

## The Rice Experiment – The Mole/Avogadro's Number

**OBJECTIVE:** This experiment is designed to give the student practice using scientific notation, significant digits, units, and mole calculations. Your instructor will look for these specific ideas when grading this lab.

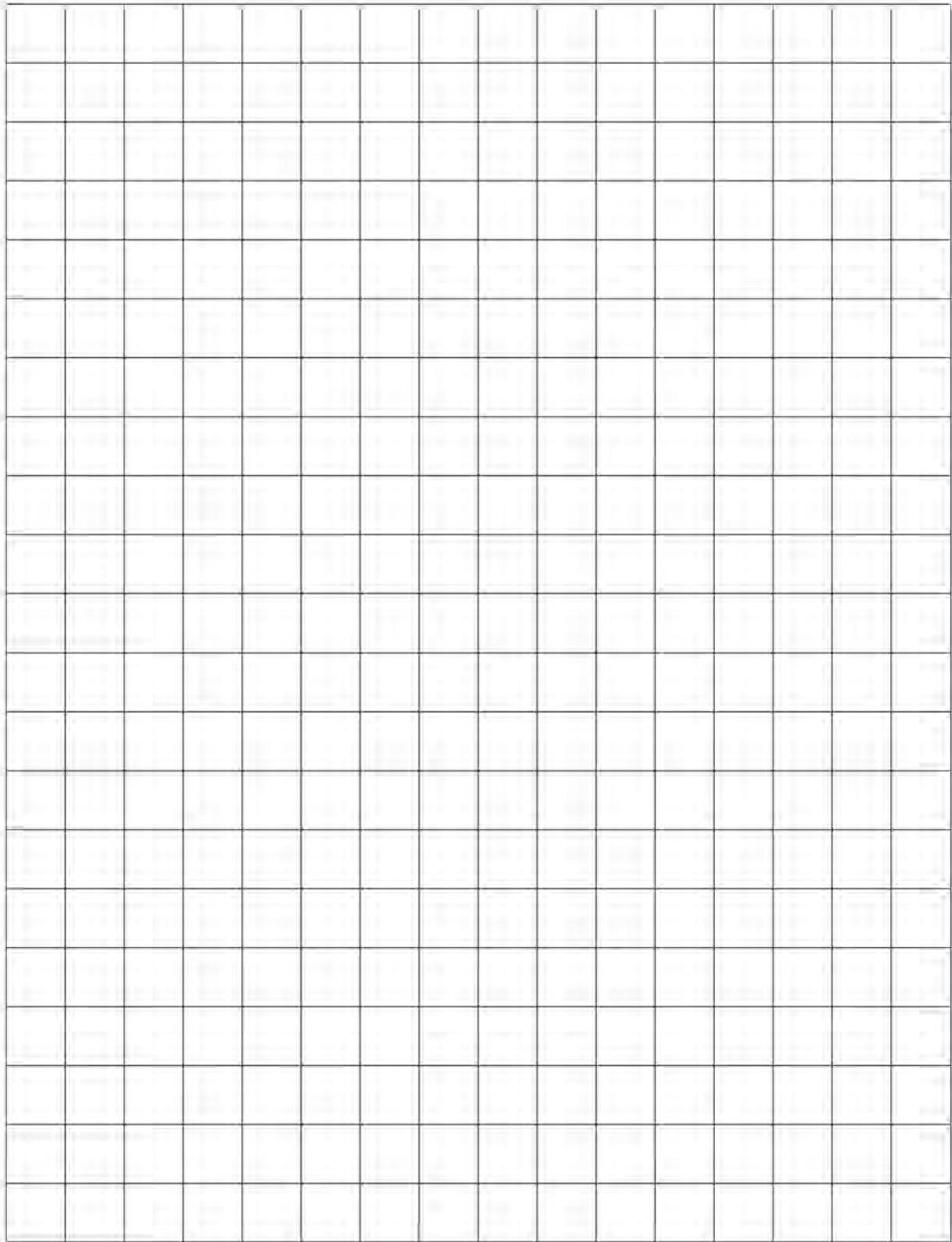
This experiment will also give students an appreciation of the size of Avogadro's number ( $6.022 \times 10^{23}$ ).

### PROCEDURE:

1. Determine the mass of the rice and container together. Record this value in the data table.
2. Place the rice on the graph paper. Spread the rice so that it covers a rectangular area with a uniform depth of one rice grain. It is important that as little space as possible exists between grains of rice.
3. Determine the mass of the empty container. Record this in the data table. From this data, determine the total mass of the grains of rice.
4. Determine the total number of blocks on the graph paper that are covered by rice. Multiplying length by width of the area covered can do this.
5. Randomly choose five blocks on the graph paper that are covered by rice. Count the number of grains of rice per block in each of these five blocks. Record these values on the data sheet.
6. Calculate the average number of grains of rice per block by counting the total grains of rice in the five blocks and dividing this number by 5. Round this number to the nearest whole number.

**CALCULATIONS:** Be sure to show your set-up for each problem and label all units. **You MUST record your answers with appropriate SigDigs and in scientific notation.**

1. Determine the total number of grains of rice in your sample by taking the number of blocks on the graph paper covered by rice and multiplying by the average number of grains of rice per block.
2. Calculate the mass of one grain of rice by dividing the total mass of the rice by the number of grains in your sample.
3. Calculate the number of moles of rice present in your sample by dividing the number of grains of rice by Avogadro's number. (Hint: Units for Avogadro's number are particles/mole. In this case, "particles" are grains of rice).
4. Calculate the mass of 1 mole of rice by taking the mass of 1 grain of rice and multiplying by Avogadro's number.
5. Calculate the number of grains of rice in a typical box of rice from the grocery store. A box of rice normally weighs 1 pound (454g). This calculation may be done by taking the mass of the box of rice, 454g, and dividing by the mass of 1 grain of rice.
6. Calculate how many grocery store boxes of rice you would need to have 1 mole of rice grains. This may be done two separate ways to produce identical answers:
  - A.) Divide Avogadro's number by the number of grains of rice in a grocery store box (from calculation #5).
  - B.) Divide the mass of 1 mole of rice by the mass of rice in a box (454g).





**Additional Problems** (Use data and answers to previous calculations)

Be sure to show your set-up for each problem and label all units. **You MUST record your answers with appropriate SigDigs and in scientific notation.**

1. How many particles (grains) of rice would be in .456 moles of rice:
2. How many moles of rice are present in  $3.45 \times 10^{23}$  particles of rice:
3. How many particles of rice would be in 3.59 moles of rice:
4.  $6.8 \times 10^{26}$  grains of rice would equal how many moles of rice:
5. What is the mass (in grams) of 0.876 moles of rice (Hint: use answer from the calculations for mass of 1mole of rice):
6. How many moles of rice would be present if you had  $1.9 \times 10^3$  grams of rice: