

Worcester Polytechnic Institute
Interactive Qualifying Project

Teacher Preparation Program:
Teaching Practicum at Worcester Technical High School

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March 2017

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Abstract

This paper will discuss my experience as a student teacher fulfilling my teaching practicum at Worcester Technical High School. It was the capstone experience in the Teaching Preparation Program, which will lead to my Massachusetts Teaching License in Physics. I will outline the culture in the school setting I taught. I will present and prove my competency in the six essential elements of Candidate Assessment Performance (CAP) on which I was evaluated. I will relate my background and WPI education to my preparedness for teaching. I will describe my classroom environment and the flow of a day. I will conclude on how this experience has helped me grow as a professional and an integral person.

Dedication

I believe teachers are the foundation of society, setting newer generations for a brighter future. Their job is hard and arduous, but very rewarding. I hold teachers in the highest respect. Having served as one, and having the chance to make an impact on students' lives is an honor. I dedicate this paper to all teachers, old and new. Now that I have been in your shoes, I respect you even more. I can truthfully state that teaching is harder than rocket science. Thank you all for what you do.

I want to thank all my teachers for having had the patience to have an impact on my life and make me who I am. Special thanks to Ramon, William, Santiago, Dana, Beatriz, Katie, Shari, and Jackie. Thanks for sparking the drive to become a teacher, and thanks for being with me during this process of becoming one.

Chapter 1: Background

This section will cover the legislative, cultural, socio-economic, historical and academic perspective that sets the ground for what would be my Teaching Practicum at Worcester Technical High School. Understanding this factors is fundamental on recognizing what it takes to become an active educator in this school.

The Massachusetts Education Reform Act of 1993 (MERA) set shape to what will become the education system in the state, including the Worcester District. This reforms looked for revolutionary changes in how education was being handled and set clear goals to be achieved within a decade. Some of the key statements in MERA are the following. Equitable distribution of increased funding, student learning accountability, standardization for students, educators, schools and districts. (Education Connection Magazine, 2003) These led to the creation of “foundation budget,” the Common Core standards, and the MCAS examinations. All of which take a fundamental role in today’s education and are in compliance with the federal No Child Left Behind Act.

The state of Massachusetts has fared very well in standardized academic performance testing. About the global average, Massachusetts has performed higher each year in math and sciences. Trends in International Mathematics and Science Study (TIMSS) shows a superior average score through the years in both the tested disciplines (National Center for Education Statistics, 2003, 2007, 2011). This relative higher performance is necessary today as it shows that high expectations are anticipated for students, teachers, and schools.

Worcester Public Schools is a School District that serves the city of Worcester, MA. The district is comprised of 52 schools serving an average of 24,740 students yearly. Worcester Public Schools is the third biggest school district in Massachusetts.

Worcester Technical High School (Worcester Tech) is one of these 52 schools and one of seven high schools in the area. Worcester Tech is a public vocational high school where students are not only taught academics tied to the state standards, but also are taught one craft of their choice. Worcester Tech serves grades 9 -12 and has an enrollment of 1,389 students. Teacher to student ratio is 11 to 1. The demographic distribution at Worcester Tech is as follows. 37.1% White, 36.8% Hispanic, 16.6% African-American, 6.6% Asian, and 3% Multi-Race, Non-Hispanic. Worcester Tech selected populations distributed in the following manner 57% High Needs, 43.8% Economically Disadvantaged, 40.6% First Language not English, 12.6% Students with Disabilities, and 8% English Language Learner.

Worcester Tech Accountability ranks as a level 1 school within the district. It means that the school is meeting their proficiency gap-narrowing goals. Worcester Tech performance is superior to that of the rest of the area and even to that of the whole state of Massachusetts. According to the Composite Performance Index were Worcester Tech ranks higher in English, Mathematics, and Sciences. MCAS scores show similar results having Worcester Tech grade 10 students scoring higher than their district and state counterparts. The graduation rate at Worcester Tech is about 96% with 81% of the graduates attending some form of post-secondary education.

During the practicum and Worcester Tech, I was part Science Department which is in charge of providing the school and students with the required curriculum of Biology, Chemistry, and Physics. These courses are given in four different levels Special Education, College, Honors, and Advanced Placement (AP). Students choose their degree based on their work ethic, and ease of understanding as they range from easier and lower paced to harder and fast paced. I taught the Honors Chemistry and AP Physics courses. The references I used to teach this courses were the following. For Honors Chemistry I used the Massachusetts department of elementary and secondary education, Science and Technology/Engineering Curriculum Framework. (Massachusetts Department of Elementary and Secondary Education, 2001) For

AP Physics I used the AP Physics 1 Algebra-Based Curriculum Framework developed by the College Board.
(CollegeBoard, 2014)

It is important to understand the past, present, and future of the state, district, and school to be an impactful educator. The Past, recognizing the history and how legislative reforms have shaped the system. Today, understanding the socio-economic reality of the students. And future, using the knowledge of past and present to plan and work towards a prosperous future for each and every one of the students.

Chapter 2: Developing Organized and Meaningful Lesson Plans

Developing Organized and Meaningful Lesson plans is part of the “Curriculum, Planning and Assessment” standard, first of the Six Essential Elements of CAP. “1. A.4: *Well Structure Lesson Plans: Develops well-structured lessons with challenging, measurable objectives and appropriate student engagement strategies, pacing, sequence, activities, materials, resources, technologies*”. (Massachusetts Department of Elementary and Secondary Education, 2016) This standard looks to promote the learning and growth of all students. Based on the instructor's ability to provide high-quality instruction, founded by the instructor’s educational and children development understanding. Various activities and assessments are tailored so that learning is achieved in the most efficient manner and can be recorded to analyze student’s growth.

Proficiency on this standard is critical to becoming an active educator because a planned lesson will always have a deeper impact on the students learning and overall growth. By planning a lesson not only the subject is imparted in a more systematic and paced way but also all students are addressed according to their interests, different intelligence types. By planning a lesson, the instructor is in complete control over what is going on during the lesson. What strategies will be used to help each of the students achieve the lesson goal, and how he will get assess that this objective was achieved.

