[redacted]

0407238

Contextual Factors
Rubric

Teaching Process: The candidate uses information about the learning/teaching context and student individual differences to set learning goals, plan instruction and assess learning.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Knowledge of Community, School and Classroom Factors	Candidate displays minimal, irrelevant, or biased knowledge of the characteristics of the community, school, and classroom.	Candidate displays a general understanding of the characteristics of the community, school, and classroom that may affect learning. ✓	Candidate displays a comprehensive understanding of the characteristics of the community, school, and classroom that may affect learning.	1
Knowledge of General Characteristics of Students	Candidate displays minimal, stereotypical, or irrelevant knowledge of student development and how it may affect learning.	Candidate displays a general understanding of student development and how it may affect learning. ✓	Candidate displays a thorough and explicit understanding of student development and how it may affect learning.	4
Knowledge of Specific Student Characteristics & Approaches to Learning	Candidate displays minimal, stereotypical, or irrelevant knowledge about specific student characteristics and approaches to learning (e.g., development, interests, culture, abilities/disabilities, learning styles, learning modalities).	Candidate displays a general understanding of specific student characteristics and approaches to learning (e.g., development, interests, culture, abilities/disabilities, learning styles, learning modalities).	Candidate displays a thorough and explicit understanding of specific student characteristics and approaches to learning (e.g., development, interests, culture, abilities/disabilities, learning styles, learning modalities). ✓	3
Knowledge of Students' Skills And Prior Learning	Candidate displays little or irrelevant knowledge of students' skills and prior learning.	Candidate displays a general understanding of students' skills and prior learning that may affect learning in the current context. ✓	Candidate displays a thorough and explicit understanding of students' skills and prior learning that may affect learning in the current context.	4
Implications for Instructional Planning and Assessment	Candidate does not provide implications for instruction and assessment based on student individual differences and community, school, and classroom characteristics OR provides inappropriate implications.	Candidate provides general implications for instruction and assessment based on student individual differences and community, school, and classroom characteristics.	Candidate provides specific implications for instruction and assessment based on student individual differences and community, school, and classroom characteristics. ✓	4

24

Comments:

You'll never have a homogenous group of Ss, sorry.

Learning Goals

Rubric

Teaching Process: The candidate sets significant, challenging, varied and appropriate learning goals.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Significance, Challenge and Variety	Goals reflect only one type or level of learning.	Goals reflect: • several types or levels of learning; • are somewhat significant and/or challenging.	Goals reflect: • multiple types or levels of learning; • all are significant and challenging. ✓	5.
Clarity	Goals are not stated clearly and are activities rather than learning outcomes.	Some of the goals are clearly stated as learning outcomes.	Most of the goals are clearly stated as learning outcomes. ✓	8
Appropriateness For Students	Goals are not appropriate for the development, pre-requisite knowledge, skills, experiences, or other student needs.	Some goals are appropriate for the development, pre-requisite knowledge, skills, experiences, and other student needs	Most goals are appropriate for the development, pre-requisite knowledge, skills, experiences, and other student needs. ✓	3
Alignment with National, State or Local Standards	Goals are not aligned with national, state or local standards.	Some goals are aligned with national, state or local standards.	Most of the goals are explicitly aligned with national, state or local standards. ✓	2

Comments:

For a student teacher, this is impressive.

I'd like to see more emphasis on methane hydrates in the future.

Assessment Plan

Rubric

Teaching Process: The candidate uses multiple assessment modes and approaches aligned with learning goals to assess student learning before, during and after instruction.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Alignment with Learning Goals and Instruction	Content and methods of assessment: • lack congruence with learning goals; • lack cognitive complexity.	Some of the learning goals: • are assessed through the assessment plan; • some assessments are congruent with learning goals in content and cognitive complexity.	Each of the learning goals: • is assessed through the assessment plan; • all assessments are congruent with the learning goals in content and cognitive complexity. ✓	9
Clarity of Criteria and Standards for Performance	The assessments contain no clear criteria for measuring student performance relative to the learning goals.	• Most assessment criteria are clear; • Most are linked to the learning goals.	• All assessment criteria are clear; • All are explicitly linked to the learning goals. ✓	9
Multiple Modes and Approaches	The assessment plan: • includes only one assessment mode; • does not assess students before, during, and after instruction.	The assessment plan: • includes multiple modes of assessment; • some are performance-based; • and/or require the integration of knowledge, skills and reasoning ability. ✓	The assessment plan: • includes multiple assessment modes (including performance assessments, lab reports, research projects, etc.); • assesses student performance throughout the instructional sequence.	9
Technical Soundness	• Assessments are not valid; • scoring procedures are absent or	• Assessments appear to have some validity; ✓ • Some scoring procedures are explained; • some items or	• Assessments appear to be valid; • scoring procedures are explained; • most items or	9

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
	inaccurate; • items or prompts are poorly written; • directions and procedures are confusing to students.	prompts are clearly written; • some directions and procedures are clear to students.	prompts are clearly written; • directions and procedures are clear to students.	
Adaptations Based on the Individual Needs of Students	• Candidate does not adapt assessments to meet the individual needs of students; • these assessments are inappropriate.	Candidate makes adaptations to assessments that are appropriate to meet the individual needs of some students. ✓	Candidate makes adaptations to assessments that are appropriate to meet the individual needs of all students.	4

Comments:

ASK QUESTIONS

Design for Instruction

Rubric

Teaching Process: The candidate designs instruction for specific learning goals, student characteristics and needs, and learning contexts.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Alignment with Learning Goals	• Few lessons are explicitly linked to learning goals; • Few learning activities, assignments and resources are aligned with learning goals; • Not all learning goals are covered in the design.	• Most lessons are explicitly linked to learning goals; • Most learning activities, assignments and resources are aligned with learning goals; • Most learning goals are covered in the design.	• All lessons are explicitly linked to learning goals; • All learning activities, assignments and resources are aligned with learning goals; • All learning goals are covered in the design.	2
Accurate Representation of Content	• Candidate's use of content appears to contain numerous inaccuracies; • Content seems to be viewed more as isolated skills and facts rather than as part of a larger conceptual structure.	• Candidate's use of content appears to be mostly accurate; • Shows some awareness of the big ideas or structure of the discipline.	• Candidate's use of content appears to be accurate; • Focus of the content is congruent with the big ideas or structure of the discipline.	2
Lesson and Unit Structure	The lessons within the unit are not logically organized (e.g., sequenced).	• Most of the lessons within the unit are logically sequenced; • Lessons appear to be somewhat useful in moving students toward achieving the learning goals.	• All lessons within the unit are logically sequenced; • Lessons are useful in moving students toward achieving the learning goals.	2

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Use of a Variety of Instructional Strategies and Tactics	• Instruction incorporates little variety of instructional strategies and tactics across instruction, activities, assignments, and resources. • Heavy reliance on textbook or single resource (e.g., work sheets).	Instruction incorporates some variety of instructional strategies and tactics across instruction, activities, assignments, or resources.	Instruction incorporates a significant variety of instructional strategies and tactics across instruction, activities, assignments, and/or resources. This variety makes a clear contribution to learning. ✓	5
Use of Contextual Information and Data to Select Appropriate and Relevant Activities, Assignments and Resources	• Instruction has not been designed with reference to contextual factors and pre-assessment data. • Activities and assignments do not appear productive and appropriate for each student.	✓ • Some instruction has been designed with reference to contextual factors and pre-assessment data; • Some activities and assignments appear appropriate for the class.	• Most instruction has been designed with reference to contextual factors and pre-assessment data; • Most activities and assignments appear productive and appropriate for each student.	3
Use of Technology	• Technology is inappropriately used OR • candidate does not use technology.	• Candidate uses technology appropriately; • Technology contributes to teaching and learning. ✓	• Candidate consistently integrates appropriate technology; • Use of technology makes a significant contribution to teaching and learning.	2

Tie into student interests more!! This lesson (mole part) could have been in anyone's chem class. More Erin, please.

Instructional Decision-Making
Rubric

Teaching Process: The candidate uses on-going analysis of student learning to make instructional decisions. zz

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Sound Professional Practice	Many instructional decisions are inappropriate and not pedagogically sound.	Most instructional decisions are appropriate and pedagogically sound. ✓	Most instructional decisions are appropriate, pedagogically sound, and will contribute significantly to student learning.	3
Modifications Based on Analysis of Student Learning	Candidate treats class as "one plan fits all" with no modifications.	Some modifications of the instructional plan are made: • to address individual student needs; • based on the analysis of student learning; • based on best practiee; • based on contextual factors. ✓	Appropriate modifications of the instructional plan are made: • to address individual student needs; • are informed by a thorough and thoughtful analysis of student learning/performance; • based on best practice; • based on contextual factors. • Explanations of why the modifications would improve student progress are included.	4
Congruence Between Modifications and Learning Goals	Modifications in instruction lack congruence with learning goals.	Modifications in instruction are somewhat congruent with learning goals. ✓	Modifications in instruction are congruent with learning goals.	4

Comments:

→ Use questions to adjust <u>during</u> class, as well. And give examples.

Analysis of Student Learning
Rubric

Teaching Process: The candidate uses assessment data to profile student learning and communicate information about student progress and achievement.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Clarity and Accuracy of Presentation	• Presentation is not clear; • does not accurately reflect the data.	• Presentation is clear and logical; • reflects the data somewhat accurately.	✓ • Presentation is clear and logical; • accurately reflects the data.	9
Alignment with Learning Goals	Analysis of student learning: • is not aligned with learning goals; • and/or fails to provide a comprehensive profile of student learning relative to the goals for the whole class, subgroups, and two individuals.	Analysis of student learning: • is partially aligned with learning goals; • provides a somewhat comprehensive profile of student learning relative to the goals for the whole class, subgroups, and two individuals.	Analysis of student learning: ✓ • is fully aligned with learning goals; • provides a comprehensive profile of student learning for the whole class, subgroups, and two individuals.	9
Interpretation of Data	• Interpretation is inaccurate; • conclusions are missing or unsupported by data.	✓ • Interpretation is technically accurate; • some conclusions supported by data.	• Interpretation is meaningful and accurate; • appropriate conclusions are supported by the data.	9
Evidence of Impact on Student Learning	Analysis of student learning fails to include evidence of impact on student learning in terms of numbers of students who achieved and made progress toward learning goals.	✓ Analysis of student learning includes some evidence of the impact on student learning in terms of numbers of students who achieved and made progress toward learning goals.	Analysis of student learning includes clear evidence of the impact on student learning in terms of number of students who achieved and made progress toward each learning goal.	9

Comments:

Would have liked more discussion of particular assignments.

Self-Evaluation
Rubric

Teaching Process: The candidate analyzes the relationship between his or her instruction and student learning in order to improve teaching practice.

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Interpretation of Student Learning	Little or no evidence is provided to support conclusions drawn in "Analysis of Student Learning" section.	• Provides some evidence to support conclusions drawn in "Analysis of Student Learning" section; • Explores possible hypotheses for why some students did not meet learning goals. ✓	• Uses ample evidence to skillfully support conclusions drawn in "Analysis of Student Learning" section; • Explores multiple hypotheses for why some students did not meet learning goals.	10
Insights on Effective Instruction and Assessment	Provides little or no rationale for why some activities or assessments were more successful than others.	✓ • Identifies successful and unsuccessful activities or assessments; • explores reasons for student success or lack thereof with some use of theory or research.	• Identifies successful and unsuccessful activities and assessments; • provides theoretically sound reasons based on research for student success or lack thereof.	10
Alignment Among Goals, Instruction and Assessment	• Does not connect learning goals, instruction, and assessment results in the discussion of student learning and effective instruction; • and/or the connections are irrelevant or inaccurate.	Connects learning goals, instruction, and assessment results in a general discussion of student learning and effective instruction.	Logically and thoroughly connects learning goals, instruction, and assessment results in a comprehensive discussion of student learning and effective instruction. ✓	10
Implications for Future Teaching	Provides few or no ideas or inappropriate ideas for redesigning learning goals, instruction, and assessment.	• Provides some ideas for redesigning learning goals, instruction, and assessment; ✓ • offers a general rationale for why	• Provides ideas for redesigning learning goals, instruction, and assessment; • offers a specific rationale as to why these	10

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
		these changes would improve student learning.	modifications would improve student learning.	
Implications for Professional Development	Provides few or no professional learning goals or goals that are not related to the insights and experiences described in this section.	• Presents professional learning goals that are somewhat related to the insights and experiences described in this section; • provides a general plan for meeting the goals.	• Presents professional learning goals that clearly emerge from the insights and experiences discussed in this section; • Describes specific steps to meet these goals.	10

Comments:

Student Teaching Reflection
Rubric

Teaching Process: Reflective practitioners continually evaluate the effects of their choices and actions on others, including students, parents, and other professionals within their learning community

Rating → Indicator ↓	1-2 Unacceptable	3-4 Acceptable	5-6 Target	RIBTS
Learning	Candidate describes in general terms what was learned with little reference to student teaching experience and shows little or no consideration related to the success of the experience in developing personal and professional knowledge.	Candidate describes in detail what was learned that includes references to the student teaching experience, showing some consideration related to the success of the experience in developing personal and professional knowledge. ✓	Candidate provides a detailed explanation of what was learned in student teaching, demonstrating a thoughtful consideration of the success of the experience in developing personal and professional knowledge.	10
Reference to Standards	Candidate makes little or no reference to RIBTS and/or Conceptual Framework in discussion of student teaching experience and his/her professional practice.	Candidate demonstrates some insight into and understanding of RIBTS and Conceptual Framework in discussion of student teaching experience and professional practice. May focus on one set of standards more than the other. ✓	Candidate demonstrates strong insight into and understanding of both the RIBTS and Conceptual Framework in discussion of student teaching experience and professional practice.	10
Planning, Action and Reflection	Partially describes and analyzes his/her professionalism but provides limited evidence, few recommendations to improve future practice.	A somewhat thoughtful analysis of professional practice and some recommendations for future professional development are included. ✓	Provides multiple pieces of evidence and analysis of professional practice. Thoughtful and careful analysis and numerous plans to seek out professional future professional development are included.	10

Omitted Conceptual Framework

[redacted]

Assessment Plan : The Mole

need m, v, d and SI units, or problems can arise!

Assessment Plan Overview

Learning Goal 1: Given the number of moles, grams, or particles of any substance, students will be able to convert to any other unit in 80% of the problems

Pre-assessment: Measurement activity to determine if student can convert between different units. The first couple of problems in each of the different sections of the mole notes to determine if students are capable of converting between the three different mole units.

Formative Assessment: 25 problems built into the class notes that students will practice with; performance-based task in which students will apply the mole conversions to a lab situation

Formative Assessment: group exercise in which students will devise a procedure to count a very large number of particles (impossible to do without mole conversions)

Post-assessment: Quiz on mole conversions and part of the quiz will be a lab practical in which students must actually go into the lab and show me how to apply mole conversions to a lab situation

Learning Goal 2: Given a sample and the chemical formula of the sample, students will predict the number of moles and the number of particles in a lab situation.

Pre-assessment: 2-3 problems in which mass of a sample is given and students must determine the unknowns

* You have totally omitted asking questions, the most common form of assessments.

Formative assessment: students will work in small groups and perform calculations on an overhead transparency and then present to the class. This will make the students more accountable for their work √

Post-assessment: Quiz on mole conversions and part of the quiz will be a lab practical in which students must actually go into the lab and show me how to apply mole conversions to a lab situation

↳ nice!

Learning Goal 3: Students will use the concept of the mole and mole conversions to solve a non-unique problem

Pre-assessment: 2-3 problems (built into the notes) to be done for homework to make sure the students have the knowledge they need in order to solve the problem

Formative assessment: as the students work, provide assistance with possible procedure flaws and errors in calculations ↖ ASK QUESTIONS!

Post-assessment: the procedure that the students use to solve the problem and the types of calculations they use

TOO

Learning Goal 4: Given a sample or word problem, students will be able to theoretically and experimentally apply the concepts they have learned to determine the empirical formula of a compound and the empirical formula of a hydrate

Pre-assessment: the first couple of practice problems that are built into the notes; percentage of water in a fruit lab; determine the percentage of boys and girls in the classroom

Formative assessment: how students do on the practice problems; how students go about in determining the empirical formula of a compound and the empirical formula of a hydrate. How students work in the lab and find the equipment that they need in order to be successful

Post-assessment: 2 quizzes; final lab reports due at the end of the lab. Students must answer data analysis questions and perform all calculations. The empirical formula of a hydrate lab requires a formal lab report. Rubrics for the lab are to be attached.

