**A Mole of Rice**

**HIGH SCHOOL**

**Green Chemistry & Sustainable Science**

**Teacher Background Information:** The Mole is a very large number used to measure the number of very small objects in chemistry. Using the mole to describe the number of a macroscopic object is not practical.

**Safety Information:** N/A

**Educational Goals:** Reinforce the magnitude of a mole while simultaneously providing a visual for the size atoms must be when moles of atoms occupy very little space

**Student Objectives:** Students will problem solve using the mole concept to determine the depth that one mole of rice would cover the surface of the earth if evenly spread over the planet surface. This illustrates the magnitude of the size of a mole of rice.

**Materials:**

* 500g rice
* 50 mL Beakers
* Centigram balance
* 50 mL graduated cylinder

**Time Required:** 40 min class time + homework time

**NGSS Standards Met:**

* **HS-PS1-7:** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

**Key Terms**: The Mole. Students use measurement and geometric mathematics principles to solve a chemistry problem.

**Teacher Prep:** Copy student handout, half fill 50 ml beakers with rice (one per student group)

**Keys for Success:** Students will need to find the mass and volume of single rice grain, by massing and taking the volume of 50-10 grains and then dividing by the number of grains. Once they know the volume of one grain, they can find the volume of a mole of grains. This volume will be a very large number (in mL) and will need to be converted to L or kL. Students may need to be reminded that 1L is equivalent to 10cm x 10 cm x 10cm cube.

**Disposal Information:** Rice can be saved for another year or another experiment.

**A Mole of Rice Student Lab**

**Introduction:** The Mole is a very large number used to measure the number of very small objects in chemistry. Using the mole to describe the number of a macroscopic object is not practical.

**Problem:** If there were a mole of rice grains stacked evenly over the surface of the planet;

a) How deep would the layer be?

b) How long would it take the country of China to produce a mole of rice grains?

**Hypothesis:**

A mole of rice grains will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ deep if stacked evenly over the planet Earth’s surface. It will take China \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to grow a mole of rice.

**Assumptions:** Radius of earth is constant at 12 756.3 km

China produces 160.65 million tonnes of rice per year (2003)

Rice floats on top of the water (assume the earth to be like a ball)

**Solution:** (show your work please!)

**Write a paragraph that explains why and how the mole concept would be important in the study of Green Chemistry.**