

## Lesson Plan for PHASE CHANGE

### Part 1: Simulation

*Aim: To explore the relationship between molecular size, heat and temperature in phase change*

#### Agenda:

- ◆ Phase Change Science Detective's Notebook and simulation (40 minutes)
- ◆ Wrap Up (5 minutes)

#### Materials:

- ◆ Computers
- ◆ Science Detective's Notebook #4: Phase Change

#### Lesson Procedure:

##### Distribute Computers:



Go to: [www.create.nyu.edu/mm](http://www.create.nyu.edu/mm) and navigate to the diffusion simulation

##### Simulation Activity:



Students complete the Science Detective's Notebook while working through the phase change simulation

*In the simulation, students adjust the heat in a container and observe what happens to particles in a substance when that substance, as a liquid, boils to a gas. A graph shows the relationships between heat energy, temperature, and the boiling point of the substance. Variables include heat, temperature, type of particle (Chlorine, Bromine, or Iodine), and time.*

##### Entry 1: Make Observations and Propose a Hypothesis

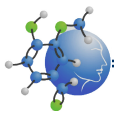


Students read a short online comic narrative called "The Case of the Loco Cocoa."

*The story is about boiling water for hot chocolate and introduces the concept of phase change*



Students answer questions about the story and generate a hypothesis using phase change to explain the "disappearance" of the water.



### **Entry 2: Explore A Model to Test Your Hypothesis**



Students work through the online tutorial.



Students record the variables that they will need to use to test their hypothesis and review the proper units of each variable.

### **Entries 3-5: Examine Chlorine, Bromine and Iodine Molecules**



Students work through the simulation model and generate phase change graphs for the three different types of molecules



Students record observations and the heating curves for each molecule explored in the simulation in their notebooks.

### **Entry 6: Examine Your Data**



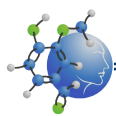
Students analyze the heating curves for each molecule explored in the simulation and make conclusions about the changes that took place and the effects of molecular mass.

### **Entry 7: Synthesize What You Learned**



Students connect what they observed in the simulation to the hypothesis that they generated and to “The Case of the Loco Cocoa.”

### **Wrap Up**



## Lesson Plan for PHASE CHANGE

### Part 2: Lab/Demo

*Aim: Can you recreate the phase change graph in the real world?*

#### Agenda:

- ◆ **Do It Now** (10 minutes)
- ◆ **Lab/Demo:** Lauric Acid and Phase Change Lab Notebook
- ◆ **Set Up** (8 minutes)
- ◆ **Observation of Phase Change** (15 minutes)
- ◆ **Graph Data** (5 minutes)
- ◆ **Analyze Data and Draw Conclusion** (7 minutes)
- ◆ **Extension Activities**

#### Materials:

- ◆ **Phase Change Lab Notebook**
- ◆ **Goggles**
- ◆ **Lauric acid test tube**
- ◆ **Two beakers, 400 mL**
- ◆ **Thermometers**
- ◆ **Hot plate**
- ◆ **Tap water**
- ◆ **Ice for ice bath**

#### Lesson Procedure:

##### Pre-Lab Set-Up

**Distribute lauric acid lab materials**

##### Entry 1: Do It Now



See Phase Change Lab Notebook page 27 for pre-lab questions.

##### Entry 2: Lab/Demo:



Read introduction in the Phase Change Lab. See Lab Notebook for detailed procedure (pages 28-38).

##### Entry 3: Extension Activities

##### Wrap Up