For example, looking back at the lesson plans from the beginning of the practicum I can see how vague and poorly written they were (Appendix B.1, B.3). In this lesson, the subject was imparted, but it was not imparted in a way organized and meaningful way. There was always room for improvement. Techniques that would target particular students were not utilized. Timing was off as lessons would end early or run longer without getting appropriate feedback from the students. One of my laboratory practices involved working with acids and other harmful chemicals. It also included controlled explosions. To make sure everything was safe and educational I had to plan it thoroughly. This laboratory lesson plan has everything

needed to create a safe environment reinforcing laboratory rules and safety guidelines. It also has a very well structured series of experiments followed by a discussion that highlights the findings. Thanks to this careful planning nobody got harmed, and everyone enjoyed the laboratory within the strict time constraint. (Appendix B.2)

By the end of the practicum, my lesson plans had all the experience scripted from start to finish with different techniques and activities. These lessons were more meaningful as I proposed assessments that would let me know that students were reaching the goals I had set for them for that lesson. Showing competency on this standard which was critical to student's learning and engagement.

Chapter 3: Safe Learning Environment

Safe Learning Environment is the 4th CAP essential element, and it is part of the Teaching all Students standard. “2. B.1: *Safe Learning Environment: Uses rituals, routines, and appropriate responses that create and maintain a safe physical and intellectual environment where students take academic risks and most behaviors that interfere with learning are prevented.*” (Massachusetts Department of Elementary and Secondary Education, 2016) For meaningful learning to occur, it is essential that the mind is focused and at ease. This standard sets the case for creating an environment does not allow any child to feel in any way that can hinder their learning. It is critical for the instructor to understand the background of his class and students, for him to be able to foment a safe environment where all the students feel represented and engage in meaningful learning.

Many factors can contribute to offsetting the safe balance on a classroom environment. To preserve this balance and become an active educator, it is crucial for a teacher to identify this influences. Ranging from lack of class identity to problems at home, and bullying, these issues appear in different forms. Proficiency in this standard arises from the educator’s capacity of recognizing several factors that threaten the classroom culture and address them assertively. The instructor is capable of creating a class identity that sustains a safe learning environment on its own.

During the practicum, I was fortunate to have arrived at a school with a robust and safe learning environment. Everybody was put up to high standards and was ready to engage in learning. I did not have any significant problem maintaining the environment, nor had to deal with any issue that attempted to hurt it. Nevertheless, I did contribute to creating a better classroom culture. In class, we developed an identity where both instructor and students were treated as full on chemists or physicist. Personally being a young teacher I wanted to be a role model for the students showing them that they can be anything they wanted to be. They could be Doctors; they could be Rocket Scientists. I did not think this would have

the impact it had on the students. One of the students said, "You will see Mister, how with my chemistry I will become a Doctor," another one said "Mister, I was thinking, and I know the answer. I could only think about it because I am a physicist."

Competency was proved regarding this standard as having students embrace their subject and took the role of a physicist or chemist. It provided the self-motivation to live up to the name. Leading to the confidence needed to engage in meaningful learning even in harder to understand topics.

Chapter 4: Adjustment to Practice

Adjustment to practice is part of the Curriculum, Planning and Assessment standard, second of the Six Essential Elements of CAP. “1.B.2 Adjustments to Practice. Organizes and analyzes results from a variety of assessments to determine progress toward intended outcomes and uses these findings to adjust practice and identify and implement appropriate differentiated interventions and enhancements for students.” (Massachusetts Department of Elementary and Secondary Education, 2016) This standard looks for teachers to develop a close feedback system on how they teach their lessons. A system was what the students show during their learning is used to tailor teaching and new assessments. It provides the optimal learning experience for all students.

This standard is fundamental in making an active educator. A teacher that does not tailor his lessons according to the student’s performances is doomed, and his students are too. If students are frustrated and are not grasping a concept, it is crucial for the educator to recognize. If not, the students will be tested yielding bad grades, gaps in their future learning, and especially the lack of fondness for the subject matter. Same can be true for over-performing students. With this in mind, we can see how important it is for an educator to be able to read each and every one of his students, as well as the group as a whole to provide the education they deserve. Proficiency in this standard is achieved by teachers that can read their crowd, designs assessments to gauge student understanding, and finally, uses this information to tailor his lesson in a way that targets different students in the best way possible.

During the teaching practicum, I made sure I practiced this standard every day. I was always on the lookout for student’s comments, questions, or facial expression. I would get any hint that would show me they understood the lesson. For every assessment that I graded, I would reflect on the overall as well as the individual performance. If I found a standard error or misunderstanding, I made note, so I talked about it the next day with the whole class. If I had a chronic underperformance by an individual student, I would

call them after school to suggest extra help on after hours. Also based on the feedback I got from reading students and their work. I would change the schedule and tailor lessons to be delivered as to fill perceived gaps or what I usually had to do is slow down the pace and break the material up. Even when I taught the same class, different groups yielded different tailored lessons.

Proficiency in this standard can be shown by the adoption of a system that would give me instant feedback, which allowed me to adjust on the spot. Using Plickers, I could ask a question and get live polling of the student's results. (Appendix H) Using this aid, allowed for increased participation, as no student was held accountable for an incorrect response in front of the group. Based on the poll I could decide how I wanted to spend the lesson time. If most of the students had the wrong answer, I would slow down and explain the why the sure option was correct and why another the others were incorrect, especially if one of the incorrect answers was picked in abundance.

I conducted a survey to all students on the four classes. Getting feedback on my performance as an instructor and how they perceived their teacher's job was helping them learn. I honestly took the time to analyze them and adapt lessons to the feedback from the students. I especially acknowledged their request for a slower pace. More on this matter on chapters 7 and 9.

Chapter 5: Meeting Diverse Needs

Meeting Diverse needs is the 3rd CAP essential element, and it is part of the Teaching all Students standard.

“2.A.3: Meeting Diverse Needs. Uses appropriate practices, including tiered instruction and scaffolds, to accommodate differences in learning styles, needs, interests, and levels of readiness, including those of students with disabilities and English language learners.” (Massachusetts Department of Elementary and Secondary Education, 2016) This standard looks at the educator’s ability to recognize the individuality of each of his students. Providing specialized instruction according to their respective needs, learning styles, interests, and readiness. This standard makes special emphasis on teaching students with disabilities and special learning conditions.