Learning Goal 5: Given an inquiry task, students will design a procedure for solving a given problem, perform the procedure, and assess the final results

Pre-assessment: determine the volume of rectangular and cubic shapes; ~~1~~ one problem in which students convert from cubic meter to meter unit

Formative assessment: the procedure that the students devise to solve the problem and how the students actually perform the procedure; provide scaffolding for the procedure and bring up possible problems with design to the whole class

Post-assessment: a one page final paper from each group explaining the procedure they used to solve the problem and all of the calculations that they used

Learning Goal 6: Students will analyze a scientific debate-whether or not methane hydrates will be a viable fuel source in the future- and write a persuasive essay in which they pick one side and back up their claims with evidence and logic

Pre-assessment: informally ask the students what they remember about energy sources and the advantages and disadvantages of each kind

Formative assessment: students will fill out the notes and do the practice problems given; provide scaffolding as needed

Post-assessment: Students will also write a persuasive essay on the possible use of methane hydrate as a future energy source. The focus will be more on how the students use logic and evidence to back up their claims. ↘ Could also have the debate !

The pre-assessment for Learning Goals 1 and 2 consists of 6 dimensional analysis problems. Students must get 5 out of 6 correct in order to be deemed proficient. The other pre-assessment is being able to correctly do one problem from each of the different sections in the mole notes packet without assistance. The post-assessment is a quiz on mole conversions and a lab practical. The student must get an 80 or above to be deemed proficient.

The pre-assessment for Learning Goal 3 is two homework problems and a unique problem that they have never seen before. Students must show all work and have the correct answers for the homework problems in order to be proficient and students must be able to individually solve the unique problem on their own and have the correct answer. The post-assessment is how the students went about in solving a unique problem in order to be proficient they must have the correct answer.

The pre-assessment for Learning Goal 4 is being able to correctly do one problem from each of the different sections without assistance. Another pre-assessment is students must be able to determine the percentage of boys to girls in the classroom without assistance and determine the similarities between 4 different compounds that all have the same empirical formula. The students must also be able to determine the percentage of water in a fruit without assistance.

For each of these, the students must also have the correct answer. The post-assessment consists of 2 quizzes, one lab, and one formal lab report. Students must get above an 80 on all of these in order to be deemed proficient.

The pre-assessment for Learning Goal 5 is being able to determine the volume of rectangular and cubic shapes and converting from cubic meters to meters. Students must be able to solve both problems correctly. The post-assessment is a one page paper with a procedure for performing the task and the calculations that were used. Each group needs to hand in one page and in order to be proficient the procedure must be plausible and 80% of the calculations must be correct.

The pre-assessment for Learning Goal 6 is an informal question on the types of energy sources. Students must be able to name 3 different types of energy and differentiate between renewable and non-renewable energy. The post-assessment is a writing assignment on methane hydrates and in order to be deemed proficient students must use evidence to back up their position, cite it 80% of the time, and they must use 2 different sources.

The formative assessments that I will use consist of many practice problems and performance of procedures in the lab. Each subsection in the unit will have practice problems for the students to do. This is extremely important because it tells me a lot about where students are having trouble and at one point in the problem the student is tripping on. I tell the students to show all of their work so that I get a clear picture of what exactly they do know and where they need help. Their performance in the lab is also very important because it tells me what students are capable of and it also lets me know if the students can apply the theory to a real-world situation.

[redacted]

Teacher Work Sample: Learning Goals

Learning Goals:

1. Given the number of moles, grams, or particles of any substance , students will be able to convert to any other unit in 80% of the problems
2. Given a sample and the chemical formula of the sample, students will predict the number of moles and the number of particles in a lab situation.
3. Students will use the concept of the mole and mole conversions to solve a non-unique problem ?! huh
4. Given a sample, students will be able to theoretically and experimentally apply the concepts they have learned to determine the empirical formula of compound and the empirical formula of a hydrate
5. Given an inquiry task, students will design a procedure for solving a given problem, perform the procedure, and assess the final results (M&M task) → Communicate results!!
6. Students will analyze a scientific debate-whether or not methane hydrates will be a viable fuel source in the future- and write a persuasive essay in which they pick one side and back up their claims with evidence and logic ↖ Good - connects to world

Aligned with the Standards:

Goal 1,2,3,: State Standard: Physical Science(PS2 #6) Students demonstrate an understanding of physical, chemical, and nuclear changes by using chemical equations and information about molar masses of reactants and products in chemical reactions

Goal 1,2,3,: National Standard: Physical Science: Structure of Atoms – matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge

Goal 3: National Standard: History and Nature of Science

Usually, changes in science occur as small modifications in extant knowledge. The daily work of science and engineering results in incremental advances in our understanding of the world and our ability to meet human needs and aspirations. Much can be learned about the internal workings of science and the nature of science from study of individual scientists, their daily work, and their efforts to advance scientific knowledge in their area of study.

Science and Technology: creativity, imagination, and a good knowledge base are all required in the work of science and engineering

Goal 4: National Standard: Physical Science: Structure of Atoms – matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge

National Standard Content Standard A- Abilities necessary to do scientific inquiry

Use technology and mathematics to improve investigations and communications- mathematics plays an essential role in all aspects of an inquiry; measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results

Goal 5: National Standard Content Standard A - Abilities necessary to do scientific inquiry:

Design and conduct scientific investigations- students must use evidence, apply logic, and construct an argument for their proposed explanations

Use technology and mathematics to improve investigations and communications- mathematics plays an essential role in all aspects of an inquiry; measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results

Formulate and revise scientific explanations and models using logic and evidence- in the process of answering the questions, the students should engage in discussions and arguments that result in the revision of their explanations

Goal 6: National Standard: History and Nature of Science:

Science as a Human Endeavor- individuals and teams have contributed and will contribute to the scientific enterprise. Doing science or engineering can be as simple as an individual conducting field studies or as complex as hundreds of people working on a major scientific question or technological problem

Nature of Scientific Knowledge- Because all scientific ideas depend on experimental and observational confirmation, all scientific knowledge is, in principle, subject to change as new evidence becomes available. In areas where data or understanding are incomplete, such as the details of human evolution or questions surrounding global warming, new data may well lead to changes in current ideas or resolve current conflicts

Science in Personal and Social Perspectives:

Science and technology in local, national, and global challenges- Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and who bears them. Students should understand the appropriateness and value of basic questions-"What can happen?"-"What are the odds?"-and "How do scientists and engineers know what will happen?"

Types and Levels of Learning Goals:

Goals 1 and 2 are knowledge goals and they focus on application of a concept. Students need to be able to convert between number of particles, the mole, and mass because the mole is an extremely important unit in chemistry. The mole allows scientists working in the lab to be efficient and cost-effective, which is very important especially in our current economic times. Most importantly, the mole bridges the gap between the microscopic world of atoms where chemistry occurs, to the macroscopic world which we live in. The mole also makes equivalencies a lot easier to deal with, which will be extremely important for the next unit on stoichiometry. The prerequisite knowledge needed to start this goal is dimensional analysis. (and metric system)

Goal 3 is an upper level goal because it asks students to use the concepts they have learned so far and apply it to a situation that is unique and different from what they have previously seen. In order to solve the problem, they will need to be able to perform mole conversions and really understand why the mole is used in the lab.

Goal 4 is an upper level task because it asks students to apply the concepts they have learned to theoretical word problems and to a lab situation. Two different labs were performed and the first lab was spelled out in terms of procedure because of the safety issues involved with burning magnesium oxide. The second lab was more open in terms of how to do the lab because the students were more comfortable using the Bunsen burners at this point and the safety issues concerning copper(II) sulfate were minimal. In order to do well on the labs, the students really had to know how to determine empirical formulas and not just be able to do the same practice problem over and over again.

Goal 5 is an upper level task because it asks students to develop a procedure in order to solve a given problem. For many labs, students are usually given the procedure like a recipe ✓ and in most cases they can follow it blindly without really knowing what they are accomplishing. This goal focuses on inquiry and getting the students to develop their own plan of action and actually performing it and assessing their results. In the process, mistakes will be made, but the point of the task is to make modifications and continue. The students will be given all of the knowledge they need to complete the task, but they need to put it all together in order to solve the problem. → remind them that real science works this way!

Goal 6 is an upper level task because it asks students to analyze a scientific debate. Methane hydrates are a possible future energy source, but there are many issues that still need to be resolved such as global warming implications and technology problems in extracting the methane hydrates from the bottom of the ocean. More importantly, it asks students to use evidence and logic in forming their opinion.

missing the communication piece

[redacted]

Teacher Work Sample: Contextual Factors

The school that I am student teaching at is Pilgrim High School in Warwick, RI. It is a suburban high school with about 1200 students. The student population is varied in terms of the socio-economic profile. Some of them are considered upper-class, most are middle-class, and some come from very poor families. The political climate of the area is stable right now, but the governor's proposal to cut COLA benefits for those teachers who do not retire that are eligible is causing some commotion among the teachers and administrators. Another huge factor that is causing some uproar and really affects how I teach is the fact that there is no money for supplies. For example, there is a continual threat of running out of paper and I just found out that the library no longer gets a subscription to the daily newspaper. The school curriculum is based on national and state standards and it is very rigid. Pilgrim has adopted the use of common tasks for the students and I believe all of the major subjects are using them. Social studies is the only exception, however, they are starting to use them this year. The common task has limited me in terms of making my own final assessment for a unit because we are supposed to use the task. Not all units have a task for it because they are still being developed, but so far I like the tasks because they are situational tests and I think they are valid.

The classroom that I am teaching in is very cramped. The teacher's desk is huge and located right in front of the blackboard so I have to squeeze in many times in order to use the board. There is a moveable whiteboard that is located to the right of the blackboard but it is broken so you have to be really cautious when you write on it or it will flip over. There is an overhead projector in the room, which I plan on using more and more because I am finding that

Because of you, or because of them?

I do not like to have my back to the students. There is also a projector for powerpoints or anything else that you would want to display from a computer. There is also access to a television that just needs to get signed out. In terms of classroom rules and routines, it is not an extremely strict class and there are not many rules, which I think is a good thing. The most important rule that I will be firm on is being safe in the lab. √

The students that I am teaching are sophomores and juniors. They are a fairly homogenous group in terms of race/ethnicity. Most of them are Caucasian and I only have one girl who is of Spanish descent. She is not an ELL student, however, and her primary language is English. There are 6 boys and 10 girls in the class and only one girl has an IEP. The reason that she has one is because she is colorblind, so I will have to keep that in mind whenever I do labs that require being able to differentiate between colors. pH; color-spectra; think it through. The teacher for the class already ran into this problem when they did the flame test lab in the beginning of the year and she marked all of the student's work wrong, not aware that she was colorblind. ouch This is a Honors Chemistry class and in order to stay in the class and go into Honors Physics next year the student must get at least a B. After the first half of the year, about 3 students left the class because they were failing, to go take College Prep Chemistry, which is less math-oriented and the pace is a lot slower. I am not sure if any of these students had an IEP or 504 because they left just before I started teaching. My cooperating teacher tells me that she thinks these students should not have been in the class in the first place and that the guidance counselors were the one to suggest they try it because they had okay grades in biology the year before. The students' skills are not at the level that I was hoping they would be and I am finding that I need to do a lot of teaching that I did not think I would have to. I may need to use more than a couple pre-

I guarantee they won't be.

assessments to make sure that everyone starts out at the same level. In terms of the difference in their skill levels, it does not seem that there is a huge gap anywhere. Of course there are students that get the A's and there are students that get the E's, but from what I have seen it is not an issue of skill level, but rather lack of motivation and not doing the work in class. I do realize that there is always the possibility that these students are not motivated because they feel that the material is too difficult and they will never get it, so why try. This is where the use of good pre-assessments will hopefully help me out in the long run. → good adjust

Knowledge of the contextual characteristics of the community, classroom, and students has greatly affected how I will plan and implement my unit. First of all, the students in my class (which one?) seem to be concerned with their grades and I have found that using a good or bad grade as motivation does work very well. This is very different from the rest of my classes where most students do not seem to care about their grades as much as they do about looking good in front of their peers. As a result, for these classes I have activities planned in which the students will need to present their findings to the rest of the class, which also holds them accountable. ✓ The students are also very antsy. They really have a hard time sitting still for too long. I realize most students have this issue, but these students are really fidgety. Therefore, I have a lot of activities in which the students move around the room. I also planned a lot of labs for this unit to keep them moving.

some of that is the tightly enclosed space; it causes that behavior.

Name: Pd:

Measurement Activity

There are many kinds of measurements in the world. Show all work for calculations

1. How many eggs are in 15 dozen eggs? (1 dozen = 12)

2. How many donuts are there in 6 dozen? (1 dozen= 12)

3. How many sheets of paper are in 5 reams? (1 ream = 500 sheets)

4. How many reams is 3,250 sheets of paper? (1 ream = 500 sheets)

5. How many particles are in 3 moles? (1 mole = 6.02×10^{23} particles)

6. How many moles are in 3.27×10^{18} particles? (1 mole = 6.02×10^{23} particles)

Name: pd. date:

1. What do each of the molecules in box A have in common? Box B? Box C?

Box A	Box B	Box C
CH_2O	$C_2H_4O_3$	$C_{12}H_{20}$
$C_2H_4O_2$	$C_6H_{12}O_9$	C_6H_{10}
$C_4H_8O_4$	$C_4H_8O_6$	C_3H_5
$C_6H_{12}O_6$	$C_{12}H_{24}O_{18}$	$C_{15}H_{25}$

2. Circle the molecule in each box with the lowest whole number ratio.

3. Find the percent composition of the students in this class according to gender. What percentage is girls and what percentage is boys?

Why is the intro question #3?

Lead w/ this → then move to chemistry

Name: Pd. Date:

Lab: Percent Water in a fruit

Problem: Determine the percentage of water in a piece of fruit

√

Pre-Lab:

1. How could you get rid of the water in a piece of fruit? (5 points)

Data:

2. What kind of fruit did you choose?________________

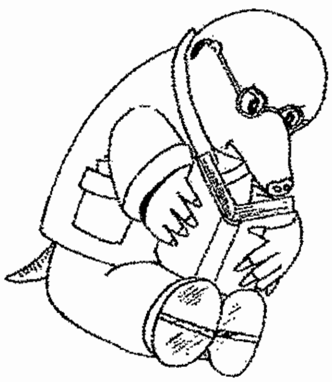
Make a **data table** for your calculations (10 points)

3. What is the mass of water in the fruit?

Post-Lab

4. What is the percentage of water in the fruit? (Show all calculations) (10 points)

NOTES: THE MOLE



THE MOLE:

- A mole is a unit!
- **1 mole = 6.02×10^{23} of anything**
- Ex. 1 mole of Pencils = 6.02×10^{23} Pencils
- Ex. 1 mole of an element = 6.02×10^{23} atoms of the element
- 6.02×10^{23} is called **Avogadro's Number.**

COUNTING PARTICLES

- Particles in a molecular compound are called **molecules**
  - Only NONMETALS
    - Examples: water (H_2O), carbon dioxide (CO_2, methane (CH_4)

- Particles in an ionic compound are called **formula units**
  - Metal & a Nonmetal
    - Examples: sodium chloride (NaCl), copper (II) sulfate ($CuSO_4$)

- Particles in an element are called **atoms**
  - Symbols are on the Periodic Table
    - Examples: copper (Cu), silver (Na), magnesium(Mg)

QUESTIONS:

1.) How many particles are in one mole of aluminum foil?

2.) How many particles are in one mole of iron (II) oxide?

3.) How many particles are in one mole of nitrogen monoxide?

