

The Mole Lab

Name: _____

80/1200

Objective: Students will calculate all types of mole math problems, including: using molar mass to determine unknown elements, calculate numbers of particles, volumes of gases, and masses, all from mole measurements. You will be expected to use the “Mole Island” map to guide you through the math in this lab.

For your safety: DO NOT OPEN ANY CONTAINERS.
No goggles required.

Part 1: Measure the mass of the jar containing one mole exactly of 12 different elements. Subtract the mass of the container to get the mass of one mole of the element. Use the periodic table to discover what element is in each jar.

Part 2: Get the data for masses of the nails, an Oreo cookie (one per kid), drops of water, and the aluminum foil.

Part 3: The 14 questions.



This lab requires:	This information	POINTS
Cover	title and one perfect sentence from question # 27.	3 points
Elements Page	Twelve elements, one mole of each	12 points
Data collection page	Fill in all the blanks	4 points
Questions	14 Questions, SF, units count always.	14 points
Conclusion	Use 2 full sides of a sheet of paper. On the front: Draw a full sized mole island “map” complete with “tolls” or conversion equalities. On the back: Write out and solve a two step mole math problem. Write neatly.	7 points
Report due on: _____		40 points

	Container	Total mass of Jar + Element	Mass of the Jar	Mass of JUST the ELEMENT (the molar mass)	Element Name + Symbol
1	A				
2	B				
3	C				
4	D				
5	E				
6	F				
7	G				
8	H				
9	I				
10	J				
11	K				
12	L				

Use this page to collect your data. Questions will come up again in the questions later on.

- ◆ Which nail has more atoms, the iron one, or the aluminum one?
Mass both nails which we will assume are 100% iron and 100% aluminum.

Iron nail mass _____

Aluminum nail mass _____

- ◆ How many molecules of sugar are in the middle of an Oreo cookie?
Zero out a folded paper towel on the scale. Mass your whole cookie. Eat the inside, use your tongue to get all of the white sugary inside into your insides. Mass the cookie again. Assume all of the white stuff is pure sucrose, formula $C_{12}H_{22}O_{11}$. (if you can't eat cookies, that's okay, make sure you get the data)

Whole cookie _____

Chocolate part _____

Sugar part _____

- ◆ How many molecules are in one drop of water?
Zero out a small beaker on the scale. Add 5 drops of water and write down the mass. Zero out the scale again. Mass five more drops. Zero out scale AGAIN. Repeat 5 X. What is the average mass for five drops? What is the average mass per ONE DROP? How many molecules of water are in the average drop of water?

Mass of 5 drops: _____

Average mass of 5 drops _____

Average mass of ONE drop _____

- ◆ How many atoms are in a sheet of aluminum foil?

Mass of foil sheet provided _____

Assume that this foil is exactly _____ cm X _____ cm.



This mole was drawn by Natalie in the fall 2018.

The Mole Lab - Questions

Put answers on the right. Put work on white paper, and then staple it to the lab report. Make sure that your work is clearly labeled 14-26 so that I can check it.

14. How many atoms are in the iron nail?
15. How many atoms are in the aluminum nail?
16. Calculate the molar mass of sucrose, $C_{12}H_{22}O_{11}$.
17. How many atoms of sucrose are in the white of an Oreo cookie?
18. How many molecules are in a single drop of water?
19. Calculate the number of atoms in the sheet of aluminum foil.
20. What is the volume of the aluminum foil sheet?
(Hint: use density formula to calculate volume from mass first, then use volume = length x width x height, and calculate the "height" or thickness of the foil.)
21. What is the DIAMETER of an aluminum atom (not the radius)?
22. How many aluminum atoms thick is the aluminum foil?
23. The jar of oxygen gas contains 8.46×10^{21} molecules of oxygen gas, which we will assume is at STP. What is the volume of the jar?
24. What is the mass of just this oxygen gas?
25. This jar contains 0.135 moles of potassium dichromate.
How many formula units of this ionic compound are present?
26. How many grams of potassium dichromate are in the jar?
27. You get 3 balloons for your birthday. One has helium, one is blown up by mouth and contains just carbon dioxide, and one contains methane gas (CH_4) because as a joke your buddy wants to explode it later after the little kids leave. Each balloon is at STP. Each balloon happens to be exactly 22.4 liters in size. Fill in the chart and write ONE sentence that best explains what you discover when the chart is finished. Make this sentence your cover page sentence.

Gas	Helium	Carbon dioxide	Methane
Volume			
Pressure			
Temperature			
Number of moles present in the balloon			
Number of particles present in the balloon			

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