Every student is a unique person, as an educator, it is granted that you will have students with various personalities, needs, and learning styles. No one guarantees that a single teaching style will suit all students equally. Proficiency in this standard leads to an active educator. An influential teacher understands his classroom environment and knows each and every one of his students. Using an assortment of techniques he provides specialized instruction according to different learning styles and interests. A particular challenge within this standard is reaching students with special needs. This matter makes the difference between a good and an excellent educator. A splendid teacher can teach students on Individualized Education Programs (IEPs), have a disability (504s) or their first language is not English (ELL). It is crucial for an active educator to be able to reach to these students the same way he reaches all of the students. Sometimes it is necessary for the instructor to take an extra step and tailor lessons so that these students are specially targeted. Achieved by studying their situation and creating specialized material or utilizing targeted techniques.

Competency on the standard can be supported by using the following strategies. First I made sure lessons had a fair share of pictures, videos, and kinesthetic activities aside from language. This way I made sure I

was targeting students with different learning styles. Also, I made sure I related the lesson to student's interests. Tying the experience to sports and even their respective crafts. I provided students with self-discovery guided laboratory practices. Providing them with a different learning setting from which they can learn by experimenting in groups. I also used the scaffolding technique where I modeled how to solve a problem and then stepped back as students showed mastery. It gave me the opportunity to dedicate more time to students that were struggling and provide understanding students with tougher problems.

Personally, I think I still need to improve regarding this standard. Nevertheless, I used several techniques and activities to reach students with different learning styles. I believe that I could have done more to reach my students that were on 504s. In my classes, being high achieving groups, I had the particular case that none of my students were ELLs. So I did not get a lot of experience working with these students. I also did not have any student on an IEP. I had two students with disabilities on 504s. One student had had a brain surgery and had hindered hearing on one of his ears. The other had limited eyesight as she was going to undergo eye surgery. To help these students I used the echo strategy. And I made sure I repeated or made someone repeat what was said. I also taught so that group and pair activities will benefit them. Thinking back I wish I had talked facing them more often, so they could read lips. Also, I wish I had created specialized handouts so that they can follow the lesson more effectively. Nevertheless, I always went to their seats and asked them if everything was understood or if they had any particular question. I think that the fact that I could not do specialized instruction for them was that I was not comfortable enough reaching to all the students in the class even if they did not have a 504.

Chapter 6: High Expectations for all students

High Expectations is the 5th CAP essential element, and it is part of the Teaching all Students standard.

“2.D.2: High Expectations. Effectively models and reinforces ways that students can master challenging material through effective effort, rather than having to depend on innate ability.” (Massachusetts Department of Elementary and Secondary Education, 2016) This essential element looks for teachers not to expect nothing less than mastery for all students. To achieve this, educators have to reinforce good practices and guide students step by step to the, always high, bar.

Instead of portraying an influential teacher in the implementation of this element, a weak instructor will be portrayed. A poor teacher will not teach something to his students because he believes they are not capable of understanding. An ineffective instructor will tell a failing student that he should better drop because there is no way he can pass. A poor educator would assign meaningless work to some students, while he teaches the “smart” students. As we can see, a weak teacher is a toxic presence in the classroom concerning this element. Thus we can value the importance of being not even proficient but only competent in this standard. It is critical for an instructor to believe in each and every one of his students and work with them towards content mastery. No matter how challenging the subject, no matter how much struggle. It is not a question of talent, but an issue of hard work. The instructor has to set the bar high for all the students.

During the experience at Worcester Tech, it was not hard for me to prove competency in this element. First because at Worcester Tech, the whole school has developed a culture of high achievement. Because of this, all students know that they have to put the effort and do their work. They have to pass and even more worthy, remain in the school. Second, these classes were directed towards high achieving students. Chemistry students were Honors level, and they knew the bar was going to be set high when they enrolled. Physics students were AP students. AP physics has the reputation of being painful. So all the students that

were enrolled although a little scared were up to the challenge. Lastly, my mentor teacher has the reputation of being the hardest teacher at the school. All of this factors made it easy for me to set a high bar, but it also put a lot of pressure on me. I had to deliver and teach the students material to the expectations that they deserve. It led to a classroom environment where high expectations were not only expected from the student but also from the educator. Mastery was reached in very complex topics in Chemistry and Physics.

Chapter 7: Reflective Practice

Reflective Practice is the 6th and last essential element of CAP. Part of the Professional Culture standard.

“4.A.1: Reflective Practice. Regularly reflects on the effectiveness of lessons, units, and interactions with students, both individually and with colleagues, and uses insights gained to improve practice and student learning.” (Massachusetts Department of Elementary and Secondary Education, 2016) This element exists to promote a thoughtful analysis by the educator. To think about the flow of the lessons, his students, his performance. With the purpose of figuring out what might be going wrong, what is going well and how can it be better, or even better. It also exists to stimulate teachers to collaborate and benefit from sharing with colleagues and learning from each other. Growing individually and as a field.

Education is an ever-changing enterprise. Every day will be different, and it is impossible to expect what will happen. The involved human factor generates the uncertainty. Some days can be good, and others can be bad. Proficiency in this standard is achieved when a culture of self-reflection is established by the educator. It is crucial for an active teacher to find alone time and delve into self-reflection. Reflect on the overall flow of the day. Think about his conversations with the students and peers. Think about what went right and what went wrong. If right, make note to keep doing it. If wrong, think why, and how it can be done better. If there was a problem during the day, reflect on how you tackled it and why. Was it effective? If an action or clarification is required, make sure happens as soon as possible the next day. If the educator does this frequently, the classroom environment will benefit. Everything would be much smoother, and students will respect the teacher more.

Self-reflecting about the past and present is not the only critical aspect of this standard. As any other science. New breakthroughs and research point to better ways of delivering a meaningful lesson to students. It is essential for an energetic educator to keep studying and be always learning and improving

as a teacher. Establishing healthy collaboration relationships with peers is important. Attend capacitation sessions, share material and discuss lessons with peers.

At the end of the practicum, program supervisor mentioned that very few student reach the proficient in any of the essential elements. Even long time teachers struggle to achieve this quality. Surprisingly both her and supervisor practitioner believed I attained profficient in reflective practice. It can be attributed to one of my most defining character traits. I analyze everything that happens in my life the way reflective practice element looks for you to do on education. It was performing this standard at a high level without even noticing. I would always think on the drive back home, or when I had a little spare time. I thought about what went right and reinforced myself to keep doing it. But I also thought about what went wrong. I often regretted not doing certain things or not saying others. For example, one day I could not solve one of my problems on the board because I made a mistake that I could not catch. I thought about this a lot during the afternoon. Next day, I talked to the students and used the opportunity to give them a lesson on mistakes. It is all right to make a mistake; even your teachers make mistakes. The important thing is being able to learn from them. What reflective practice looks for as a standard, is to be a platform for learning from errors and improving positive experiences.