THE MOLE AND THE PERIODIC TABLE:

I. Atomic mass (atomic weight) = **MOLAR MASS.**

Definition of **MOLAR MASS**:
The mass, in grams, of 1 mole of an element or compound

Unit of MOLAR MASS: **g/mole**

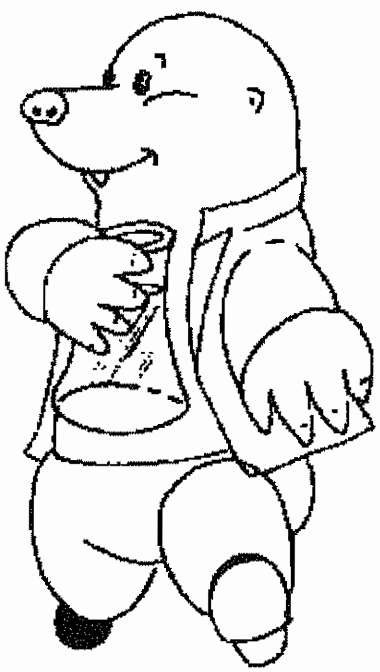
Ex. 1 mole of carbon has a mass of 12.01 grams.
(Round all molar masses to 2 decimal places)

Conversion factors for carbon:

1 mole carbon atoms = 6.02×10^{23} carbon atoms

1 mole carbon atoms = 12.01 grams of carbon

PRACTICE:



4a.) 1 mole of iron = ? iron atoms

4b.) 1 mole of iron = ? g iron

5a.) 28.09 g of silicon = ? moles of silicon

5b.) 28.09 g of silicon = ? atoms of silicon

6a.) 6.02×10^{23} atoms of sodium = ? moles of sodium

6b.) 6.02×10^{23} atoms of sodium = ? g of sodium

MOLAR MASS OF A COMPOUND:

1.) To find the molar mass of any compound:

- Find the number of atoms of each element
  - Look at the subscripts
- Multiply the number of atoms of each element by the molar mass.
- Add the total mass of each element to get the mass of the compound.
- The unit for molar mass is always g/mol.

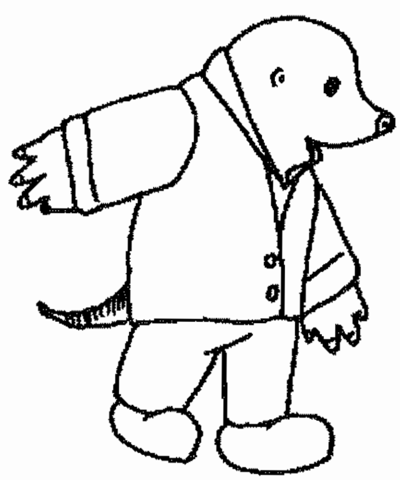
Ex 1.) Find the molar mass of H_2SO_4.

Count the atoms then multiply the # of atoms by the molar mass of the element:

2 atoms of hydrogem: 2(1.01 g/mol)
1 atom of sulfur: 1(32.06 g/mol)
4 atoms of oxygen: 4 (16.00)
TOTAL: 98.08 g/mol = molar mass of H_2SO_4

The conversion factors:
1 mole H_2SO_4= 98.08 g H_2SO_4
1 mole H_2SO_4= 6.02×10^{23} molecules H_2SO_4

(Notice how H_2SO_4 is called a **molecule** because it is **molecular**)



Ex.2) Find the molar mass of Fe_2O_3.

2 atoms of Fe: 2(55.85g/mol)
3 atoms of O: 3(16.00 g/mol)

TOTAL: 159.7 g/mol

Conversion factors:
1 mole Fe_2O_3 = 159.7 g
1 mole Fe_2O_3 = 6.02×10^{23} formula units of Fe_2O_3

Notice how Fe_2O_3 is called a **formula unit** because is it **ionic.**

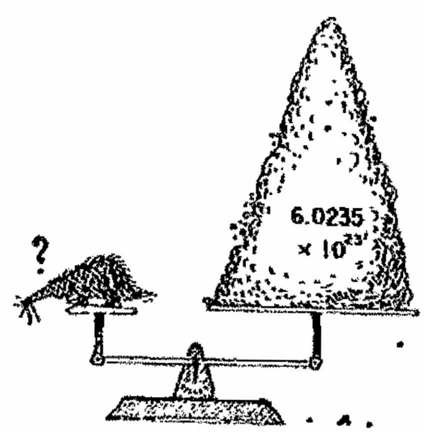
Practice Problems:

7.) What is the molar mass of oxygen? (Remember that it is diatomic!)

8.) How many atoms of zinc are in 1 mole of zinc?

9.) What is the molar mass of dinitrogen tetroxide?

10.) What is the molar mass of magnesium sulfide?

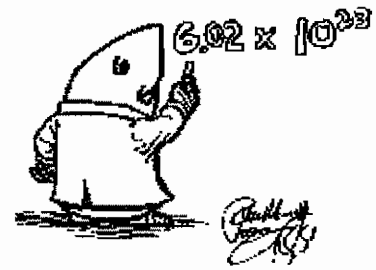


11.) How many particles are in one mole of dinitrogen tetroxide?

12.) How many particles are in one mole of magnesium sulfide?

13.) 6.02×10^{23} atoms of boron is equal to how many moles of boron?

14.) What is the mass of one mole of silver?



15.) What is the mass of one mole of methane?

16.) What is the mass of one mole of hydrogen sulfide gas?

17.) 1 mole $Al_2(CO_3)_3$ = ? g

18.) 1 mole $Ba_3(PO_4)_2$ = ? g

MOLE CONVERSIONS:

Mass (g) ⟷ Mole (mol) ⟷ Particles

(atoms, formula units, or molecules)

Conversion Factors:

1.) Moles to mass: Use molar mass from Periodic Table

2.) Moles to Particles: Use Avogadro's Number- 6.02×10^{23}

3.) Mass to Particles: Requires two conversions

- Remember rules of Dimensional Analysis
  - Set up units so they cancel out

PRACTICE:
Use dimensional analysis to solve the following.

19.) 19.5 g carbon dioxide = ? moles carbon dioxide

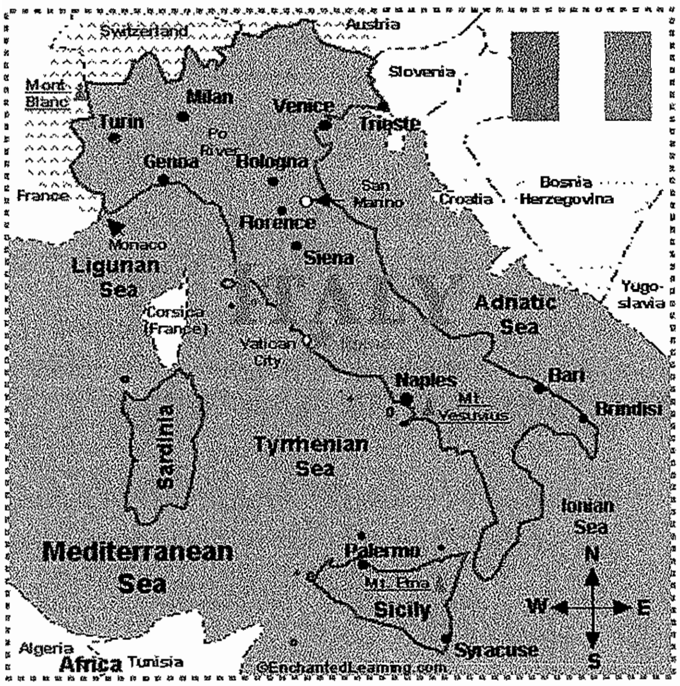
20.) .156 moles potassium = ? grams potassium

21.) .034 moles silver = ? atoms of silver

22.) 3.24 x 10^{25} molecules of Hydrogen = ? moles Hydrogen

23.) Molysite is a silvery gold mineral that can be found in small amounts in Mt. Vesuvius in Italy. How many formula units of iron (III) chloride are in .35 grams of molysite?

From: http://www.mindat.org/min-2749.html



24.) Calcium carbonate is the main component in seashells. You have collected 4.72 grams of seashells on Oakland Beach. How many formula units of calcium carbonate have you collected?

25.) Vinegar is made of acetic acid, $HC_2H_3O_2$. You use 2.32 grams of vinegar in a recipe. How many molecules of vinegar have you used?

26.) How many atoms are in 8.9 grams of phosphorus?

27.) What is the mass of 9.8×10^{45} formula units of $MgSO_4$?

EXTRA CREDIT #1: Build a Mole (+10)

Directions:

1.) Go to http://www.statweb.org/ACT2/mole%20pattern%20old.pdf

OR

Google "Mole Pattern"

2.) Build a mole out of fabric or paper BUT to earn extra credit MOLE must be 3D

3.) On the side of your mole write Avogadro's Number- 6.02×10^{23}

EXTRA CREDIT #2: Mole Songs (+ 10)
Directions:

1.) Write an original mole song/poem. Have fun with it, be creative!
2.) Must mention at least 4 chemistry vocabulary words
3.) Write lyrics onto construction paper to make an eye-catching presentation.

WARNING: Do not steal a song/poem from the internet! This is plagiarism!

Mole Conversion Exercise **Pd.**

Think of moles as a "chemist's dozen". Just as 12 eggs is a dozen eggs, 6.02×10^{23} eggs is a mole of eggs. 6.02×10^{23} molecules of oxygen is a mole of oxygen.

The number of grams in a mole is different from substance to substance. If you're like most students, it's *this* that's confusing you. Picture it this way: a dozen elephants have a different weight than a dozen rabbits- but in each case, you have a dozen animals. Similarly, a mole of oxygen gas has a different weight than a mole of water- but in each case, you have 6.02×10^{23} molecules.

Why use moles? You often want to know how many molecules you have in a sample of a substance. Counting the molecules individually would be completely impractical. Even if you had a way to see the individual molecules, there are just too many, even in a tiny sample. Moles were defined to solve the problem of counting large numbers of molecules. With moles, you count the number of molecules in the sample by weighing it.

Really? You ever done that?

Ex.
Let's say that you are working in the lab and you are told to make table salt (NaCl). The recipe calls for 8.18×10^{18} atoms of sodium metal and 4.09×10^{18} atoms of chlorine gas. How would you go about in getting 8.18×10^{18} atoms of sodium metal and 4.09×10^{18} atoms of chlorine gas?

*Would you start trying to count out 8.18×10^{18} atoms of sodium and 4.09×10^{18} atoms of chlorine? Can you even see one atom of sodium or chlorine to be able to count them?

What do moles do?

→ They allow us to calculate equivalencies.

Demonstrating the need for moles will help teach it.

NOTES: Empirical Formula, Molecular Formula, % Composition

- **Empirical Formula**

  Definition: a formula that shows the lowest whole number ratio of atoms in a compound

- **Molecular Formula**

  Definition: the formula of a compound that shows the actual number of atoms in the compound

Ex. C_4H_{10} is called a Molecular Formula
- it can be reduced to C_2H_5
  - C_2H_5 is the empirical formula

PRACTICE:

1.) Glucose, a sugar dissolved in our blood & used in respiration, has the formula

$C_6H_{12}O_6$.

a. What is the molecular formula?

b. What is the empirical formula?

2.) Sucrose, a sugar that we use in our coffee, has the formula $C_{12}H_{11}O_{22}$

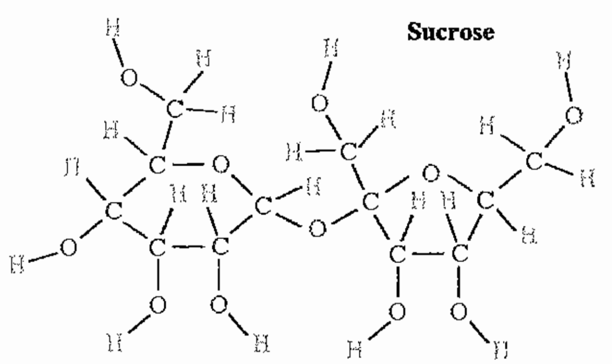
a. What is the molecular formula?

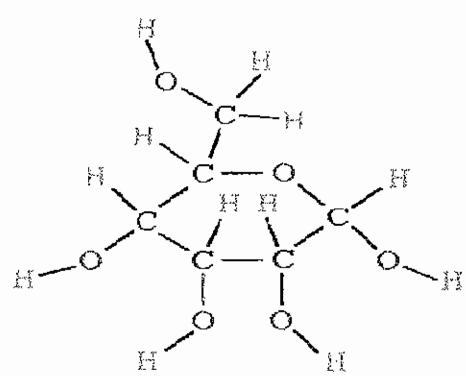
b. What is the empirical formula?

Below are the structural formulas of sucrose and glucose:

From: http://www.purchon.com/biology/sugars.htm

Sucrose





Glucose

- **% Composition**
  - Definition: the percent by mass of an element in a compound
    - To find % composition
      - Find the molar mass of the compound
      - Multiply the molar mass of each element times the number of atoms in the compound
      - Use the formula below:

Formula: $\% \text{ composition} = \dfrac{\text{mass of element}}{\text{molar mass of compound}} \times 100$

Note: Remember the percents are part/whole x 100

Example: Let's compare the % compositions of glucose and sucrose.

- Both molecules are made of atoms of carbon, hydrogen & oxygen

  % composition of glucose

  % composition of sucrose

PRACTICE:

3.) The mineral witherite is made of barium carbonate and though very uncommon it has been found in the United States, Canada, England, and Germany. Determine the % composition of witherite.

From: http://mineral.galleries.com/minerals/carbonat/witherit/witherit.htm

4.) Iron (III) sulfate is a compound used in sewage-treatment plants to help settle small particles of untreated sewage in treatment tank water. Determine the % composition of iron (III) sulfate.

From : http://www.columbusdispatch.com/live/content/science/stories/2008/01/08/sci_BattelleAMD.ART_ART_01-08-08_B6_AP8V6FO.html?sid=101

- Determining Empirical Formula from % Compositions
  - 4 steps
    - Change % to grams
    - Convert to moles (use molar mass)
    - Divide all mole amounts by the smallest # of moles
    - Multiply to get to a whole number
    - The whole numbers are the subscripts in the formula

Example:

5.) A compound is found to be 54.09% Ca, 43.18% O, and 2.73% H. Determine its empirical formula.

6.) A compound is found to be 36.87 % carbon, 16.22 % hydrogen, and 45.11 % nitrogen. Determine its empirical formula.

- Molecular Formula from Percent Composition
  - First find the empirical formula
  - Find the molar mass of the empirical formula
  - Use the formulas below:

$$n = \frac{\text{molar mass of molecular formula}}{\text{molar mass of empirical formula}}$$

n(empirical formula) = molecular formula

EXAMPLE:

7.) The % composition of a compound is 40.00% C, 6.72% H, 53.29% O. The molar mass of the molecule is 180 g/mol. Determine the empirical formula & the molecular formula.

8.) A compound with 57.1 g carbon, 38.0 g sulfur and 4.9 g hydrogen has a molar mass of 168 g/mol. Determine the empirical formula & the molecular formula.

PRACTICE

9.) Determine the empirical and molecular formula for C_3H_6.

10.) Determine the % composition of C_3H_6.

11.) How many molecules of C_3H_6 are in 6.78 grams?

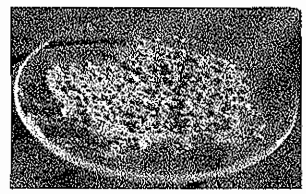
NOTES: HYDRATES

Hydrate

*Definition: A compound with water molecules as part of the crystal structure

Example of a Hydrate:

cobalt(II) chloride hexahydrate vs. cobalt(II) chloride



1. What is the difference between these two compounds?

2. What do you call a compound that is without water?________________

3. What color is the hydrated form of the compound?________________

   What color is the anhydrous form of the compound?________________

*One use of **anhydrous compounds** is as a **dessicant** – a dessicant is used to keep things dry by absorbing the water in the air and away from whatever it is that you want to keep dry.

Prefixes		
1	-	mono
2	–	di
3	–	tri
4	–	tetra
5	–	penta
6	–	hexa
7	–	hepta
8	–	octa
9	–	nona

***RULES for Naming Hydrates**

- Name the ionic compound
- Use numeric prefixes for the number of water molecules
- Substitute the word hydrate for water

Ex:

What is the name of Na_2SO_4 $5H_2O$?

***Rules for Writing Formulas for hydrates:**

- Write the formula for the ionic compound
- Draw a dot to separate the ionic compound from the water molecules
- Write the formula for water with the appropriate coefficient

Ex:

What is the formula for calcium chloride tetrahydrate?

