of task, brainstorm with students how to measure physical properties like transparency. \*Evaluate both qualitative and quantitative methods. * \*Demonstrate use of light meter * \*Introduce concept of transparency in relation to the amount of light blocked by the candy |
| 2 | 3  (determine molecular formula of sugars + understand the different shaped molecules + how glucose can act as an interfering agent | Understanding the chemistry of sugars and the use of interfering agents   * Have students look at the ingredients of the candy and use this to introduce sucrose and glucose and their molecular structures. * \*Have students observe the physical properties of candy samples (e.g., transparency and hygroscopicity). * Ask students why they think the physical properties of the candy they observed had different properties. * Show students samples of amorphous candy with crystallization and without. * \*Discuss how an interfering agent like glucose can prevent crystallization in amorphous candy.   <https://www.britannica.com/topic/crystalline-candy>  <https://www.ck12.org/c/physical-science/solid/lesson/Solids-MS-PS/> |
| 3 | 1 | Research on hard clear candy and introduction to baker’s percentage   * \*Review candy recipes researched by students. Ask students to look for ingredients common to the recipes (sucrose/sugar and glucose/light corn syrup). * Discuss a way to compare recipes – introduce how CA students use baker’s percentage (CA teacher/students can explain and demonstrate their calculations). * \*Help ICP students calculate the baker’s percentage of ingredients for one of the recipes together as a class * Have students discuss the baker’s percentage of glucose/light corn syrup – remind students its potential as an interfering agent |
| 4 | 2  (hypothesis on transparency + hypothesis on hygroscopicity) | Experimental design   * Review with the class the meaning of independent and dependent variables * Review the project task with the class * \*Brainstorm with the students if they were to get optimal transparency, what would they change in the recipes? * Remind students of their observation of the physical properties of candy. \*What physical properties of the candy would they measure as they change the recipes? (transparency using light meter and hygroscopity using hygrometer) * Based on the discussion have students name the independent and dependent variables for the experiment. * \*Work with students to develop working hypotheses. * Have students decide on the baker’s percentage of interfering agent for the experiment (these decisions can be made with the CA students). * \*Discuss with students how constants, reliability, and repeatability would apply to the experiment. |
| 5 | 1 | Practice use of equipment and prepare table for data   * Let students practice the use of equipment with sample candy (light meter and hygrometer). * \*Discuss with students ways to obtain precise and accurate measurements. * (\*Alert students of expected changes in candy over time and determine the frequency of measurement) * Help students create a table and work out the weight of the various ingredients according to the baker’s percentages they have chosen. |
| 6 | 2  (weigh ingredients + conduct experiment) | Prepare for and conduct experiment   * Have students weigh ingredients according to the baker’s percentage of interfering glucose they have decided upon. * Go through candy making procedure. * Review safety measures. * Students make the candy together with the CA students [in CA kitchen]. The candy is poured onto silicone moulds. |
| 7 | Over days 2, 8, and 12 (students should predetermine the days for measurement) | Measurement of transparency and hygroscopicity (tackiness)   * Have students observe changes to the candy over time and take multiple readings over the days of the week. |
| 8 | 4  compile results and graph plotting + discovering trends in data + discuss limitations in findings + choose graphs based on scientific reasoning | Making sense of data as a class   * Have students compile results as a class. * Brainstorm ways with students how to make sense of data e.g., explore ways to represent the data – Excel * \*Have students explore for trends in transparency and hygroscopicity. * \*Discuss issues like: outliers in the data, possible sources of error, and limitations of their findings. * \*Have a discussion about the results and whether it was in line with their hypotheses. * \*Based on the results have students choose a baker’s percentage as recommendation to the CA students. * \*Use scientific reasoning to choose the graphs to be used as supporting evidences. * \*Prepare recommendation presentation to CA. |

\*Students record their reflections on worksheets