Other aspects that prove competency in this element are active involvement in trying to become a better teacher and incurred peer interactions. I attended several peer development days, and I enjoyed them thoroughly. I applied what I learned in those, to classes. At WPI at the seminar sessions, I would always learn from my teachers and classmates experiences and also implement them in teaching. I also interacted with different faculty at Worcester Tech, attending faculty and department meetings. And working with the AP Chemistry teacher on developing a laboratory practice. I even shared the favorable laboratory with other Chemistry teachers.

Chapter 8: WPI Education

WPI education played a vital role on the teaching practicum. Not only what I have learned at WPI but also what led me to become a WPI student. I grew up in Quito, Ecuador. Ecuador is an underdeveloped country where science and engineering are not fields frequently studied. Even more, something Ecuadorians believe is so far from their reach, Aerospace Engineering. During High School, the love for Math and Physics started early. Thankfully I was also good at it. Performance in these areas led me to win national competitions. Eventually, it will lead me to leave the country and pursue a degree in Aerospace Engineering in Worcester. I want to prove to my country people that we can do anything that we challenge ourselves to do. Even something that at first seems unimaginable. To do so, I have to return to the country and apply everything that I have learned and will learn. But the question was how. How can I share the experience and knowledge I attained back home? I decided to become a teacher. By being a teacher, I can go back and teach the marvels of math, physics and space exploration. Be a role model for the new generation of Ecuadorians. Inspire them to become scientists or engineers, to pursue a higher education degree. We will work towards a brighter future for our country.

This practicum was the first step for me to attain the abilities and skills necessary for me to fulfill this dream. The Teacher Preparation Program and I were a great match. I could learn the necessary pedagogical and psychological studies at the same time I finished my Aerospace degree. I chose to be a Physics teacher. Being the subject that I love the most. I had the luck also to teach chemistry. The subject matter knowledge in both of these fields is extensive. Nevertheless, as a Rocket Scientist, the fact that I knew about it was taken for granted. I knew I understood a lot about these subjects, but I was surprised to see at what level. I did not realize I had complete mastery over the issue until I started teaching it. Even more, by teaching it, my proficiency grew. I was able to break down material so that students could

understand, and answer questions. I was proud of my background and thankful that it can be used to impact student's lives.

My story and my goals make me a fascinating teacher. I can still remember student's reactions when they heard that I was an Aerospace Engineer. "Mr. waits, so... that means... You are a Rocket Scientist". The fact that the students can say that a "Rocket Scientist" is teaching them Physics and Chemistry causes a significant impact. They not only think it is cool, but they also believe that you are fresh and they respect you a lot. They think that you know everything and oneself is brilliant. But the best part about this is not what they know about it. It is what they do not. Through ages, teachers have received the dreadful question. "How is this going to be useful in real life?" I was not scared by this issue; I encouraged it. I was teaching chemistry and physics. I make aircraft and spacecraft for a living. I used what I am teaching them every day in real life. This ability was my main strength as a teacher. I could make real examples on how physics and chemistry are applied to real life. In things as cool as rockets, airplanes, and satellites. It gets your students excited. I can still remember their faces when I tell them that I use the same Newton's equations to plan a mission that will take a robotic payload from Earth to Mars.

Even with all this knowledge, I would not be a good teacher as the course work at WPI made me become. Having the content behind me, I just needed to learn more pedagogy. Courses like Psychology of Education led me to understand the cognitive growth of the human being. How to teach and promote an optimal development through several stages. Teaching methods in Math and Science was a great experience. It introduced me to the American high school system. The teachers were titular teachers at a local high school. I learned from them how to plan a lesson, how to create an assessment, how to impart a lecture, how to give a meaningful experience overall. A lot of techniques and strategies were enforced that would help target all the students and maintain an appropriate classroom behavior and the environment. Finally, the practicum seminar sessions were always very helpful and full of lessons that could be applied the next day. It was always a safe space to vent and discuss how my classmates and my

classes were going. In this sessions, we could analyze and learn from what we were experiencing in real classroom situations. Always being guided by long-time teachers who shared their experiences and expertise and were there always to support us. Looking to the future, I still have some more classes to take within the Teacher Preparation Program. There is one more Psychology that studies human as a social asset. And an English Language Learner class where we would learn how to teach this students more effectively. Also, I will have more seminar sessions in my senior year, and we will be practicing with augmented reality classrooms. All these future experiences as well as my past show how WPI education has played a fundamental role in forging me, in what I hope will be, active educator.

Chapter 9: Classes

In this section, I will describe all the classes I had the opportunity to teach. Worcester Tech being a vocational high-school had a cyclical schedule Academic week (A-week) and Shop week (Z-week). All students attended their particular shop, where they were taught the craft of their choice on one of the weeks. During the other week, students would study their academic curriculum. A-week was when I got to teach the first group of students, while the other was in the shop. It meant that for one week I would only teach one group of Chemistry and one group of Physics (I will call this group's Chemistry A and Physics A). Next week, now a Z-week, the groups would switch. The students I had, had to go on to their shops, and the students that were on shop last week come to academic week. Then again, I would have a new group for Chemistry and Physics. (This groups will be called Chemistry Z and Physics Z) This system is beneficial in that I got to teach one week, and repeat the same lessons with a new group the next. It allowed for me to reflect and adapt lessons. An opportunity that a lot of teachers do not get until after their first year. But it also was a big challenge. I had to teach them the same curriculum other teachers had one year to instruct. I had half the time because of this weekly cycle.

Chemistry A was an Honors level introductory class in Chemistry. It met every day for 80 minutes in the first two periods of each day. It was an overall good group. It was composed of 20 10th grade students. It was very varied in every sense. I had students representing all sorts of race, gender, religion, and socio-economic status. They were all very respectful and intelligent. They came to class on time and did their work. They were quiet in general. I think because it was the first period. I enjoyed discovering each of the student's personality. It was interesting to see them grow at such a critical age. I had a group of girls that you could see that chemistry was not their favorite, but still, they worked hard and laughed at my jokes. I had a group of guys that would sometimes get distracted and tease a bit. Nevertheless, they were quick to get back on task and always delivered high results. There was a group of Latino kids that were fun, and

I liked to overhear when they spoke Spanish. I had very dedicated girls, who studied very carefully before class. One of the students was absent a lot due to illness. It was a challenge because both he and I had to keep track of a lot of catching up work. The limited eyesight 504 students mentioned in Chapter 7 was part of this group. She showed a particular fondness for chemistry and was always enthusiastic about learning new concepts. One of the students I had a great impact on was in this group. He respected me as a teacher. He always approached me with fascinating questions. At the end of the practicum, he thanked me and told me just to wait till he uses his chemistry when he becomes a doctor.