Practice Examples:

Write the name for the following hydrates:

4. $CuSO_4$ $10H_2O$

5. Na_2SO_4 $5H_2O$

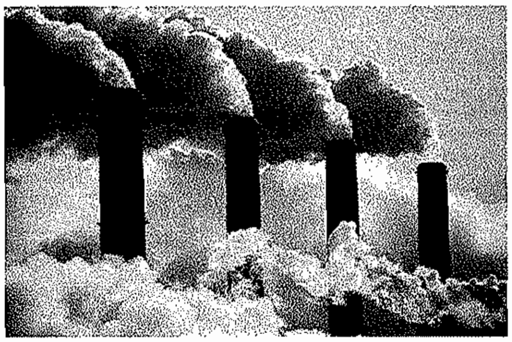
Write the formula for the following hydrates:

6. Nickel (II) chloride hexahydrate

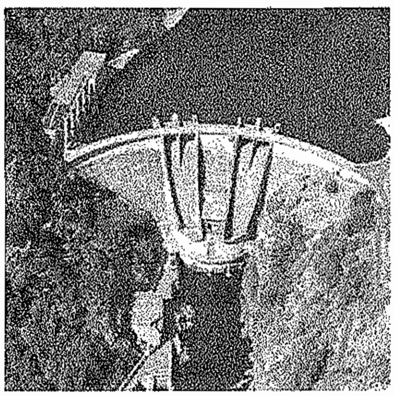
7. Magnesium carbonate pentahydrate

Energy Sources - Review

*What are some **nonrenewable** energy resources? ______________________________



*What are some **renewable** energy resources? ________________________________

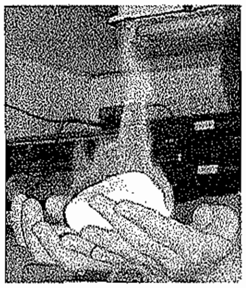


There is a constant search for **alternative energy sources because we are currently using up our nonrenewable energy. It is an issue that will become very relevant to your future**

One possible future energy source that is currently being researched is the use of gas hydrates - specifically **METHANE HYDRATE**

*Methane alone is found where? ____

*What is the slang name for methane hydrate and why is it given this name?



*How many moles of water are there for every 1 mole of methane? __________

*Where is methane hydrate found and why?

*What are the 4 major problems of obtaining methane hydrate?

*Explain why a sudden release of methane gas could have such a serious effect on Earth's atmosphere?

Name: Pd. Date:

Honors Quiz: Mole Conversions

For each of the following show all calculations and units. (5 points each)

1. How many formula units are in one mole of sodium chloride?

2. How many grams are in 1 mole of Flourine gas?

3. How many grams are in 3 moles of sodium carbonate?

4.) How many atoms are in 10.7 grams of carbon?

5.) In order to make magnesium sulfide (MgS), you need 5.08×10^{22} atoms of magnesium metal and 5.08×10^{22} atoms of sulfur.

a.) How many grams of magnesium do you need to weigh out?

b.) How many grams of sulfur do you need to weigh out?

6.) How many molecules are in 29 grams of H_2O?

Extra Credit: Show all work (10 points)

Which sample has more atoms? 30 kg of helium or 0.5 mg of gold

Name: Pd.

Lab Practical: (15 points)

What is your sample?____________________

Determine the number of particles, moles, and mass of your sample:

Name Date:

Honors Quiz: Show all work (20 points)

1. Determine the percent composition of aspartame ($C_{14}H_{18}N_2O_5$), an artificial sweetener.

↳ give example, maybe picture

2. Hydrazine contains 87.45% nitrogen and 12.55% hydrogen, and has a molar mass (molecular formula) of 32.04 g/mol. Determine hydrazine's empirical and molecular formula.

Name: Pd. Date:

Honors Hydrates Quiz

Name the following hydrates (3 points each):

1. $CaCl_2 \cdot 6H_2O$

2. $MgSO_4 \cdot 7H_2O$

Write the formula for the following hydrates (3 points each):

3. Barium hydroxide octahydrate

4. Cobalt(II) chloride tetrahydrate

Show all work (10 points each)

5. Chromium(III) nitrate forms a hydrate that is 40.50% water by mass. What is its chemical formula?

6. Determine the percentage of anhydrous sodium carbonate and water in sodium carbonate decahydrate.

7. Hydrated sodium tetraborate ($Na_2B_4O_7 \cdot xH_2O$) is commonly called borax. Chemical analysis indicates that this hydrate is 52.8% sodium tetraborate and 42.7% water. Determine the formula and name the hydrate.

Extra Credit(10 points)

The compound methyl butanoate smells like apples. Its percent composition is 58.8% carbon, 9.8% hydrogen, and 31.4% oxygen and its molar mass is 102 g/mol. What is the empirical and molecular formula of methyl butanoate?

Name: Date: Period:

Group Partners':

Lab: Determination of an Empirical Formula

Materials:

Magnesium ribbon	steel wool	
Ring stand	clay triangle	
Crucible & cover	tongs	
Bunsen burner	ring	wire gauze

Procedure:

1. Place a clean, dry crucible and crucible cover on a clay triangle on a ring stand over a bunsen burner. Adjust the height of the ring so the bottom of the crucible will be in the hot part of the flame. Place the cover so it is slightly ajar, allowing air to leave the crucible.
2. Heat the covered crucible for about 5 minutes. The bottom of the crucible should be red-hot. Turn off the burner and allow the crucible to cool for 5 minutes.
3. When the crucible is cooled to room temperature, transfer it to the balance with crucible tongs and record the mass. Record the mass in the data table.
4. Obtain about 0.15-0.2g of magnesium ribbon. If the metal is not shiny, rub it with steel wool to remove oxidized metal. Wipe the metal with a paper towel to remove the oxide dust. Weigh the clean metal to the nearest 0.001g and record the mass in the data table.
5. Fold the magnesium ribbon so it fits in the crucible. Place in the crucible. Cover the crucible and reweigh it. Place the crucible on the clay triangle over the Bunsen burner.
6. Carefully lift the edge of the crucible so you can see the crucible's contents. Start heating the covered crucible. Do not open the lid too far, doing so will cause the magnesium to enflame, carrying some oxide product away as smoke. The metal should glow brightly without flames.

Safety:

Burning magnesium produces a very bright white flame. DO NOT look directly at the flame, it can damage your eyes.

- **Be aware of your surroundings when working with a Bunsen burner. Any inappropriate behavior will result in a ZERO on the lab.**

7. Continue heating until no metal remains and the sample no longer glows. Turn off the burner and allow the crucible and its contents to cool to room temperature.
8. Mass the crucible and record in the data table.
9. Clean your crucible and dispose of the waste in the correctly labeled waste container.

Pre-lab Questions: (5 points each)

Read the procedure before answering the two questions below.

1.) Draw a diagram of the apparatus for the experiment. Label all equipment.

2.) Prepare a data table to record all measurements and observations.

DATA ANALYSIS: (10 points each)

1.)Write a balanced chemical equation to represent the reaction that takes place during this experiment.

2.)Explain which type of reaction is taking place by describing how the particles are being rearranged.

3.)Propose a reason why the crucible was heated at the beginning of this experiment.

RESEARCH:

1.) Research magnesium and magnesium oxide. Discuss common uses, discovery, and it's abundance on Earth in 50 to 100 words. Cite your sources and include an MLA works cited page. (30 points)

POST-LAB

Calculations: (10 points each)

1.)Determine the empirical formula of the product.

2.)Determine the percent composition of the product.

Honors Writing Assignment: Methane Hydrate (50 points)

The U.S. government is currently in the process of deciding whether or not to spend billions of dollars on research and development projects to extract methane hydrate from the ocean floor (Japan is already doing this). As a prominent scientist you have been asked to write a persuasive essay about whether we should spend the money on this potential future energy source or if you think this would be a bad idea because of the possible global warming implications. Write at least 3 paragraphs stating your opinion and use at least 2 references. Use the Popular Mechanics article as one reference and find another reference. (Remember, you may choose either side, but you must back up what you say with evidence from your references). Cite the evidence in your essay using MLA format.

Materials:

Copper (II) sulfate crystal	crucible
Wire gauze	tongs
Bunsen burner	balance

Procedure:

1.) Mass an empty crucible & record in the data table
2.) Mass the crucible with a crystal of copper (II) sulfate & record in the data table
3.) Set up the apparatus
4.) Heat the crucible for 5-10 minutes
5.) Record observations in the data table
6.) Mass the crucible with crystal after heating & record in the data table
7.) Dispose of anhydrous crystal in labeled container

Apparatus: Draw & Label the lab apparatus (10 points)

SAFETY

Copper (II) Sulfate: WARNING! HARMFUL IF SWALLOWED. AFFECTS THE LIVER AND KIDNEYS. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. – From MSDS

- Be aware of your surroundings with lit Bunsen Burners
- **ANY** Inappropriate Behavior will result in an automatic **ZERO** on the lab!

DISPOSAL

- DO NOT DUMP ANYTHING IN THE SINK!

Name: Date: Period:

Chemistry I Lab: Empirical Formula of a hydrate

Purpose:

- Determine the empirical formula of a hydrated copper (II) sulfate crystal
- Determine the percent composition of the hydrated compound.

Pre-Lab:

Questions: (5 points each)

1.) Define the following:

a. Empirical formula

b. hydrate

c. percent composition

2.) Explain how to write the formula of a hydrated compound.

3.) Name the following hydrates:

a. $LiClO_4 \cdot 3H_2O$

b. $MgCO_3 \cdot 5\ H_2O$

c. $NiSO_4 \cdot 6\ H_2O$

4.) Determine the percent by mass of nickel in $NiSO_4 \cdot 6\ H_2O$

DATA: (5 points)

Use the procedure to draw a data table with appropriate headings and units.

Observations: (5 points)

POST-LAB

Calculations:

Calculation Scoring:

Showing work (2 points)
Including all units (2 points)
Correct answer and unit (4 points)
Correct # of sig figs (2 points)

1.) Determine the mass of water in the hydrated crystal.

2.) Determine the moles of water in the hydrates compound.

3.) Determine the moles of anhydrous copper (II) sulfate

4.) Determine the empirical formula of the compound.

5.) Calculate the percent by mass of water in the hydrated compound.

Data Analysis: (5 points each)

1.) What is the formula of the hydrate? What is the name of the hydrate?

2.) Is the heating of a hydrated crystal a physical or chemical change? Explain.

3.) Explain the color change during the experiment. Cite specific evidence from the lab.

Name: Date: Period:

Group Members' Names:

Name of Lab: Due Date:

Refer to lab report format sheet while completing lab report

ABSTRACT	Points earned	Points Possible
Purpose is stated		5
Results are stated		5
Conclusion is stated		5

Pre-lab Work:

Title page		5
Purpose & Hypothesis		5
Materials, Procedure, and Safety		5

Data and Observations:

ALL data has unit and ALL measurements are accurate		5
Observations were recorded "before" and "after" the lab		5

Calculations: TOTAL #: 3

For each calculation: Formulas shown, work shown, units included, and rules of sig figs used (5 points each)		

Data Analysis: TOTAL #: 2

For each data analysis question: Questions should be answered with appropriate reference to data and questions should be accurate. (~~5~~ 10 points each)		

~~Graph~~

~~Graph: Each graph must include: Specific title, accurate scale, labels and units, key if necessary, and be neatly done~~		10

Conclusion/Discussion:

Questionable data is discussed		5
Errors are discussed		5
Overall concepts and effectiveness of the lab are discussed		5

Overall Organization:

Correct order, neatly assembled		10
GRADE:		

Chemistry: Lab Report Format

Why are lab reports necessary?

Labs provide the opportunity for skills learned in class to be applied in a hands-on, minds-on situation. Experiments performed throughout the year will require you to use problem solving skills to accurately analyze data that is collected. You then have the opportunity to show that you have comprehended the chemistry that we are covering in class by writing a lab report which will require you to draw conclusions and make connections to chemistry concepts.

In order to successfully complete a lab report you must fully understand the chemistry involved in the experiment. It is therefore recommended that you ask as many questions as you need to prior to completing the lab report as well as use your group members to discuss the experiment and share ideas. For every lab report that you are asked to write be sure to refer back to this format sheet.

Basic Guidelines:

- Use only pen or a computer
- If you are working through calculations, correct them as neatly as possible.
    - Ex. ~~Mitsake~~

- Title page should include the following:
    - Name of lab report, your name, teacher's name, group members' names, and the date the lab was performed
        - The title of the lab should be centered in the page
        - All other information should be written in the lower right hand corner

- ORDER:
    - Hand in lab reports, stapled, in the following order:
        - Title page, Abstract (separate page), Purpose, Hypothesis, Materials, Procedure, Safety, Data & Observations, Calculations and Data Analysis, Conclusion (separate page), and Lab Rubric

- Collaboration is required during the experiment and discussion of data is recommended but all lab reports are to be individually written. Duplicate lab reports or portions of labs that are too similar will be given a zero.

- If you are asked to find background information, always include a works cited page. Failure to do so will result in an automatic 10% deduction of points.

PRE-LAB WORK:

Before you walk into the lab to collect data, the following two sections of the lab need to be completed:

Purpose & Hypothesis:

Purpose: A statement of the problem or a question posed that needs to be answered. Purpose needs to be as specific as possible and will usually start with, "To..."

Hypothesis: A prediction of expected results.

Materials, Procedure, and Safety:

- If you are given a lab handout you may reference the materials and procedure. If you are not given a lab handout you must write your own materials and procedure section.
- Labeled diagrams may be included for an experiment showing the equipment used and the configuration of the apparatus.
- Safety rules from the Flinn Science Safety contract must be referenced.

LAB-WORK:

- This section of the lab includes data and observations and will be collected during the lab.
- All data must have appropriate units and be written neatly into data tables.
  All data must have the appropriate number of significant figures according to the instrument being used to collect data.
- Detailed observations must be recorded for each part of the experiment.

POST-LAB WORK:

This is the analysis section of the lab and is the section where you prove that you have understood the chemistry that was tested during the experiment.

Calculations:

- Most labs will ask you to perform calculations from the collected data.
- For all calculations work must be shown, units must be used, and significant figure rules must be followed.
- When accepted values exist, you will be asked to perform a percent error calculation.

Data Analysis:

- Most labs will ask you to answer questions regarding collected data and calculations.
- Questions must always be answered in complete sentences and answers must reference specific parts of the experiment or specific pieces of data.

CONCLUSION AND ABSTRACT:

did you teach these language skills? if not, this is unfair.

- When writing the conclusion & abstract:
  - Always write in the past tense
    - Ex. The mass of the water was measured to be 5.0 g
  - Never use pronouns ex. I, me, they, we, them, us, etc.
    - Ex. The density of the water was calculated as 1.2 g/mL
  - Be as specific as possible with respect to results and calculations.
    - Always reference your calculations.
      - Ex. When alka-seltzer was added to water, a fizzing sound was heard.
    - Stay away from general statements.
      - Ex. The two things were added together and a funny sounds was heard.
  - To report results for more than one substance, use the term respectively in the following way.
    - Ex. The density of substance A, substance B, substance C, and substance D were found to be 3.4 g/mL, 2.0 g/mL, 0.9 g/mL, and 1 g/mL respectively.
      - Instead of having to write: The density of substance A was 3.4 g/mL. The density of substance B was .....

The wrong way to write a conclusion/abstract:

- "I put the beaker on the balance. The mass is 4.5 g."
  - This is incorrect because pronouns should not be used and tense needs to be past tense.

Conclusion:

- A conclusion always involves three distinct pieces, each written in separate paragraphs.
    - Paragraph #1:
        - Restate the hypothesis and include whether the hypothesis was accurate or not. Also, explain how the results of the lab show how the hypothesis was right or wrong.
    - Paragraph #2:
        - Discuss any questionable data or results and any errors that occurred during the experiment.
        - If a percent error was calculated, then discuss how the percent error shows the accuracy of the data and how the procedure led to this error.
            - Human error does not count.
                - For ex. Do not state: The mass of beaker was measured wrong.
            - Procedural error does count.
                - For ex. The mass of the substance was too high since the substance was not heated for a long enough period of time.
    - Paragraph #3:
        - Discuss what was learned by performing this lab. Include all chemistry vocabulary and make connections between concepts. Also, offer any suggestions for procedure modifications OR offer any additional experiments that could be performed to further test the purpose of the lab.

