



## Mole Day Challenge

Chem Honors

[20 pts]

Name \_\_\_\_\_

Period \_\_\_\_\_ Date \_\_\_\_\_

1) [4 pts] How many **MOLES** of water are in the water bottle?

- **HINT:** A MOLE of water has approximately the same volume as a *white-out* bottle.
- Measuring the mass of the water bottle is **AGAINST** the rules.
- **MOLE DAY PRIZE:** The person with the estimate closest to the actual number of moles in the water bottle, will win a **special Mole Day pencil**. If you win, the chemistry student will bring your prize to you tomorrow. The student in class with the lowest % error in their closest guess will also win a Mole Day pencil

| Name<br>(neatly written)  | Number of moles of water in<br>bottle? |
|---------------------------|--|
| 1 (non-chemistry student) |  |
| 2 (non-chemistry student) |  |
| 3 (non-chemistry student) |  |
| 4 (non-chemistry student) |  |
| 5 (non-chemistry student) |  |
| 6                         |  |
| 7                         |  |
| 8                         |  |
| 9                         |  |
| 10                        |  |

\*\*\* You must get **at least 5 students not currently taking chemistry** to guess. You may have up to five other people estimate as you would like-- teachers, staff members or any student.

- a) [2 pts] **Calculation of actual number of moles in your water bottle:** (Calculated in class the day after Mole Day.)  
Measure volume of water using graduated cylinder. You may need to make two measurements and add them. *Show all work. Write units and correct significant figures.*  
*Show all work. Write units and correct significant figures.*

- b) [1 pt] **Calculation of percent error in best guess (mark best guess above):**

2) [2 pts] Did you wear your decorated T-shirt on Mole Day? \_\_\_\_\_

3) **Mole Guessing Problems:** Show a correctly reasoned calculation for each to get the points.

a) [2 pts] Estimate how many moles of NaCl are in the huge block of NaCl. \_\_\_\_\_  
*Hints (might be useful): the density of NaCl is  $2.16 \text{ g/cm}^3$  at  $25^\circ\text{C}$ ;  $1 \text{ lb} = 454 \text{ g}$*

b) [2 pts] Guess how many moles of sucrose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ ) are in the sample of candy. \_\_\_\_\_  
*Hint: Mass out one piece of the candy. Mass of one piece of candy = \_\_\_\_\_*

4) [2 pts] **If the average penny is 2.0 mm thick, how far will a stack of ONE MOLE of pennies reach?**  
Give total distance in units of km (use good dimensional analysis):

5) [1 pt] Which of the following measurements is the best approximation for the distance spanned by a mole of pennies?

a) The distance from the earth to the moon--  $4 \times 10^5 \text{ km}$

b) The distance from the earth to pluto--  $6 \times 10^9 \text{ km}$

c) The distance from the earth to the closest star outside our galaxy--  $4 \times 10^{13} \text{ km}$

d) The distance that is spanned by the local cluster of galaxies that we are in (including the Milky Way and Andromeda, 5 million light years across) --  $4.8 \times 10^{19} \text{ km}$

6) [2 pts] How much would the mole of pennies be worth, in dollars? *Use good dimensional analysis.*

7) [2 pts] The size of the world economy was estimated to be \$77.609 trillion in 2014 (1 world economy =  $77.609 \times 10^{12}$ ). How many world economies would the mole of pennies from #6 be worth? (This is the number of earths you would need to have 1 mole of pennies.) *Use good dimensional analysis.*

**Extra Credit (Pick up to one):**

[3 pts] Brought in stuffed mole. Name/description: \_\_\_\_\_

[3 pts] Brought in home-made food or project. Description: \_\_\_\_\_

[1 pt] Brought in bought food. Description: \_\_\_\_\_