Chemistry Z was also an Honors level introductory class in Chemistry. It met every day for 80 minutes in the first two periods of each day on Z-weeks. It was composed of 22 10th grade students. I enjoyed teaching this group. They were very active. They were always respectful and ready to learn. In this panel, I also had a variety of personalities that made the classroom environment absorbing. One of the students would have a comment for everything or would want to answer every question with whatever came to mind. It led to some interesting exchanges. The girl who sat next to him will also try to answer all of the questions. She also asked questions (chatted with me) during breaks or when they were on task. She helped hand out papers and helped me keep track of time during the classes. I had two brilliant students that were often slothful. They often stayed a few minutes after school finishing up their work. They developed a cordial relationship with me as they acknowledged their laziness was causing their bad grades and they came for extra help. I had a group of very focused and high-achieving girls. I sensed a hint of competitiveness on them that drove them to success. I had three students in the corner. They were very smart, and they got new concepts very quickly. Although, they were too confident sometimes and slacked off in some assignments. They reminded me of myself in high school. The 504 student with hearing disabilities that were mentioned in Chapter 5 was part of this group. He was not performing very well and sometimes looked lost. I wish I could have spent more time with him.

Physics A and Z were Advanced Placed physics classes that culminate in taking the AP exam in May. These levels were characterized by its extensive material delivered in a fast-paced manner. For this reason, the enrollment on this course was lower. Left for high achieving students that are up to a big challenge. Physics A was composed of 18 students, and Physics Z consisted of 13 students. We met every day for 80 minutes during the last two periods of the day in their particular weeks. Teaching these groups was a complete pleasure because the students that decided to take this course were there because they wanted to learn physics. It was an honor to be able to be the person that taught them such a beautiful subject. Due to A, Z-week schedule, this curriculum was very fast paced for them to achieve the AP requirements in half the time as their counterparts in the rest of the country. While the students were on shop week, they were still expected to do work for the class. They were tasked to read, take notes, and solve problems in advance, before next week's topic. During the academic week, the topic that was pre-studied would be discussed as a group, and laboratory practices would be performed. Also during the week, we would practice together solving both real AP multiple choice and open response questions. The week ended in the students taking a test that would mimic taking an actual AP exam but focused on just that week's topic. It would be a real test given in the same conditions; even timing was enforced. This test was challenging. Thus I gave this classes the opportunity to work on test corrections together and on course. It allowed for the most important dynamic of this class. Students would work together to correct the exams. When they learned from their mistakes, they achieved meaningful learning. When doubts arose even within their groups, they came to ask me. Students enjoyed test corrections and worked hard to get those points back. Many students came during their free hours and stayed after school to work on these.

In the A Physics group, I had two students that were one step ahead. They would come during shop week to ask questions about the assigned problems and reading. During the academic week, they were quicker in understanding complex concepts thus I had to have extra challenging problems for them. I had a group of students that often liked to share a laugh but never disrespectfully. I had a group of girls that I needed

to give more attention as they struggled to grasp the content. Although, one of the girls was brilliant and just needed a little more confidence on what she knew. When she explained to the others, she developed mastery while the other ones understood the concept. I had a group of boys who appreciated my presence in the classroom and always thanked me after I answered their questions. Guiding them to the correct answer was always an interesting exchange. Lastly, I had a group of hard-working but somewhat stubborn boys. This group had fascinating conversations that I often did not intervene to see how they would end. They would enter into good learning discussions where some students would make an argument for a wrong answer, but the others would use physics to case otherwise. Overall they were a fascinating group to work. And I will be expectant of their AP exam success.

Physics Z was my smallest class. At 13 students I got the chance to develop a lot better relationship with all of them. This particular group had a lot of energy and liked to talk a lot. They always behaved and were never disrespectful. We shared some good conversations and laughs. I had two boys that will always work together and stay after school to work on test corrections. They enjoyed physics and enjoyed when they learned it. They were particularly fond of me and took me as a role model. They even asked me to give them advice so that they can come to WPI. I asked one of them what kind of engineer would he want to become and he answered "kind of like you engineer." I had another group of really smart boys that always worked diligently and reached good discussions and conclusions during laboratory practices. I had one student that took to heart the fact that I called everyone a physicist. He told me to call him "Sir Isaac Carlos" because of Newton. He adopted my way of explaining life phenomena by stating the reason was "I am a physicist." Finally, I had a group of girls that in their words "hated physics." Nevertheless, they always seemed to have a great time learning it. Whenever I would interact with them to help them on a problem or in a lab, they would burst to laugh on how silly they were trying to do it. But this was the group that had the most Eureka moments, and it was a pleasure to share those with them.

Classroom management was never a real problem. Because of the culture developed by the school, the students were always on task and were very respectful. Rarely would they be talking or a little distracted, but the single act of coming closer to them and tapping on the desk was more than enough to bring them back to task. After tests, when some students finished, and the others were still working. Keeping them from talking to each other and do some other tasks required some extra guidance. Sometimes I made group announcements. I reminded everyone some classroom logistics. I warned them to come to class on time, to do their work and to study for their tests. This kind of announcements assured my control over the classroom.

All four classes had the chance to evaluate me as a teacher. After analyzing the survey that each of them completed. I could see a common trend in all the classes respecting how fast I am going over the material. With AP physics it is understandable because the curriculum goes quickly. One new topic per week is an exciting rhythm. So I had no choice but to teach so that the use class time to do hands-on activities or lab sessions. With chemistry, I am going too quickly because they get the content of one year of chemistry on half the time. So I had to cover certain material within a particular time. I decided to slow it down. Let more time for students to copy down the slides while I give more examples and ask more questions. I also told them that if they want me to slow down, they should ask questions. Because sometimes they just stare at me and I assumed they got it, so I moved on. After the evaluation had been performed, I slowed down lessons having them sometimes slide to the next day. But it worked as students felt more comfortable with the pacing.