Abstract:

The abstract is the last part of the lab to be completed but it the first part of the lab that is read. The abstract presents an overview of the lab in the following format:

- 1-2 sentences stating the purpose and how it was tested.
- 1-2 sentences stating the results
- 1-2 sentences stating the conclusion

Example abstract:
(on a separate sheet of paper, with a centered title)

ABSTRACT

The purpose of the lab was to calculate the volume of water. This was done by using a graduated cylinder to measure volume in mL.

The volume of the water was reported to be 5.0 mL.

Volume is a measurement of the amount of space taken up by an object. The volume of a liquid can be measured using a graduated cylinder.

[redacted]

Design for Instruction

Results of pre-assessment

The pre-assessment for Learning Goal 1 and 2 was an informal question and answer session where the students showed me that they were capable of performing dimensional analysis. All of the students completed the exercise with no problem so I did not feel that I had to reteach how to convert between units. I then determined if the students were capable of converting between the 3 different units and I found that 5 out of 16 students could not. Therefore I will spend time in class on practicing converting between all three units and have an associated lab, which will benefit the kinesthetic learners.

The pre-assessment for Learning Goal 3 was their answers on 2-3 problems from the moles notes packet and how well they answered a problem that was new to them and unique. They all answered the 2-3 problems correctly, however, when I proposed the scenario, I received a lot of blank stares and nobody offered a solution. Therefore, I provided more scaffolding and assistance than I had previously thought I would need to. I also found it necessary to keep informing the students that they had all the information they needed in order to solve the problem and that it was really a matter of putting it all together in order to find a solution.

The pre-assessment for Learning Goal 4 was how well the students were able to realize the similarities and differences between empirical and molecular formulas and if they could determine the percent composition of boys to girls in the classroom. Eight out of 16 students either got the answer wrong or could not figure out how to find the percent composition and did not try. As a result, I spent more time teaching percent composition than I had planned.

pre-req = an understanding of %, and what it's for.

Only 3 of the students recognized the similarities between empirical and molecular formulas, but I did not find this surprising at all and it was what I had expected. I had already planned to give students explicit definitions and guided notes for how to solve different problems. I also used the performance of the students on the practice problems without any assistance as a pre-assessment. It was also as I expected and only 2 of the students were able to do the problems without any help, so I modeled how to do each of the different problems.

The pre-assessment for learning goal 5 was to determine if the students had all of the information they needed in order to perform and solve the inquiry task. Every student was able to determine the volume of rectangular and cubic shapes and they 11 out of 16 were able to convert from cubic meters to meters. Because the students in this class were so successful, I actually took away some information and made the task a little harder by not organizing the information that they would need.

The pre-assessment for Learning Goal 6 was determining what the students know about energy. About 5 of the students could not come up with any type of energy and that was enough for me to include a review of energy in the Powerpoint so that all students had the same base of knowledge.

Unit Overview

See attached outline

Activities

See attached lesson plans/activities

Technology

I will use technology throughout the mole unit. There are 4 lab activities where students must use the electronic balances, 2 labs that require the use of the Bunsen burners, and 1 lab that requires the use of the oven. The overhead projector will be used at least two times, in which students will showcase their work to the rest of the class. It is also useful when I explain how to do certain problems because I can use different colors, which is helpful to the visual learners and probably the rest of the class too. There are two activities that require the use of the AV projector and this is also more visually stimulating and keeps the students more focused. The projector also allows me to show anything that is accessible from the internet, such as clips from the Discovery channel about methane hydrates.

[redacted]

Mole Unit Overview

Day one

Informally ask the students to do convert between units for 5-7 different examples to determine if they are able to do dimensional analysis **(LG1)**

Opening exercise for introduction to the concept of the mole- have students write down everything they would buy if they had 6.02×10^{23} dollars **(LG1)**

Hand out the mole notes and start to go between particles and number of moles- introduce the problem, model how you would do the problem and then have the students practice on their own **(LG1)**

Day 2

Using mole notes – now convert between grams and moles using same method as above **(LG1)**

Hand out mole conversion exercise where students must determine on their own how to go from particles to grams **(LG3)**

Continue with mole notes- mole conversions in which students convert between the 3 different units in many ways **(LG1)**

Day 3

Finish with the mole notes and hand out the bookwork practice problems for the students to complete on their own **(LG1)**

Day 4

Mole Lab- students are given different samples and they must determine the mass, moles, and number of particles for each sample **(LG2)**

Day 5

Mole conversions quiz with lab practical- student must demonstrate that they can perform mole conversions in the lab **(LG1 &2)**

Day 6 & 7

Inquiry Mole task- students must determine the number of moles of M&M's they can fit into Pilgrim high school **(LG5)**

Day 8

Hand out the nanoradio article and read as a class (let the students listen to the recording of "Layla" that was made using the nanoradio)– very interesting article about the invention of the nanoradio – at the end of the class have the students determine how much a carbon nanotube radio would weigh **(LG1&3)**

Day 9

Hand out the pre-assessment activity for empirical and molecular formulas and percent composition to determine what the students know **(LG4)**

Hand out the empirical and molecular formulas and percent composition notes (with built in practice problems) and introduce the difference between empirical and molecular formulas and how to use percent composition to determine the empirical formula – model how to solve each problem and then let the students do the rest on their own **(LG1&4)**

Day 10 & 11

Empirical formula of MgO lab- students will be given a sample of magnesium and must determine the empirical formula of the product (after heating it) **(LG 1&4)**

Day 11

Give a surprise quiz on empirical and molecular formulas and percent composition **(LG1&4)**

Day 12

Percent of water in a fruit lab- students will choose a fruit and determine the percentage of water in the fruit - this will help me to determine if the students can figure out how to find the percentage of water from a hydrated sample **(LG4)**

Give the powerpoint presentation on methane hydrate as a possible future energy source (have students complete the accompanying notes) and hand out the writing assignment – a persuasive essay where students must choose one side of the debate and use evidence to back up what they say **(LG6)**

Day 13

Finish up the fruit lab and then hand out the hydrates practice problems where students must go from finding the percentage of water in a fruit, to finding the percentage of water in a hydrate **(LG1&4)**

Day 14

Lab- students must devise a way to determine the empirical formula of a hydrate and a formal lab report must be written for this lab **(LG 1&4)**

Day 15

Hand out the mole conversion practice problems ditto as a reinforcement for everything that was learned in the beginning of the unit- some students were still having trouble with reading word problems and figuring out what exactly the question was asking for **(LG1)**

Day 16

Give the hydrates quiz **(LG4)**

Day 17

Review for the Unit test using problems from each section **(LG1,LG4)**

Day 18

Give the Mole test and check notebooks (notebooks are worth a test grade-must be in order, follow the table of contents, have complete notes, and be legible) **(LG1, LG2, LG4)**

Unit VIII Outline
TOPIC: THE MOLE

Main Ideas:

Atoms are tiny. They are beyond tiny. They are so extremely small that the tip of your pencil contains *billions* of carbon atoms.

Atoms are too small to be counted individually. It is impossible to pick up an object and start counting its atoms. But it is very important to know how many atoms are in a particular substance so chemists know how much of a substance is needed for a chemical reaction to take place. The knowledge of this type of chemistry is necessary in drug manufacturing, water purification, medicine, and other fields that are vital in our everyday lives.

Atoms are counted by measuring mass. Once you know the mass of an object you can determine the precise number of atoms in the object. The **molar mass** of an element is the **mass of one mole of an element**. Molar mass is found on the periodic table. The value is the same as atomic mass but the unit for molar mass is **grams/mole**.

The word mole is a counting word. Just as one dozen is equal to 12, one mole is equal to **6.02×10^{23}**. The number **6.02×10^{23}** is called **Avogadro's number**, named after Amadeo Avogadro, a chemist who determined this relationship.

In this unit we will use the molar mass of different elements and compounds to determine how many moles and how many particles are in different substances. We will also look at how to use the mole concept to determine empirical and molecular formulas of unknown compounds and determine the formula of a hydrate.

SYLLABUS

Days 1-3 **DATES: ______**
- Notes: The Mole & Mole Conversions
- MOLE Labs

Day 4: **WORKDAY: BRING YOUR BOOKS!!! DATE: _______**

Day 5: QUIZ (Lab Practical) **DATE: _____.**

Day 6-8: Inquiry Mole Lab

Days 9-12: **DATES: ______**
- Notes: Empirical and Molecular Formula
- Lab: Empirical Formula of MgO
- Lab: % Water in a Fruit

Day 13-16: **DATES: ______**
- Notes: Hydrates & Percent Composition **DATES: ______**
- Lab: Empirical formula of a hydrate

Day 17: Quiz & Notebook Due **DATE: ______**
Day 18: **WORKDAY: BRING YOUR BOOKS!!! DATE: _______**

Day 19: **UNIT TEST DATE: ______**
BLOG DUE: ______ **EC BLOG DUE: ______**

Chemistry Unit VIII Table of Contents- TOPIC: The Mole

Name: Period:

Assignment Name	Page #	Points Earned	Points Possible
Notebook Rubric			
THE MOLE Outline & Syllabus			
THE MOLE Table of Contents			
Notes: The mole			
MOLE LABS			
Book Work: MOLES			
Quiz: MOLES			
Mole Lab: Inquiry			
Notes: Empirical & Molecular Formulas & Percent Composition			
Lab: Empirical Formula of MgO			
Quiz: Empirical & Molecular Formulas, % Composition			
Lab: % water in a fruit			
Notes: Hydrates			
Lab: Empirical Formula of a Hydrate			
Book Work: Empirical & Molecular Formulas, % Composition & Hydrates			
Quiz: Hydrates			
Writing assignment			
TEST			

[redacted]

Activity 1

This lesson is aligned with Learning Goal 5 which asks student to devise a procedure, perform the procedure, and evaluate the results as a class

Mole Inquiry Lesson: How Large is a Mole of M&M's: Predict how many M&M's can fit into Pilgrim High School

National Standards:

Content Standard A - Abilities necessary to do scientific inquiry:

> Design and conduct scientific investigations- students must use evidence, apply logic, and construct an argument for their proposed explanations
>
> Use technology and mathematics to improve investigations and communications- mathematics plays an essential role in all aspects of an inquiry; measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results
>
> Formulate and revise scientific explanations and models using logic and evidence- in the process of answering the questions, the students should engage in discussions and arguments that result in the revision of their explanations

Push this one; more

State Standard:

Physical Science(PS2 #6) Students demonstrate an understanding of physical, chemical, and nuclear changes by using chemical equations and information about molar masses of reactants and products in chemical reactions

Objectives:

Given a problem and the materials necessary to solve the problem, students will design a procedure, implement the procedure and solve the problem in 1-2 days working in groups of 3-4.

The students will determine the volume of a mole of M&M's , use dimensional analysis to convert liters to cubic meters, determine the volume of Pilgrim high school, and determine if a mole of M&M's will it.

Materials:

For each group: large bag of M&M's, meter stick or tape measure, 400 ml beaker, scientific calculator(optional), students are told that anything in the lab is available to use

Anticipatory Set:

(2-3 min) Pose the problem to students.

Activities:

Day One: (10-15 min) (Pre-assessment) – Determine if students are capable of using dimensional analysis to go between units. Give 2 problems to solve and review.

(5-10 min) Have students calculate the volume of small objects with rectangular and cubic shapes.

(10 min) Students design a procedure for determining if a mole of M&M's will fit in their high school. The procedure needs to be written out. (Honors class)

*More guidance will be necessary for CP classes. Break up the task. Ask the students how they would determine the number of M&M's that occupies a 400 ml beaker. Could you determine the number of M&M's that will fill a different object if you know the number of M&M's that will fill a 400 ml beaker? Ask students how they would go about in determining the volume of their high school in cubic meters.

(End of Day One/Day Two) (25-30 min)Students will collect their data.

(15 min) Students will perform calculations necessary to determine if a mole of M&M's can fill up their school

(10-15 min) each group will hand in a page with all of their calculations and a paragraph explaining how they went about in solving the problem for a final assessment

Formative Assessment – performance of procedure

Options: Tell students that you will answer questions but it will cost them points off of their final grade. Each question will cost them a point and I reserve the right to not answer a question if it will just give away the answer.

Extension to keep the students actively engaged and self-motivated: after all the groups collect the data and predict a number, put the results on the board (or overhead) and also put the actual number(whatever number you come up with). Have the students decide if their results as a class were precise. Have each group decide if their result is accurate.

→ Compare/contrast methods: Discuss the idea that scientists do this too.

Give 5 points extra credit if their results were precise (+/- 10%), and 5 points extra credit to each group whose result is accurate (+/- 10% from my value)

Technology Extension- put the rules on an overhead or powerpoint and leave it up during the task to avoid any confusion

I chose this activity because it kept the students moving and actively engaged. For this class, I added the stipulation that if they asked me a question it would cost them a point off of their final grade because this class was concerned about their grades and I knew they would not ask me anything unless they were desperate

I believed this activity would be very doable for the students because when I informally asked them questions to see if they had the prerequisite knowledge I found that they all did.

Break the students into groups and have stations set up so the students can go from station to station as they go through the lab. (See Mole Labs handout)

The pre-assessment for this activity is how the students performed on the mole notes packet and how well the students are at converting between units

The formative assessment is the students' performance during the lab and the actual lab that must be handed in at the end of the class.

I chose this lab because it kept the students constantly moving and it was more interesting and challenging than a typical mole conversion activity. For example, the students had to determine the mass, moles, and number of particles of their name written in chalk. Many of the students struggled with how to figure out the mass of their name written in chalk, but in the end they all prevailed. I gave the students the materials that they would need, but I made them figure out how to go about in doing the lab. By doing this I think I forced them to work cooperatively together because they had no other choice in that I was not going to answer their questions.

!!MOLE LABS!!

Image from: faculty.lacitycollege.edu/boanta/mole.jpg

Name: ______________________ Period: Date: ______

Lab Partners: ______________________

Your assignment:

For each sample, determine the

1.) **mass**
2.) **moles**
3.) **number of particles**

Lab #1:

A sample of 

Data table (5 points):

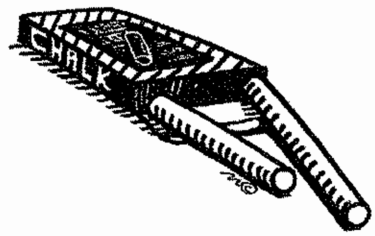
Calculations (15points):

Mass:

Moles:

Particles:

Lab #2:



- Your full name on the chalkboard.
  (- The formula for chalk is $CaCO_3$)

Data Table (5 points):

Calculations (15 points):

Mass:

Moles:

Particles:

hydrates because alternative energy sources are a very important science topic in the world right now. It is an issue that might not be apparent to many students, but it will directly affect their lives in the future and there is a lot money to be made in the field, which can be motivating to learn more about it to some students especially in our current economic situation.

[redacted]

Activity 2 → too narrow a focus. where is this used? what good is it?

This lesson is aligned with Learning Goal 2, which asks students to apply their knowledge of mole conversions in a laboratory setting. It is also aligned with Learning Goal 5 because it asks students to devise a procedure, perform the procedure, and assess the final results.

Lesson : Mole Labs

National Standard:

Physical Science: Structure of Atoms – matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge

Abilities necessary to do scientific inquiry: use technology and mathematics to improve investigations and communications- a variety of technologies, such as hand tools, measuring instruments, and calculators, should be an integral component of scientific investigations

State Standard:

Physical Science(PS2 #6) Students demonstrate an understanding of physical, chemical, and nuclear changes by using chemical equations and information about molar masses of reactants and products in chemical reactions

Objectives:

Given a lab on mole conversions, students will apply their knowledge of mole conversions to a lab situation in small groups

Materials:

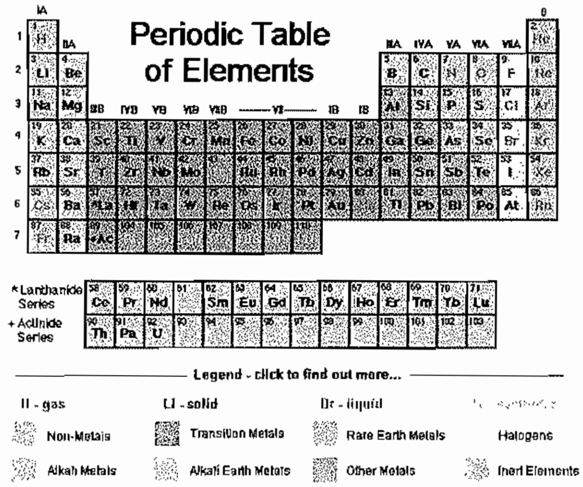
Mole Labs handout, electronic balances, variety of chemicals to be used as different samples (tin,lead, antimony, copper, copper(II) sulfate, ammonium dichromate,zinc, etc.) chalk, water, graduated cylinder, calculator

Anticipatory Set: (3-5 min)

Ask students how they would determine the mass of something in a lab? If they have the mass of a sample, can they determine the number of moles and number of particles in the sample? How would they go about in doing that?

