Chemistry Mini-Lab: M & Ms and the Mole

WHAT TO TURN IN:	5 Calculations	Data Table	Questions #1-4

OBJECTIVE

- To determine how much of a mole of M&Ms can fit in our classroom
- To determine how many classrooms would be needed to hole a entire mole of M&Ms

MATERIALS

M & M candies (about 3 pounds)
Meter sticks
Scientific calculators
A cubic decimeter (1 dm^3 = 1 L) plastic cube

PROCEDURE

1) Fill the plastic 1-dm^3 cube with M&Ms.
2) A few students will count the number of M&Ms in one dm^3. Record this number in the data table. It is the same for everyone in the class.
3) Measure the length, width, and height of our classroom (in meters) with the meter sticks. Record in the data table.
4) Calculate the volume of the classroom: L x W x H. Record in the data table.
5) Calculate the number of M&Ms in 1 m^3, using the number of M&Ms from step 2. Record your answer in the data table.

$$\frac{\#\ \text{M\&Ms}}{1\ \cancel{dm^3}} \times \frac{1000\ \cancel{dm^3}}{1\ m^3} = \frac{\#\ \text{of M\&Ms}}{1\ m^3}$$

6) Calculate the number of M&Ms that would fill the classroom, using the number of M&Ms from your answer in step 5 and the volume of the room from step 4. Record your answer in the data table.

$$\frac{\#\ \text{M\&Ms}}{1\ \cancel{m^3}} \times \frac{\#\ \cancel{m^3}}{1\ \text{classrooom}} = \frac{\#\ \text{of M\&Ms}}{1\ \text{classroom}}$$

7) Calculate how much of a mole of M&Ms can fit in our classroom, using your answer from step 6. (This time, the "representative particle" used is M&Ms.) You should get a *very* small number. Record your answer in the data table.

$$\frac{\#\ \cancel{\text{M\&Ms}}}{1\ \text{classroom}} \times \frac{1\ \text{mol}}{6.02 \times 10^{23}\ \cancel{\text{M\&Ms}}} = \frac{\#\ \text{mol}}{1\ \text{classroom}}$$

8) Calculate how many classrooms the size of ours would be needed to hold one mole of M&Ms. Use the *inverse* of the answer from step 6. You should get a *very* large number. Record your answer in the data table.

$$\frac{1\ \text{classroom}}{\#\ \cancel{\text{M\&Ms}}} \times \frac{6.02 \times 10^{23}\ \cancel{\text{M\&Ms}}}{1\ \text{mol}} = \frac{\#\ \text{classrooms}}{1\ \text{mol}}$$

CALCULATIONS

Step 4: volume of the classroom
Step 5: number of M&Ms in 1 m^3
Step 6: number of M&Ms that would fill the classroom
Step 7: how much of a mole of M&Ms can fit in the classroom
Step 8: how many classrooms the size of ours would hold one mole of M&Ms

DATA TABLE

Total M&Ms in 1 dm^3 = _____

Room dimensions: **Length** = _____m **Width** = _____ m **Height** = _____m

Volume of the classroom: _____m^3

Number of M&Ms in a m^3 = _____

Number of M&Ms in one classroom = _____

Amount of moles in one classroom = _____

Number of classrooms needed to hold 1 mol M&Ms = _____

QUESTIONS

1) Does the answer you calculated for step 7 surprise you? Why or why not?
2) Does the answer you calculated for step 8 surprise you? Why or why not?
3) Why do you think M&Ms are a good choice for the "particles" in this lab?
4) How is DA (dimensional analysis) used in this lab?