

Toxins 1: The mole, empirical and molecular formulas

Essential Questions:

- What does it mean for a reaction to be toxic?
- What is the mole?
- How does the mole help us study things we can't directly see?
- How can the mole help us determine the ratio of elements in a compound?

Toxins 1: Define and make conversions using moles.

Complete simple unit conversions given conversion factors (i.e., kg to lb) and explain the role of dosage in toxicity.

Explain how large numbers of small objects are determined.

Calculate the percent error of a calculation.

Translate numbers into scientific notation, and vice versa.

Explain the mole concept and Avogadro's number in terms of number of particles, mass and gaseous volume.

Define the molar mass of an element or compound.

Calculate the molar mass of an element or compound.

Convert between moles, number of particles, volume, or mass of an element or compound using dimensional analysis.

Toxins 1: Distinguish between and find empirical and molecular formulas.

Find the percent composition of an element or ion in a given compound.

Explain the concept of empirical formulas and provide examples.

Explain the concept of molecular formulas and provide examples.

Distinguish between empirical and molecular formulas.

Calculate empirical formulas of compounds given mass or percent composition for each element.

Level 2: Calculate molecular formulas of compounds using their empirical formulas and molar masses.

Level 2: Calculate the empirical formula of a hydrocarbon using combustion analysis data.

Day # (55 min class periods)	Activities	How differentiated?
1	Living By Chemistry (LBC) 7 Toxins - LD50/conversions	Extension activity - Is cheap gas worth the drive? Source: Solving Real Problems in Chemistry, Pacific Crest Publishing
2	LBC 8 Toxins - Counting by Weighing lab	Extension activity - Is cheap gas worth the drive? Source: Solving Real Problems in Chemistry, Pacific Crest Publishing
3	Wrap up LBC 8/Mastery check Begin POGIL (process oriented guided inquiry learning): The Mole [molar mass and Avogadro's number on a conceptual level]	Mastery check= practice quiz that are self graded for explicit student feedback Source: Flinn's Chemistry POGIL Activities
4	Wrap up the Mole POGIL LBC 10 - Part 1- Mole Challenge (measure out a mole)	If you finish early questions in the POGIL - can you figure out mole conversions before I even explicitly teach? [progression from the inquiry activity]
5	Mastery check (from POGIL) LBC 11 Toxins - single step mass-mole conversions	
6	HW due today - video notes: mass to mole conversions Practice in class/Answer key to check!	After about 10 minutes of work time, I go around and star the papers of students who need extra small group instruction and then we meet for a "conference" in the back of the room.
7	Mole conversions mastery check Level split (based on mastery check data): <ol style="list-style-type: none">Level 0- reading + LBC toxins 12Level 1 - LBC Toxins 12 - How sweet it is (mass to mole conversions) + moles of chalk mini labLevel 2- homeopathic medicine!	Level 0- a reading reteach [yet another representation from what I've already provided] Level 1 - practice Level 2 - extension Source: Solving Real Problems in Chemistry, Pacific Crest Publishing
8	HW due today - packet of practice from unit Toxins 1 Quiz	There were four versions: <ol style="list-style-type: none">Modified (per IEP → reduced # of questions, 3 options for multiple choice instead of 4, etc)L1 Gen Chem

		3. L2 Gen Chem/Honors (usually I have one level 2 version, this time I had two depending on what they had done)
9	Grade multiple choice from quiz Quiz reflection + edits/explanations on edits on short answer on quiz in another color before I grade short answer.	This is the first year (2014-15) I've ever done this... and I'll probably keep doing this for ONLY the mole quiz.
10	HW due today - % yield + empirical vs. molecular formula video notes Mastery Check- Empirical formula Empirical Formula of Zinc Chloride Lab (day 1 of 4) - set up reaction of Zn + HCl	Students may not participate in lab if they haven't completed video notes.
11	Empirical Formula Lab (day 2 of 4) Evaporate to dryness While waiting- "What would happen in the lab if..."	I have three different activities with different scenarios of what would happen if... They have to complete a prediction on the nanoscopic representations of the scenario, a calculation with data, and explaining how errors would affect the formula (e.g., spills, leftover reactant, etc). I have three different "levels". Level 1- same lab (Zn + HCl) Level 2 - different reactants, tougher error analysis Level 3 - different reactants, even tougher error analysis
12	Empirical Formula Lab (day 3 of 4) Students MUST complete calculations for the lab [their group's trial + 2 other group's trials] Calculations: Empirical formula for each trial + percent error.	After a warm up with sample data for all students, about 15 minutes into work time I do an optional seminar if you want more help in a small group setting on calculation set up. I figure this is about enough time to let them struggle/grapple on their own or with lab groups. When done, I grade on the spot using our school's common lab report calculation rubric. If students finish early, they are to work on the rest of their lab report.
13	Toxins 1 test review	Students may not work on review if they don't have their calculations approved. That way, every student has the opportunity to have good calculations to work with.

		<p>I have multiple options for students for review. One of those options is this: "If you feel like you're going to poke your eyeballs out doing review because you've got it, ask for the combustion analysis empirical formula problems."</p> <p>I'd have between 1-5 kids in every class who asked for it/were ready for it.</p>
14	Toxins 1 test	<p>I had two versions- modified (for kids who need it per IEP → reduced # of questions, 3 options for multiple choice instead of 4, etc) and gen ed.</p> <p>Usually, I have a level 2 version. I got tired.</p>
15	Empirical Formula Lab (day 4 of 4) Lab report work time	<p>Lab report requirements are scaffolded with sentence starters and exemplars for each section, as well as a general rubric.</p> <p>I have a modified version of lab report and a gen ed version.</p>