Activities: (40 min)

Lab #3:



Choose three of the Erlenmeyer flasks.

1.) Element #1: ____________________

Data Table: (5 points)

Calculations: (15 points)

Mass:

Moles:

Particles:

2.) Element #2: ______________________

Data Table: (5 points)

Calculations: (15 points)

Mass:

Moles:

Particles:

3.) Element #3: _________________________

Data Table: (5 points)

Calculations: (15 points)

Mass:

Moles:

Particles:

Name: Date: Period:

Honors I Chemistry Lab: Pondering Particles

Purpose: Given different amounts of a variety of substances, determine which substance has the most number of moles and the most number of particles.

Materials:

Crystal of copper (II) sulfate, 5.0 mL of water, your name on the chalk board, and 3 elements in an Erlenmeyer flask.

Part I:

Pre-lab Questions

1.) Explain how to calculate moles and # of particles from a given mass.

2.) What is the relationship between molar mass and moles?

3.) What will you need to measure in the lab in order to calculate the number of moles of each of the substances?

4.) Which of the substances do think will contain the most number of particles?

5.) Write a procedure detailing the steps that you will take in the lab & draw all necessary data tables.

Part II:

Lab Work

Follow your procedure and fill in your data tables.

Part III:

Post-Lab Work

Calculations:

1.) Show all of the calculations using dimensional analysis. For every number include a unit and a substance.

Data Analysis:

1.) Which of the substance contains the highest number of particles?

[redacted]

Activity 3

This lesson is aligned with Learning Goal 6 because it asks students to use evidence and logic to write a persuasive essay about a current scientific debate

Lesson : Hydrates

State Standard:

Physical Science(PS2 #6) Students demonstrate an understanding of physical, chemical, and nuclear changes by using chemical equations and information about molar masses of reactants and products in chemical reactions

National Standard:

History and Nature of Science:

Science as a Human Endeavor- individuals and teams have contributed and will contribute to the scientific enterprise. Doing science or engineering can be as simple as an individual conducting field studies or as complex as hundreds of people working on a major scientific question or technological problem

Nature of Scientific Knowledge- Because all scientific ideas depend on experimental and observational confirmation, all scientific knowledge is, in principle, subject to change as new evidence becomes available. In areas where data or understanding are incomplete, such as the details of human evolution or questions surrounding global warming, new data may well lead to changes in current ideas or resolve current conflicts

Science in Personal and Social Perspectives:

Science and technology in local, national, and global challenges- Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and who bears them. Students should understand the appropriateness and value of basic questions-"What can happen?"-"What are the odds?"-and "How do scientists and engineers know what will happen?"

Objectives

Given a powerpoint on hydrates, students will complete the notes

Given notes on hydrates and a Popular Mechanics article, students will analyze the use of methane hydrate as a possible fuel source in the future and write a persuasive essay in which they choose one side of the debate and back up their claims with evidence

Materials:

Popular mechanics article- "Methane hydrates-Energy Source of the Future?",energy on ice article, hydrates notes handout, powerpoint on hydrates, projector

Anticipatory set

Determining the percent of water in various fruits (see below)

Activities

(20-30 min)Have the students determine the percent of water in various fruits. Let the students choose the fruit or vegetable that they want to determine the percent of water for. Tell the students that just like fruits and vegetables have water in them, so do some compounds. The method for determining the amount of water in a compound is very similar to the method we use for determining the percent of water in the fruit. We need to drive off the water in the compound, just as we drive off the water in the fruit. Tell the students that we will do a lab to determine the percent of water in a compound in a few days.

(20-25 min) Show the powerpoint on hydrates. Give notes on hydrates to the students and have them fill in the notes as you go along. Have extra examples of how to name hydrated compounds.

(10-15 min) Then give the students the craft writing assignment on methane hydrates and handout the Popular mechanics article that they should use as a reference in their assignment.

Options: Show a quick video clip of methane hydrates on YouTube

The pre-assessment for this activity was to determine what the students knew about energy sources and the types of energy. I based the amount of information I put in the Powerpoint on this pre-assessment.

The formative assessment was how well the students answered my questions during the presentation and the post-assessment was the persuasive essay. The criteria for the writing assignment was given to each student and it was very clear that they needed to use evidence to back up their claims.

I tried to create a supportive learning environment by calling on a variety of students and keeping the presentation open to any questions at any time. I also chose to talk about methane

[redacted]

Teacher Work Sample: Instructional Decision-Making

In the beginning of the Mole unit it was very important for the students to be able to differentiate between three different units: grams, moles, and representative particles. They also had to use dimensional analysis to convert between these units using conversion factors. There were only two conversion factors that the students needed to know and use, molar mass and Avogadro's number, but it became apparent in the formative assessment stage that the students were getting confused about which one to use and more importantly why. The students were doing practice problems in the moles notes packet when at least five students asked me which conversion factor to use to get from the given unit to the unknown unit. It became clear to me that the students were having trouble differentiating between the two and organizing this new material so that it made sense.

Subsequently, I bought some index cards and gave one to each student. On one side of the card I had them write one of the conversion factors. On the other side of the card I had them write the other conversion factor. I then guided the students through three different mole conversion problems using the aid of the index card. I tried to make a game of it in order to get all of the students involved and to make sure they were using the index cards correctly. For example, in a problem where students had to go from grams of a substance to particles , they have to use both conversion factors. The first one they need to use is the molar mass. So I wrote the given on the board and the students had to hold up the side of the index card that had the molar mass conversion. If they held up the correct side they got a point and the person with the most points at the end got 5 extra points on the next quiz. I had the students raise the correct side so that everyone could see in order to keep the students accountable to each other. I thought this might be an incentive for this particular class because about half of the students do not care about their grades nearly as much as they do about how they are perceived by their peers. I think the index cards kept the two conversion factors separate and organized, which was key for some students.

Another example of how I modified my original design for instruction based on a student's response was towards the end of the unit when I gave a powerpoint presentation on methane hydrate as a possible energy source for the future. I told the students the day before the topic of the presentation and one student asked me "where do we get energy?" I had assumed that all of the students would have remembered from their ninth grade physical science classes that energy comes from either renewable or non-renewable resources, what the difference was between the two and the advantages and disadvantages to each. After the student asked the question I probed the entire class further to find out just how much the students remembered. So I passed out scrap paper and had the students write down everything they know about energy in five minutes. I then collected the papers and used them as a guide for what the students actually knew. This helped me to figure out what I had to include in the powerpoint so that all students had the same knowledge of where we get energy. Just a simple statement from a student led me to rearrange my powerpoint and it probably saved me from some blank looks during the presentation.

[redacted]

Analysis of Student Learning

Whole Class – see attached table and charts

According to the data from the whole class for this unit, most of the students met each of the learning goals. For Learning Goals 1 and 2, none of the students met the criterion to be deemed proficient in the pre-assessment. When they took the post-assessment, 13 students met the learning goal. For Learning Goal 3, one student was proficient in the pre-assessment and eight students were proficient according to the post-assessment. For Learning Goal 4-1 and 4-2, none of the students were proficient in the pre-assessment; however 13 students met the criterion in the post-assessment. For Learning Goal 5, five students had met the criterion in the pre-assessment and by the post-assessment all 16 students had met the criterion. For Learning Goal 6, one student met the criterion in the pre-assessment and 14 students met the criterion in the post-assessment.

Subgroups – see attached chart

I chose to divide the class according to gender because is the most obvious difference in this particular class. From what I could gather throughout the semester all of the students seemed to be of the same socioeconomic status. The students in this class divided themselves according to gender, as well, whenever they did group work or when I let them choose their own partners. There was only one outlier in the group and he just preferred to be around the girls. I also noticed a difference between the boys and the girls throughout the semester in terms of motivation. The girls seemed to be a lot more concerned with their grades than the boys and it was very obvious for the most part that they put in a lot more effort. In this particular class, the girls asked a lot more questions than the boys and I also chose to look at the differences for Learning Goal 1. If you look at the chart you will notice that the boys actually started out with a stronger baseline of knowledge. They scored an average of 17 on the pre-assessment, while the girls scored an average of 5. However, in the post-assessment, the girls scored higher with an average of 96 while the boys only scored an average of 84. This data shows that overall the girls gained 91 points between pre-and post-assessment and the boys only gained 67 points. Even though there is a significant difference here it is also worth mentioning that overall both the girls and the boys reached the criterion needed to be deemed proficient on this Learning Goal.

Individuals – see student work samples

The two students that I chose for this analysis are Tanzeel and Amanda. Both of these students are very bright, however, Tanzeel struggles a lot more than Amanda. It is important to understand the learning of these particular students because they both require very different approaches to the subject. I was actually surprised by how much trouble Tanzeel has because I was told that last year he won the state Science fair and he excelled in biology. Then I realized that he is having so much trouble because his math skills are not up to par with most of the class and chemistry is very math-oriented. → good eye. Amanda, on the other hand, only needs to be shown how to do a problem once and she is good. In fact, many of the other students will go to her if they have questions and I am not available. For Learning Goal 4-2, it is evident that Tanzeel struggles. On the pre-assessment, both Tanzeel and Amanda scored a 0. Neither one could figure out the problems without and assistance. In the percent of water in a fruit lab, Amanda only needed minor assistance to figure out how to find the percentage of water. Tanzeel, however, required major guidance and even after I explained it multiple times he still did not really get it. Amanda received a 100 and Tanzeel got an 80. On the formative assessment, the hydrates practice problems, Amanda did not need any help and in fact was helping others. Tanzeel, however, struggled through the whole assignment. I think his first problem is that he has trouble organizing his thoughts and figuring out what the question is asking. So I walked him through the first word problem and he seemed to get it. However, when he tries to do the problem on his own he gets stuck and will just sit there until I ask him specifically if he needs help. Subsequently, I think the fact that Tanzeel is really shy and Amanda is very outspoken is another factor that affects their learning. He continually waits until the last minute to speak up and tell me that he is having trouble whereas Amanda will let it be known within seconds if she is having any issues. I learned very quickly to always ask him if he needed help because otherwise I do not think he would. GREAT ★ The post-assessment for this learning goal was a hydrates quiz and Amanda received over 100 and Tanzeel received a 62. They both did better in the post-assessment so learning must have gone on, however Tanzeel did not meet the criterion for the Learning Goal.

The other Learning Goal that I chose to evaluate them on is Learning Goal 6 because on this Learning Goal both Tanzeel and Amanda did really well. I think he did so well because the assessment was a writing assignment and did not involve math at all. On the pre-assessment, they were both below the criterion, and on the post-assessment they both received a grade of over 100. They in both did well on the formative assessment, as well, in that they both took down the notes from the presentation. I think this assignment really allowed Tanzeel to show how bright he really is. His essay was one of three in the class that I found to go above and beyond the requirements. It was thoughtful and you could tell that he really put in the extra effort. Amanda also had a really good essay, but I was not surprised at all because she always goes above and beyond what is expected. This assignment helped me realize the importance of using a variety of assessments because all students have different strengths and weaknesses and it is imperative to find what they are for each student so that they all have a chance for success.

nice

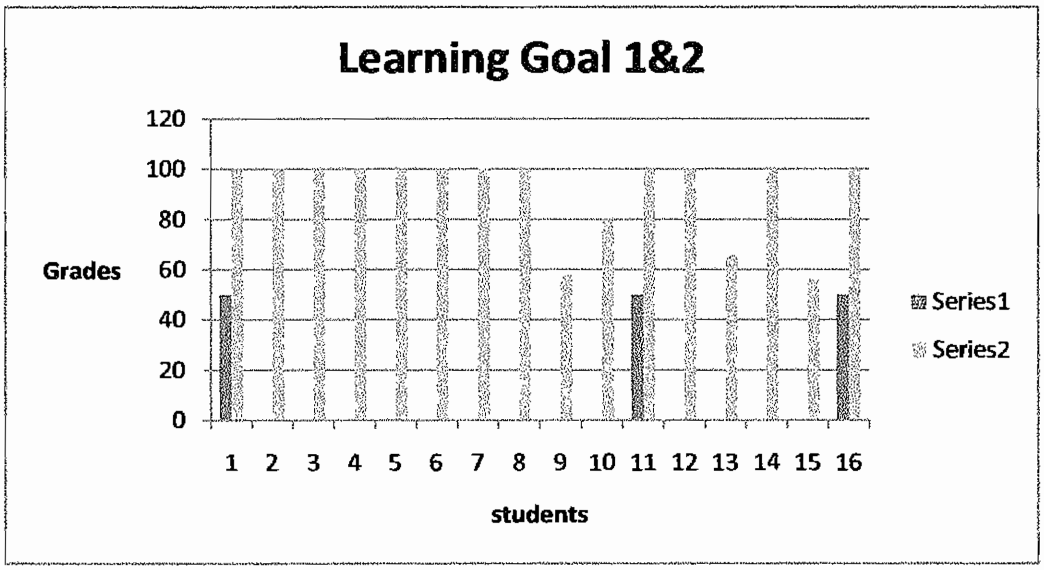
WHOLE CLASS Pre and POST Data

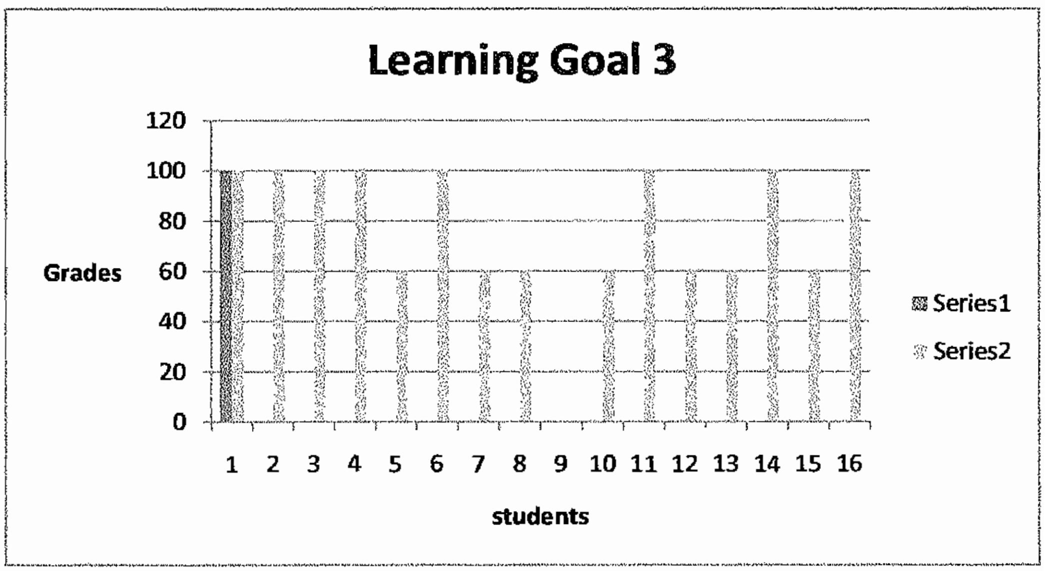
	(LG1&2) Pre	(LG1&2) Post	(LG3)Pre	(LG3)Post	(LG4)Pre1	(LG4)Post1-quiz	(LG4)Post 1-Lab
Paul	50	100	100	100	20	100	100
Janelle	0	100	0	100	20	100	100
Zachary	0	100	0	100	20	75	92
Katherine	0	100	0	100	20	100	100
Katelyn	0	100	0	60	0	100	100
Kara	0	100	0	100	0	100	100
Cara	0	100	0	60	0	100	90
Catherine	0	100	0	60	20	90	100
Jeffrey	0	58	0	0	20	70	92
Dave	0	80	0	60	0	85	100
Ellen	50	100	0	100	20	100	97
Kayla	0	100	0	60	0	90	100
Tanzeel	0	66	0	60	0	100	100
Amanda	0	100	0	100	0	100	100
Meaghan	0	56	0	60	0	75	93
Johnny	50	100	0	100	20	100	97