In the survey, all classes gave me an overall average of 2.75 to 2.99. So I will take it as I was a good teacher, but there is a lot to improve. Getting to a 3.3 would have been optimal that would have meant that most students thought I was a good teacher. Values of 3.5 or 3.7 would have been an excellent teacher, and that is what I eventually want to strive for. But I need to develop many more skills to reach that.

I attended the parent-teacher night at Worcester Tech. I liked the opportunity to meet student's parents and see how much they look alike. It was interesting to see how much their parents cared about their education and well-being. It was heartwarming how thankful the parents were towards us for teaching their children. I could feel how parents played an important role on each of the students' lives and noted that I could count on them if a problem ever arose. In future teaching opportunities, I will try to maintain a better bond with the parents.

I attended the Science Teacher Department meeting. It was very helpful. I got to see how the science teachers plan the whole year and check their progress between each other. The keynote of the meeting was introducing the new documenting system of activities and assessments every teacher created. Creating a physical database of resources that could be used by several teachers to teach the topics. Whether it is a lab, a worksheet or activity it is a way of different teachers that teach the same subjects each year to share their work and achieve a universal standard as everybody works towards filling the folders and being able to borrow from them. I think this idea is adamant and is an excellent point going forward for the department. To start the meeting we discussed the results of the MCAS exams and how high we were achieving. The staff set their goal to have a better exemplary passing percentage on this year's testing. I think the system of resource gathering will help achieve that purpose and show growth and change over time as it will be the record of what teachers did to reach this goal. They are also thinking about the future having this be the first step and building a digital resource bank the second phase. The best part about this meetings was getting to know the other science teachers and talk to them about possible collaborations like the one I achieved with the AP chemistry teacher on one of the lab activities.

Conclusion

Teaching was a wonderful experience. It had always been my dream to become a teacher. And I am thankful that I got a chance to do it early in my life. This experience reassures my position and life goals of becoming a professor and inspire new generations of Ecuadorians to pursue careers in science and engineering.

Student teaching at Worcester Tech had a great impact on my personal growth. For the first time in my life, I was on the other side of the academic setting. Taking the position of a teacher was very challenging, but very rewarding. I underestimated the responsibility and work that is required of a teacher. It is very arduous to be aware of all the students in the different classes, being on top of all the paperwork, lesson planning, and grading. All the time in your day was dedicated to providing the students with the education that they deserved. And this drove me to work tirelessly. During this experience, it was the first time in my life that I saw myself as an adult rather than a child. I no longer was dependent on other adults. Rather, the other teachers treated me as their equal. At first, it was hard for me to acknowledge my position as a responsible adult, and it was weird to interact with the other educators. I still had that view of myself as a student. I grew to become the teacher and adult that I had foreseen for me. I was responsible for the education of 70 students. I was euphoric and thankful for having had the chance to meet them, and share my love for physics and chemistry with them. Interactions with students were the most rewarding part of the experience. Even if I as an educator did not reach all my students equally, having had an impact on a few students that looked up to me as a role model and dreamed of being engineers and professionals following my steps was worth all the hard work.

I think the state of Massachusetts is doing a magnificent job in training and certifying new teachers. The Candidate Assessment Performance, on which I was assessed to determine if I was ready to teach is a fantastic platform. It covers all the necessary skills that an instructor needs to cause an impact on his

students. Proficiency on the six essential elements is expected on an energetic educator. An educator that is aware of his classroom environment and all of his students as individuals creating a safe environment for learning. An instructor that tailors valuable lessons plans and creates assessments that target a diverse group of learners. A teacher that practices reflection and adjust his methods by student feedback. An educator that is involved in the professional community and is always looking to learn new ways he can impact students. All these make a statement of what makes an active educator, and the kind of teacher I was determined to be. I was proclaimed ready to teach at the end of my practicum. The only thing I would add that makes the most impact on a student is to be remembered. As a teacher, if one of student remembers you long after he or she graduated from your classroom, you did your job. When a student grows and is more mature, the student looks back and remembers you and thanks to you for what you did to make them grow. You had an impact on that student, and you can call it an accomplished mission.

If I were to start teaching immediately after graduation, having my classroom and my set of classes and students, I would create this professional goal for myself to keep improving as an educator. By the end of this, my first year as a teacher. I will strive for proficiency in all the six elements of CAP. To do this, I will work with my colleagues, learn from my students, and study to become a better educator. I will work hard to provide the best education possible to all my students. I will pay particular attention to my ELL, and special need students. The goal will be deemed achieved under the supervision of my department head. Results will be demonstrated in student engagement and positive results. If not attained, discussion with colleagues will be conducted and practice will be adjusted accordingly. I will enjoy the process, and this will be a fantastic year. I will remain thankful for the opportunity to teach.

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Appendix

A. Weekly Reflection Example

Name: Matias F. Campos A. Date: 10/01/2016

Highlights of my week: (anecdotes about my week, effective methods of discipline or teaching strategies, etc.)

This Wednesday was parents' night. Get to know your school night. It was the highlight of my week because I got to meet my student's parents and it was fun matching them to their kids based on how they look. They are very similar. It was also really nice to see that the parents were really worried and cared about their children's learning. It was also really heart filling having parents thank us for what we are doing for their children. They were so thankful for our preparation that led to us being their teachers it was a great moment. I told Jackie that we are required to go to one of this events. But if there is another one while on my practicum I would definitely go again.

Challenge of my week and what I learned about myself, learning or teaching through it: (personal concerns, pressures, ineffective methods of discipline or teaching strategies or teaching strategies, time management problems, frustrations, etc.)

The challenge of the week. Was the copy machine room. To get copies on time on Worcester Tech you need to send them to graphics with plenty of days in advance. Because I have not mastered lesson planning that much. I do not have a week in advance to send my copies there. So I use the copy machine in the morning. I am allowed to copy only 20 but I got away with copying my assignment. I also had problems one day we run out of paper. I almost freaked out because I had no plan B. Which I should have. I ended up stealing paper from the fax machine. Also I did not quite had time to staple the copies so when I gave the assignment it was a little messy. Also I was short one copy for the last page for one student. So I had to hand copy those questions in a piece of paper so she could finish the assignment. All in all, although it was challenging I learned that I have to be more precautious when doing this. I hope it does not happen again.

One goal I have for the next week:

My goal for next week is deliver great lessons. Now that I did a better job planning and writing more detailed and structured lesson plans. I also have my copies ready and did send them to graphics so it will run much more smoothly.

Self-Evaluation: (record my growth, incorporation of new ideas, goals I met, etc.)

