



Mole Day Challenge 2016 [20 pts]
Chem Honors

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 guess 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 (neatly written)	Number of moles of water in 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 guess 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.)
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 g/cm^3 at 25°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?
- The distance from the earth to the moon-- $4 \times 10^5 \text{ km}$
 - The distance from the earth to pluto-- $6 \times 10^9 \text{ km}$
 - The distance from the earth to the closest star outside our galaxy-- $4 \times 10^{13} \text{ km}$
 - 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 = 77.609×10^{12}). How many world economies would the amount calculated above be worth? (This is the number of earth-like planets you would need to have 1 mole of pennies.) *Use good dimensional analysis.*

Extra Credit (Pick up to one):

[3 pts] Brought in home-made food or project. Description _____

[1 pt] Brought in bought food. Description _____