	(LG4)Pre2	(LG4) Post2-quiz	(LG4) Post2-Lab	(LG5)Pre	(LG5)Post	(LG6)Pre	(LG6)Post
Paul	20	100	0	100	100	60	0
Janelle	0	100	99	100	100	60	100
Zachary	0	86	93	50	100	40	100
Katherine	0	98	99	50	100	60	100
Katelyn	0	100	98	50	100	40	100
Kara	0	100	99	50	100	60	100
Cara	0	100	93	50	100	40	100
Catherine	0	83	95	50	100	60	100
Jeffrey	0	100	95	50	100	40	100
Dave	0	98	97	50	100	40	100
Ellen	20	100	100	100	100	80	100
Kayla	0	93	99	50	100	40	100
Tanzeel	0	62	75	50	100	40	100
Amanda	0	100	99	100	100	60	100
Meaghan	0	76	77	50	100	40	90
Johnny	0	79	76	100	100	0	0

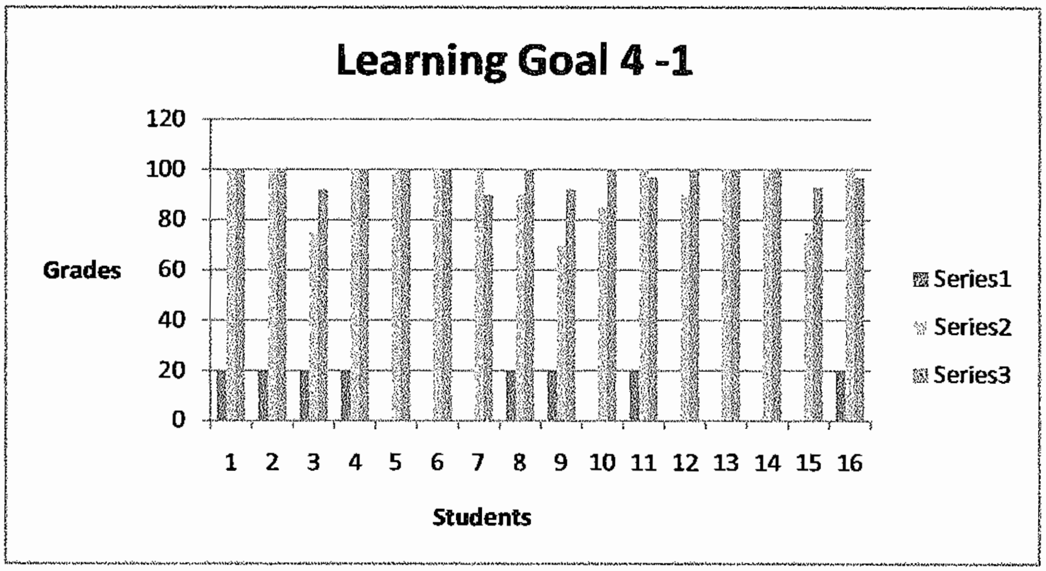
Whole Class Analysis

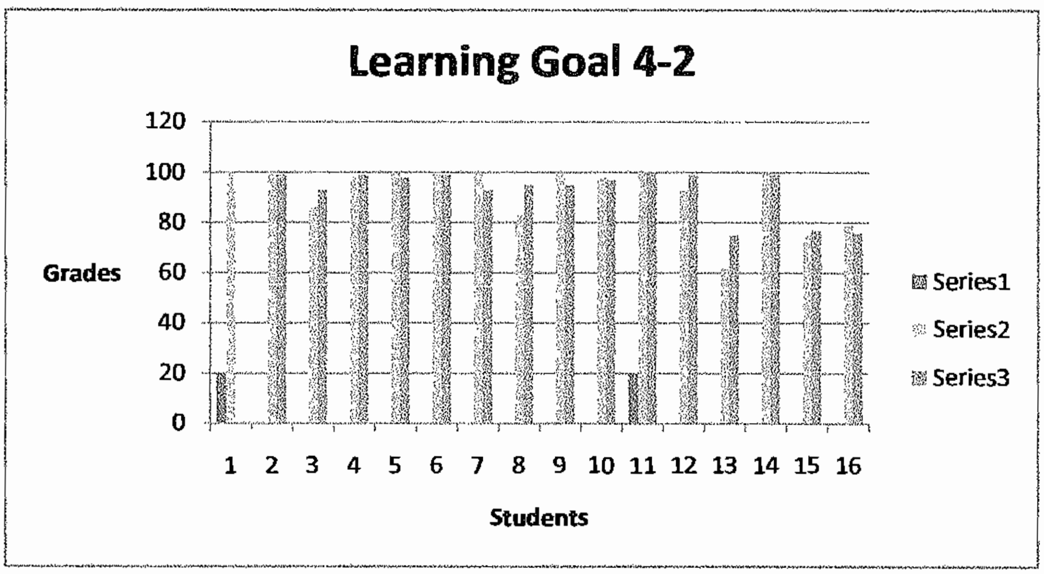
series1 = Pre-assassment
series2 = Post-assesment



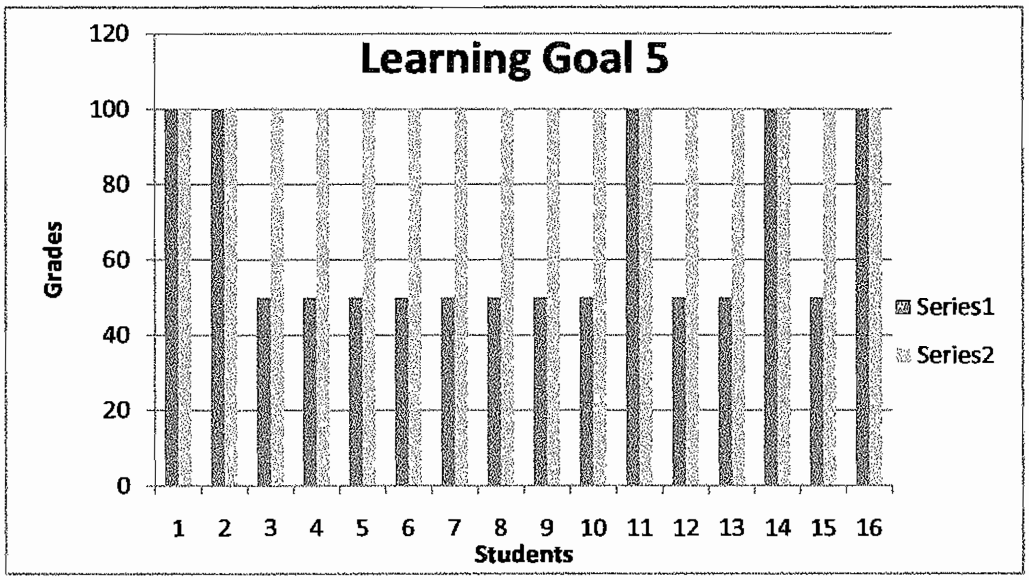


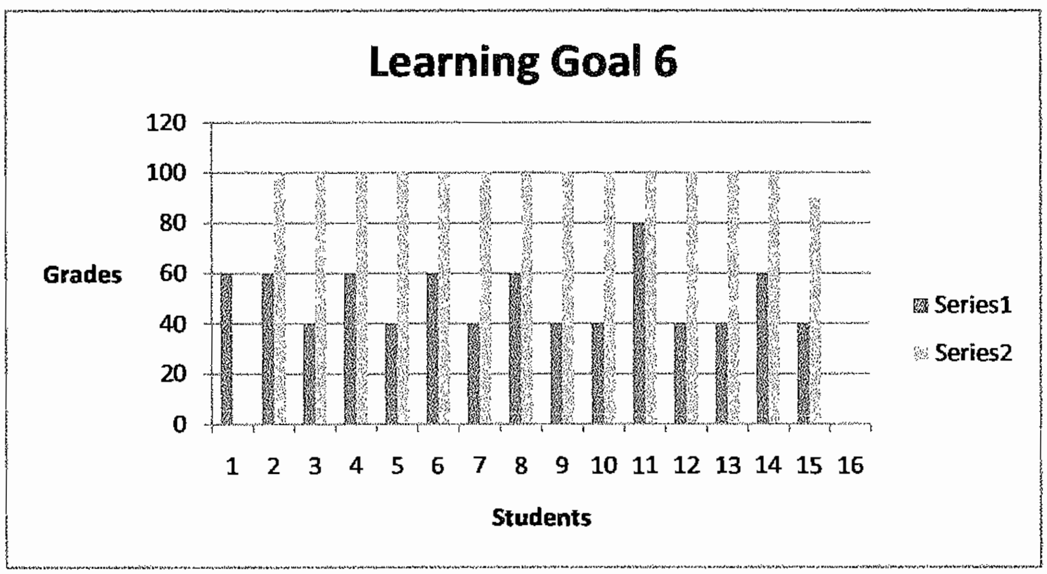
series1 = pre-assessment
series2 = post-assessment(Quiz)
series3 = post-assessment (Lab)





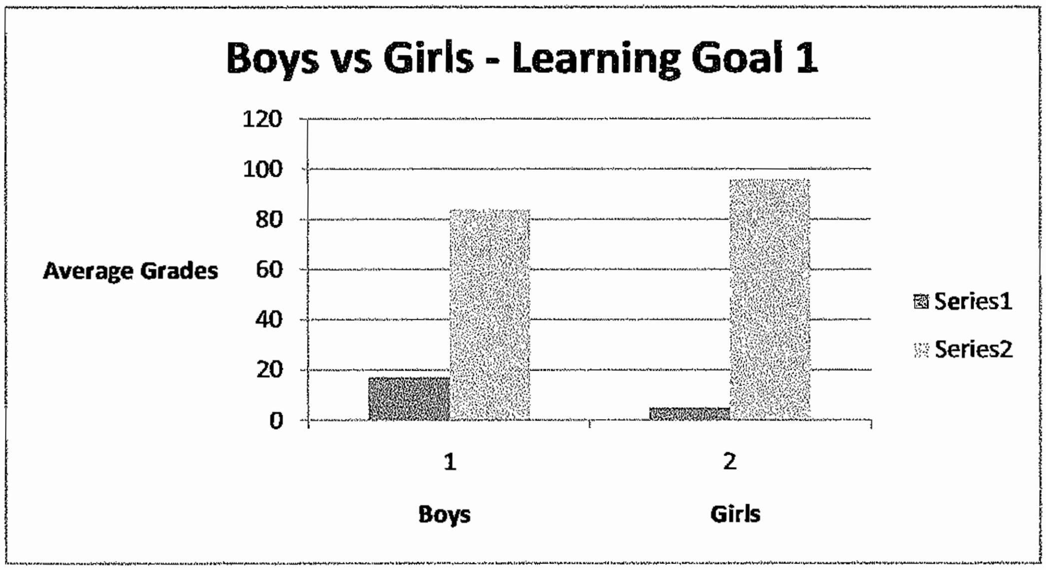
series1 = pre-assessment
series2 = post-assessment





Subgroup Analysis - Boys vs. Girls

series 1 = pre-assessment
series 2= post-assessment



Name: [redacted] Pd. Date:

Lab: Percent Water in a fruit

Problem: Determine the percentage of water in a piece of fruit

Pre-Lab:

1. How could you get rid of the water in a piece of fruit? (5 points)

Data:

2. What kind of fruit did you choose? ____________

Make a data table for your calculations (10 points)

3. What is the mass of water in the fruit?

Post-Lab

4. What is the percentage of water in the fruit? (Show all calculations) (10 points)

Page 101

Name: [redacted] Pd. 3 25/25 Date: 3/30

Lab: Percent Water in a fruit

Problem: Determine the percentage of water in a piece of fruit

Pre-Lab:

1. How could you get rid of the water in a piece of fruit? (5 points)

You could [illegible] temperature [illegible] evaporate the water by [illegible]

Data:

2. What kind of fruit did you choose? Mango

Data table/ Calculations(10 points)

Mass of pan(g)	wet weight(g)	dry weight(g)
1.3g	with pan 6.9g	with pan 2.8g

What is the mass of the fruit before heating?

5.6g

What is the mass of the fruit after heating?

1.5g

What is the mass of water in the fruit?

4.6

Post-Lab

3. What is the percentage of water in the fruit? (Show all calculations) (10 points)

$\frac{4.6}{5.6g} \times 100 = 73.21\%$ water

Name [redacted] Pd: 3 Date: 3/31/09

Hydrates Practice Problems

1. Why do you think certain electronic devices are transported with desiccants?

   So they are not damaged and it keeps them dry by absorbing the water in the air & away

2. Write the formula for the following hydrates:

   a. cobalt(II) chloride hexahydrate

      $CoCl_2 \cdot 6H_2O$

   b. sodium sulfate decahydrate

      $Na_2SO_4 \cdot 10H_2O$

3. Write the name for the following hydrates:

   a. $CaSO_4 \cdot 2H_2O$

      Calcium sulfate dihydrate

   b. $BaCl_2 \cdot 7H_2O$

      Barium cloride heptahydrate

4. Gypsum is hydrated calcium sulfate. A 4.89 g sample of this hydrate was heated. After the water was removed, 3.87 g of anhydrous calcium sulfate remained. Determine the formula for this hydrate and name the compound.

   $1.02\,g\ H_2O \times \frac{1\,mol}{18.02\,g} = 0.0566$ moles $H_2O / 0.0284 = 2$

   $3.87\,g\ CaSO_4 \times \frac{1\,mol}{136.08\,g} = 0.0284$ moles $CaSO_4 / 0.0284 = 1$

   $CaSO_4 \cdot 2H_2O$

   $CaSO_4$ and water = 4.89g

   $CaSO_4$ with no water = 3.87

   Mass of water in Gypsum = 4.89 - 3.87=

   Convert mass of water to moles of water =

   Write the formula for hydrated calcium sulfate :

   $CaSO_4 \cdot 2H_2O$

   Name the formula for this hydrated calcium sulfate:

   Calcium Sulfate dihydrate

5. Determine the percent composition of $MgCO_3 \cdot 5H_2O$ and draw a pie graph to represent the hydrate

% composition

$MgCO_3 = 84.32 / 174.42 = \times 100$ 48.34%

$5H_2O = 90.1 / 174.42 = \times 100$ 51.66%

Mg = 24.31
C = 12.01
O(3) = 16×3 = 48
10(H) = 1.01×10 = 10.1
(5) O = 16×5 = 80

Total: 174.42

6. What is the formula and name of a hydrate that is 85.3% $BaCl_2$ and 14.7% water?

$BaCl_2 \cdot H_2O$

Name: [redacted] Pd: 3 Date: 4/1

Hydrates Practice Problems

1. Why do you think certain electronic devices are transported with desiccants?
certain electronic devices are transported with desiccants so water does not come in contact with the electricity and destroy the object
2. Write the formula for the following hydrates:
   a. cobalt(II) chloride hexahydrate
      $CoCl_2 \cdot 6H_2O$
   b. sodium sulfate decahydrate
      $Na_2SO_4 \cdot 10H_2O$
3. Write the name for the following hydrates:
   a. $CaSO_4 \cdot 2H_2O$
      Calcium Sulfate Dihydrate
   b. $BaCl_2 \cdot 7H_2O$
      Barium Chloride heptahydrate
4. Gypsum is hydrated calcium sulfate. A 4.89 g sample of this hydrate was heated. After the water was removed, 3.87 g of anhydrous calcium sulfate remained. Determine the formula for this hydrate and name the compound.