I assisted professional development this Friday. Although Jackie recommended not coming because it was going to be boring and not very helpful. I thought it would be helpful and it was in many reasons apart from being required for the practicum. First I got to meet all the other teachers. The way school is set up has all the teachers on their classrooms all day and does not allow time to interact with each other. It was fun and interesting finally being able to interact with the other teachers. Some have worked in education longer than I am alive. Haha that made me realize how young I am. Then we had a session on differentiated learning. It was really bad in comparison to the sessions we have on seminar or

on ID3100 but at least it was interesting to see that they try and they are update teachers on new practices and terms of education. Then we had a session on how to use the schools online system. It was not very helpful to me because I do not have access to that system but it was very helpful for everybody else as the system is really handy and can be used to really benefit teaching and the students. It was nice that some students had come on the day they had off to help teachers become more comfortable with the system. Lastly we had a session on Transgender students. This was the highlight of the session. Over the summer I had a student who was gender fluid. I did not really know what that meant. Although I did not treat them any different I had never related to a person in this situation and I had no experience on how to go about it. I think they did not like me much because I did not get the pronoun thing. Also my boss was transgender and same there pronouns and really first time being in contact with a person like that. In Ecuador this topics are very taboo. Being young and open I respected it was not taboo to me but still it was sort of culture shock. How it is so calm and easy to talk about it and respect it here. The seminar was really helpful because now I understand what all this means, I learned all the correct vocabulary and how to use it. I heard firsthand the testimonies of a Transgender guy, a mother of a transgender daughter, and a transgender man that graduated from our school last year. They all talked about their transitions and how they really appreciate people that make them feel comfortable. All in all what I got from this seminar is that they are no different than any other person. The only thing that makes them different is that they were not lucky enough to be born the same sex their gender dictates. And this unluckiness has them go through some hard times as they grow up and have to face society. This is fundamental because now as a teacher I will defiantly come across with people going through this. And the only thing I can do is be respectful and supportive and make them feel safe in the classroom and in the school so that they get the high school experience and learning opportunities they deserve to have.

Journal Question of the Week: How are the learning needs of ELL and inclusion students met both in and outside of the classroom?

This is a tough question for me because in my seminar situation I have not had to deal with ELL or inclusion students. All my classes are either Honors or AP. This means I get the most capable students that are up to the challenge of learning at a faster pace. This being said being an ELL or an inclusion student would drastically prejudice their capability of being on the class and they just do not let them enroll on this classes. What I could see on my roster was that my students that now are considered the best students and most intelligent once were ELL and once were inclusion students. My roster tells me their ELL score is 5 or 6 meaning they are as fluent in English as I am being English my second language as well so I do not have to worry. And I see which students had special education on the past but no longer need it and they are ready for my class. This make me think and realize what the school does in order to have these students ready for my class. In the past they had to be ELL and maybe need more help and that they do not needed now means they did have the help necessary. So the system works and the need of both this student groups are being met even if it involves differentiated instruction to take place. It is working and because of that more students get the same opportunities as everybody else.

B. Lesson Plan Example

B.1 Late Lesson Plan

Lesson Plan Title: Momentum Unit Plan Z

Mr. Campos & Ms. Kalisz

Subject/Course: AP Physics

Unit: Momentum

Grade Level: 11th Grade

Overview and Motivation for Lesson:

Have you ever wondered what you would need to become a pool and billiards master? The answer is, you would have to study momentum. Besides from getting a lot of practice. This week we will explore momentum and how we can use it to explain more complex motion and aspects of motion that could not be represented with forces alone. We will even see that Newton actually defined his famous second law using Momentum and not mass and acceleration.

Stage 1-Desired Results	
<p>Standard(s): PS1 Matter and Its Interactions</p> <p>Enduring Understanding 3.D: A force exerted on an object can change the momentum of the object.</p> <p>Essential Knowledge 3.D.1, 3.D.2</p> <p>Enduring Understanding 4.B Interactions with other objects or systems can change the total linear momentum of a system.</p> <p>Essential Knowledge 4.B.1 – 4.B.2</p>	
<p>Understanding(s):</p> <p><i>Students will understand that . . .</i></p> <ul style="list-style-type: none"> Momentum is the vector product of mass times its velocity. 	<p>Essential Question(s):</p> <p>What would be easier to stop if they are going at the same speed? A huge truck or a toy car? Why?</p>

<ul style="list-style-type: none"> • The total amount of momentum is always conserved • Momentum is a vector quantity. Magnitude and direction important. • Collisions can be described using momentum. • Elastic collisions conserve energy whereas inelastic collisions have a loss to thermal energy. • Impulse equals the change in momentum and the time a force is applied. 	<p>If we shoot a block hanging on a string. Based on how up it goes. Could we tell how fast the bullet was going?</p> <p>Describe how you can apply your momentum knowledge on a game of pool.</p> <p>How much impulse does an egg get when it collides with the wall? How about with a bed sheet? Why one breaks and the other does not?</p> <p>When two balls collide and go different ways. Is momentum conserved? Why?</p>
<p>Content Objectives:</p> <p>Knowledge: <i>Students will know . . .</i></p> <ul style="list-style-type: none"> • Total Momentum is conserved. • Momentum $P = mv$ • Momentum units = $\text{Kg} \cdot \text{m/s}$ or N/s • Impulse $J = F/t$ • Impulse = $P_f - P_i$ • Newton's Second Law $F_{\text{net}} = P_f - P_i / t_f - t_i$ <p>Skills/Performance: <i>Students will be able to . . .</i></p> <p>Use momentum conservation to describe motion.</p> <p>Use momentum, impulse relationship to analyze forces.</p> <p>Analyze collisions and explain the vector characteristics of momentum</p> <p>Relate conservation of energy to distinguish results of elastic and inelastic collisions.</p> <p>Use momentum mathematical models to solve real life problems.</p>	<p>Language Objectives:</p> <p>ELD Level 5 <i>Students will be able to . . . in English</i></p> <ul style="list-style-type: none"> • Express their logical thinking using equations and technical terms. • Explain technical concepts. • Make different types of learning possible by varying teaching techniques • Involve students in lab activities to utilize differentiated assessment and have them learn through discovery by guiding them to the right conclusions • Separate Words in different tiers and emphasize explanation of words on tiers 2 and 3.