$CaSO_4$ and water = 4.89g

$CaSO_4$ with no water = 3.87

Mass of water in Gypsum = 4.89 - 3.87= 1.02g

Convert mass of water to moles of water =

$1.02g \left(\frac{1 \text{ moles}}{18.02 g}\right) = 0.0566 \text{ moles } H_2O$

Write the formula for hydrated calcium sulfate :

$CaSO_4 \cdot 2H_2O$

Name the formula for this hydrated calcium sulfate:

Calcium sulfate Dihydrate

5. Determine the percent composition of $MgCO_3 \cdot 5H_2O$ and draw a pie graph to represent the hydrate

Mg: 1(24.31) = 24.31/174.42 = 13.938%

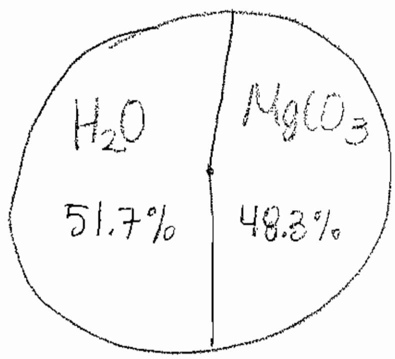
C: 1(12.01) = 12.01/174.42 = 6.886%

O: 8(16.00) = 128.00/174.42 = 73.386% /8 = 9.17325

H: 10(1.01) = 10.10/174.42 = 5.790%

$MgCO_3$ - 13.938 + 6.886 + 3(9.17325) 48.34375 = 48.3

H_2O. 5.790 + 5(9.17325) = 51.65625 = 51.7



6. What is the formula and name of a hydrate that is 85.3% $BaCl_2$ and 14.7% water?

$85.3g\ BaCl_2 \left(\frac{1\ Mole}{208.23\ g}\right) = 0.41$ Moles / 0.41 = 1

$14.7g\ H_2O \left(\frac{1\ Mole}{18.02\ g}\right) = 0.82$ Moles / 0.41 = 2

$BaCl_2 \cdot 2H_2O$

Barium Chloride Dihydrate

Name: [redacted] Pd. Date:

Honors Hydrates Quiz

Name the following hydrates (3 points each):

1. $CaCl_2 \cdot 6H_2O$

2. $MgSO_4 \cdot 7H_2O$

Write the formula for the following hydrates (3 points each):

3. Barium hydroxide octahydrate

4. Cobalt(II) chloride tetrahydrate

Show all work (10 points each)

5. Chromium(III) nitrate forms a hydrate that is 40.50% water by mass. What is its chemical formula?

6. Determine the percentage of anhydrous sodium carbonate and water in sodium carbonate decahydrate.

7. Hydrated sodium tetraborate ($Na_2B_4O_7 \cdot xH_2O$) is commonly called borax. Chemical analysis indicates that this hydrate is 52.8% sodium tetraborate and 42.7% water. Determine the formula and name the hydrate.

Extra Credit(10 points)

The compound methyl butanoate smells like apples. Its percent composition is 58.8% carbon, 9.8% hydrogen, and 31.4% oxygen and its molar mass is 102 g/mol. What is the empirical and molecular formula of methyl butanoate?

Name: [redacted] Pd. Date:

Honors Hydrates Quiz

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[redacted]

Ms. [redacted]

Chemistry I Honors

5 April 2009

55/50 !

Methane Hydrates

While the U.S government is currently in the process of deciding whether or not to spend billions of dollars on research and development projects to extract methane hydrate from the ocean floor I believe this should be done. Fist off it will help the United States to stop relying on other countries, for oil. Second it will be lower than the cost of oil which will benefit U.S citizens. Lastly United States could more than double its domestic natural gas resource base.

The United States relies heavily on other countries for oil which they need for oil sources such are heaters, and oil powered machines and vehicles (http://www.rand.org). If the United States invested there money in development projects to extract methane hydrate, it will provide enormous amounts of natural Gas (www.popularmechanics.com). The US could also greatly benefit from investing in Methane Hydrate research and development by lowering the cost for fueling vehicles and other machines, ultimately saving US citizens hundreds of dollars every month.

Research over the last decade has shown that the oceans around the United States hold immense amounts of methane. If the United States could tap into these sources there would no longer be a desire to find other sources of energy. Lastly if the United States invested in the development and research of Methane Hydrate it will greatly improve the economy thus increasing the amount of money the US can spend on other projects that are more important for our country. Overall Methane Hydrate will be an advancement for the US economic wise, if the US can safety extract it.

Works Cited

"Fire and Ice Will Methane Hydrates Help Power the World in 2020?" Http://www.rand.org/. 6 Apr. 2009.

MAYNARD, BARBARA. "Popular Mechanics: Methane Hydrates -- Energy Source of the Future?" Popular mechanics. Apr. 2009. 6 Apr. 2009.

[redacted]

Chemistry I H

Miss [redacted]

3 April 2009

60/50 ! Love the extra pages!

The Importance of Methane Hydrate Research and Use

The United States is the world's single largest energy consumer and uses more than 320 billion gallons of oil per year, of which nearly 200 billion gallons are imported. (Robert Bryce, *5 Myths About Breaking Our Foreign Oil Habit*) Most of the money spent on energy and oil comes from foreign ports, so the demand for oil and energy independence through alternate sources has become increasingly popular and important in the past few years. Scientists and researchers have already found a multitude of different resources to obtain our energy and oil through, but accessing and using these products properly have become the latest problem.

The most promising and abundant energy source found to date is methane hydrates. Methane hydrates are found in the ocean floor and have already been discovered along the coast of many states in the United States of America. Methane hydrates contain higher energy content than all other known fossil fuels combined. (William Pentland, *Methane Hydrates: Energy's Most Dangerous Game*) What is stopping scientists from removing and using this wonderful energy source, possible global warming implications. Therefore, scientists are not using an energy source that would help stimulate the economy because all of the money would go back into the country because it could hurt the environment. The environment is and should be a concern of all of the population, but things people use everyday hurt the environment as well. Carbon dioxide from cars hurt the environment and contributes to global warming, but people still drive cars anyway. Airplanes, businesses, and factories all emit carbon dioxide as well, but that does not mean less people fly on airplanes or go to work. (Eco Bridge, *Causes of Global Warming*) If scientists receive the proper funding for research in methane hydrates, they could find various ways to store and use it without hurting the ozone layer and the environment.

Although it would require spending a lot of money in order to conduct the proper research needed for the use of methane hydrates, it is important to do so. Americans give foreign providers billions of dollars per year for their oil and energy. If only a little more was spent on researching and obtaining methane hydrates, a way to use them would be possible. It may be a lot of money to spend, but all of the money spent of the usage of it would go back into the economy. The economy is in a bad place right now, but if how to use methane hydrates without hurting the environment was found, it could potentially stimulate the economy. Therefore, investing money into the research and usage of methane hydrates would not only reduce the countries dependence of foreign sources, but stimulate the economy and help the citizens of the world.

[redacted]

Self-Evaluation

Overall, the Learning Goal that my students were most successful on was Learning Goal 5. In order to be successful for this goal, students had to work together cooperatively, design their own procedure, perform the procedure, and assess the final results. Every student in the class received a grade of 100 on the final assessment. Or, grading scale too easy. One possible reason for this success is the fact it was a highly engaging activity and every student was motivated to find the answer to the question. For this goal, I proposed the question and students had to do everything else. I did not provide them with a procedure to follow and there was no correct answer. Subsequently, the students really had to think about what they were doing because they could not blindly follow a recipe in order to get the answer. I also think that the students were successful because they worked together in groups. I added a stipulation when I posed the question that if the students were precise, meaning all groups were within plus or minus 10% of each other, that they would get bonus points. So not only was there positive social interaction in each of the groups, but there was also collaboration between each of the different groups. They all wanted each other to succeed because then they could get the extra bonus points. I offered the reward to all of my classes, however, it really only had an impact on this particular class because they are motivated by grades.

The Learning Goal where my students were least successful was on Learning Goal 3, which asked students to solve a non-unique problem. Only one student met the criterion in the pre-assessment and everyone else had no clue. When I posed the problem, they all stared at me like I was crazy for asking them to find a solution. It was very difficult for the students to put together everything they had just learned and organize it so that it could be applied to a new situation. Furthermore, only 8 students met the criterion for the goal on the post-assessment. One possible reason for this lack of success is the fact that the new information they had just learned was not organized. The students had trouble figuring out which conversion factors to use and the next time I teach this I will make a concept chart with the students beforehand and post it in the classroom so that is legible to all. Another possible reason for this lack of success is that I might have helped them out too much. There were two parts to the problem and I walked them through the first part and asked that they finish up the rest of it. I think some of the students just blindly wrote what I wrote on the board and did not really process what they were writing. Therefore, when they went to finish the problem they were just as clueless as before. In the future, I will not provide as much guidance, but rather I will ask the students to walk me through the steps and only jump in whenever it is absolutely necessary. The whole process will take longer, but it will be worth it in the end.

As a result of this whole experience, there are many professional learning goals that I need to work on. The first goal falls under Professional Development Standard A in the National Science Standards which states that "profession development for teachers of science requires learning essential science content through the perspectives and methods of inquiry". Specifically, I need to work on using inquiry as my main method of transferring knowledge to the students. Clearly, it is most beneficial to all students because inquiry tasks are more motivating and engaging. My students were most successful on the inquiry task that I used for this unit over any other task. There are many things I can do to incorporate more inquiry into

I teach one of those!

my teaching and include taking workshops or classes, seeking out a mentor who has experience with inquiry, and collaborating with other inquiry-focused teachers.

Another goal I have falls under Professional Development Standard B, which states that "professional development for teachers of science requires integrating knowledge of science, learning, pedagogy, and students; it also requires applying that knowledge to science teaching". In other words, I need to work on putting everything together and identifying those points in the curriculum where students will struggle. I have come to realize that it really is not enough to just know the content you are teaching. You must apply it and tailor it individually to each student. I can work on doing this by becoming more knowledgeable of learning theory. This is also a case where a mentor would be very useful. I could find out beforehand where students have the most trouble in the curriculum and therefore plan ahead for it.

Or, experience :-)

[redacted]

Student Teaching Reflection

My student teaching experience was a very difficult and simultaneously rewarding journey. I learned more about myself as a teacher and my students as learners than I ever thought I would. In the beginning, my main focus was trying to establish classroom routines that would foster positive collaboration among students and create a safe environment where students would not be afraid to ask questions (RIBTS 6). Students definitely tried to get away with whatever they could when I first started teaching and I honestly was thrown off guard. For example, when I gave the first quiz in one of my classes I had to get very stern with the students because after they were done they would start talking to each other with no regard for the others who may have still been working. It got to the point where a couple of students started getting out of their seat to do random things. I gave two warnings for them to be quiet and then I told them that I would start taking away points. One student replied "you wouldn't do that to us", to which I replied "yes I would, that's a point off of your quiz...anyone else?" Two more students said something and they also got points off of their quiz. After that everyone knew I was serious and that I would follow through. It took me a couple of weeks to realize that I needed to be stricter because in order to have a safe, positive environment I think students need a structured class where the rules are straightforward and they know what they can and cannot do. It definitely made the rest of the semester much more manageable and productive because I never really had to talk over anyone or deal with boundary issues. Classroom management is probably the one thing that I picked up the quickest, because essentially I had to or I would go insane. Yay!

that's good

Another aspect of my teaching that I think improved is having a point to my lessons and activities. In other words, I tried to get students to see the big picture to whatever we were doing (RIBTS 1). For example, in the inquiry task where students had to determine the number of moles of M&M's that could fit into the high school, I told the students right off the bat that I did not care about whether they got the right answer. The point of the activity was to allow for students to be creative and let them develop their own procedure because that is a worthy and valuable skill to have in the real world (RIBTS 5). I think that just by informing the students of the point of the task was important in this case. This is something that I need to keep working at and I realize now that even though I see the big picture, many times students do not. Subsequently, I adopted the practice of my cooperating teacher which is to read a short outline of the main points before starting each unit. Each outline clearly states why it is important for the students to learn the upcoming material and how it might affect their own lives.

Not only did I collaborate with my cooperating teacher, but I made it a point to get to know the other science teachers and bounce ideas off of them, as well (RIBTS 7). Just by sitting in the teacher's lounge I picked up a lot of good ideas for projects, assessments, and activities. One notable example of this is when I was trying to come up with ideas for teaching energy to my freshman physical science classes. One teacher suggested having the students build a Rube Goldberg machine and I was immediately intrigued. So I tweaked the idea and had the students draw me a poster of an original Rube Goldberg machine (RIBTS 2). After I first introduced the idea to my students word must have traveled and the next day another physical science teacher came up to me and actually asked me how I was going to go about with the project. He heard from his students that we were doing this project and he was really interested in doing the same thing. As a result, for the next week or so I worked closely with this teacher to develop a plausible project for the students. I gave him ideas of clips to show and he gave me internet sites that would help the students if they were having trouble coming up with ideas. I was the guinea pig for the project and I shared all of my failures with this other teacher so that he might be able to avoid those issues when he did the project. Even though I was collaborating with other science teachers, I still need to work on collaborating with teachers of other subjects. This is one area that I think I was really weak in because I did not seek out this kind of collaboration at all. I think I put the idea at the end of my list of things to do and I never got to it. One of my goals in the future is to make this a priority because I think it would be beneficial to many students. Not only would they get the big picture in science, but they would also get to see how all of the disciplines intertwine (RIBTS 1, CF-professionalism)

nice

The Rube Goldberg project also allowed me to see the value of using different kinds of assessments because there are many different kinds of learners (RIBTS 4). There were at least two students in each of my physical science classes who excelled and really got into the project. These were students who did not do well with the traditional teaching technique of lectures and filling out dittos, but that did not mean that they were not bright or capable of doing the work. It can be deceiving at first because even though the students do not look diverse, they are all very different in terms of how they learn best (CF-diversity). I tried to have a variety of assessments such as labs, quizzes, writing assignments, group projects, and group inquiry tasks but I know there are many more options out there and I am excited about building on my foundation. The next step in my future is getting my Masters in Education and I am sure I will learn about many more assessment strategies (RIBTS 9/10).

Another part of my experience teaching that I found to be extremely important to reflect on is that students think very differently than I do (RIBTS 3). It was challenging at first to try and put myself in their shoes and determine where I thought they would have trouble and where I thought they would fly through the material. It became very apparent in my chemistry classes that I needed to use as many visuals as possible because many topics in chemistry are abstract. Some students are not at that stage developmentally yet and the use of concrete examples can be a huge help. This is where the use of technology was of great assistance to me. There are plenty of simulations and animations on the internet that can be hugely beneficial to many students. As an example, when I taught a lesson on heat and temperature I wanted to show how the molecules move faster in hotter water than in colder water. I gave the 'food coloring in hot and cold water demonstration' but I should have also shown an animation of the molecules moving faster in hotter water because I think that would have really helped. I found a website that does exactly that after the fact and I will definitely show it in my future classes (CF-technology).

you can use paper plates + popsicle sticks

Overall, I found that as a teacher I prefer to do project-based activities and tasks because I think the students learn better that way. I am a believer in the constructivist approach to learning because the most success that I saw in my classes was when students were given the chance to actively process the material. Hopefully, the longer that I do this the more I will learn about the students at this developmental stage and myself as a teacher (CF-pedagogy).

Reference Page

National Academy Press (1996). *National Science Education Standards*. Washington, DC: National Academy of Sciences

http://www.ride.ri.gov/EducatorQuality/DOCS/iplans/docs/RIBTS

Student Teaching Proficiency Skills

Date/Check

✓ Keep records of daily lesson plans, handouts, worksheets, unit plans in 3-ring binder.

✓ Keep daily records of lesson plans and schedules in a teacher plan book.

✓ Maintain a computerized grade book of all student records.

✓ Maintain homeroom records which include attendance, report cards, mid-session reports, etc.

_____ Supervise students during detention.

_____ Observe exemplary non-science teacher(s)

✓ Participate in extra-curricular activities (science fair, Science Olympiad, college bowl, dances, sporting events, etc.)

_____ Conduct an interview with school counselor regarding advising process, student records, disciplinary procedures, etc.

_____ Observe an IEP (Individual Education Plan) meeting.

_____ Conduct a parent conference.

_____ Shadow a student for and entire day.

✓ Attend school faculty meetings.

✓ Attend department faculty meetings.

✓ Attend school assemblies.

✓ Be evaluated by principal (dept. head) as beginning teacher.

✓ Obtain copy of student/teacher handbook.

_____ Interview with teacher resource specialist.

✓ Review policies in ordering equipment and science budget.

Cooperating Teacher [signature] Date 5/1/09

Student Teacher [signature] Date 5/1/09