Key Vocabulary	
Momentum, Impulse, Vector, Collision, Elastic, Inelastic	
Stage 2-Assessment Evidence	
Performance Task(s) or Key Evidence	Other Evidence:
<ul style="list-style-type: none"> • Collision Phet Lab • Momentum homework • Egging Worcester Tech • Multiple Choice scan problems • Open response practice set • Shop Week Packet • AP practice test 	<ul style="list-style-type: none"> • Ask questions to check for understanding • Let students work in groups on the big whiteboards. Oversee they work to determine understanding, Assist as necessary. • Scan multiple choice answers with phone. Immediate feedback that can be used to tailor lesson on the spot.
Key Criteria to measure Performance Task (s) or Key Evidence	
<ul style="list-style-type: none"> • I will oversee how they perform the lab activities and listen to the conversations they have while working on it. Listen who they discuss and explain it to each other. This will show me if they really understood the topic and what I should address to the class as a whole. 	
Stage 3- Learning Plan	
Learning Activities:	
Do Now/Bell Ringer/Opener:	
Momentum in Pool and Billiards, Three ball momentum demonstration.	
Learning Activity 1:	
Egging Worcester Tech. Student will explore the relationship between impulse and momentum by egging their lovely school.	
Learning Activity 2:	

Momentum Collisions Phet Lab. Students will be guided through playing and discovering how momentum is conserved. Simulations will be very helpful as it lets students try different combinations and parameters getting instant feedback as a visual representation of the physical world.

Learning Activity 3:

Practice Problems, Open Response, Multiple Choice. Students will benefit from guided practice that will keep them ready for the AP exam. Practice makes master.

Closing

Summarize each lesson. Provide students with hints of what is coming next day. Remind them of their homework. Recommend videos for further studying. Tips for AP exam taking.

Multiple Intelligences Addressed:

- Linguistic Logical-Mathematical Musical Bodily-kinesthetic
- Spatial Interpersonal Intrapersonal Naturalistic

Student Grouping

- Whole Class Small Group Pairs Individual

Instructional Delivery Methods

- Teacher Modeling/Demonstration Lecture Discussion
- Cooperative Learning Centers Problem Solving
- Independent Projects

Accommodations

I do not have received the 504 or IEP for the AP students.

Modifications

This is my last week. So I will only have one try at this lesson. Will get them right.

Homework/Extension Activities:

Any work that is not completed on class might turn into homework accordingly.

Students are expected to study and review at home with possible video help.

Also expected to seek for help after class. Loner Homework will be sent Monday and will be due Friday, it emphasizes laws of conservation and different types of energy.

Materials and Equipment Needed:

- Paper, Crayons, pencil, computers (Library, computer lab), office supplies, as needed etc.

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

Momentum Unit Z Week Execution Plan:

Monday (12/12):

1st Period

Work, Energy, Power Test Corrections (40 min)

Test corrections are fundamental on the AP physics curriculum as it gives students time to reflect on their mistakes and be able to rectify their work by bringing peer interaction and higher order thinking achieved when retackling problems and thinking about them from another perspective. They can use their notes, talk to their peers and ask their instructors.

2nd Period

Introduction (5min):

Newton's Real Second Law. Tell students that when Newton proposed his laws in his acclaimed book "Principia Mathematica" he did not write it like we know it. But he wrote it in terms of momentum and its variation over time. Show students how to derive $F=ma$ from it. And make distinction between the two. Especially limitations of the one we have been using. Once mass is not constant. Example a rocket.

Momentum Introduction Notes (35min)

Introduction to Momentum. Definitions, units, meaning, use, and Laws of conservation. Use power point with images and animations. Clear definitions for students to take notes. A couple videos and some questions. While giving the presentation ask questions to keep students engaged and have active participation. Give them a few minutes to work on sample problems. Guide them as needed. Then solve them together.

Closure :(5min)

Stacked ball video. Good summary of momentum and integration alongside energy conservation.

<https://www.youtube.com/watch?v=2UHS883 P60>

Tuesday (12/13):

1st Period:

Introduction (5min): Today we will be going outside to explore concepts of momentum and doing some controlled vandalism at the same time. We will be throwing eggs onto our lovely school and see what physical phenomenon make them break.

Egging Worcester Tech Activity (35min).

The day before educator will make sure all the materials needed to carry out the lab are in. Including plastic bags, tape, bed sheet, eggs and anything else that might be needed is ready to go to avoid losing time while doing the practice.

Take students outside to the special location selected by Ms. Kaliz. Have plastic trash bags taped on the wall to protect the wall from getting dirty. Two students will get to throw eggs to the wall, and three students will throw them to the bed sheet. Student will get the privilege if they answer Physics Trivia correctly.

Students will have close observation and will record any data they might think would be relevant for their calculations. We will gather all the materials and clean up any mess left behind and we will go back upstairs to the classroom.

On the classroom students will be guided through a series of conclusion questions and prompts that will help them develop critical thinking skills concerning impulse and momentum. It will be a great introduction to the subject as it will consolidate concepts before we go onto collisions.

If students do not finish it will be homework due tomorrow Wednesday on first period.

Closure (5min):

Wrap up and head over to computer lab to do school mandated activity.

2nd Period:

NO CLASS HOUR OF CODE ACTIVITY**Wednesday (12/14):**

Introduction (5min):

Collisions Lab (70min):

Students will be guided through playing and discovering how Collisions can be analyzed using physics. Students will apply concepts of Conservation of Momentum, Impulse, and Elastic or Inelastic collisions. Simulations will be very helpful as it lets students try different combinations and parameters getting instant feedback as a visual representation of the physical world. Student will benefit on looking at the screen and be able to determine what would happen if the scenario were happening with different mass objects, different speed, different velocities. Students will benefit the most thanks to the simulation ability to represent several physical magnitudes in the

form of vectors or graphics that help develop a better understanding of the matter. Being able to observe how energy transforms and momentum is conserved specially while considering the directional properties this conservation law. Educator will oversee the lab practice aiding as necessary. Helping all the students bring the simulation up and answering any questions students might have. Educator will make sure everyone stays on task and do not wander on the internet. Students will be tasked to analyze elastic collisions between objects of same mass. Then they will be asked to analyze collision of objects of different mass. And finally they will analyze collisions of inelastic character. Students will reach conclusions and higher level thinking on conclusion questions at the end of each section and will truly benefit from the lab asking them to perform a hypothesis before they actually play with the simulation. Lab is due the end of the second period. All papers should be collected at the bell.

Closure (Group conclusion and dialogue) (5min)

Thursday (12/15):

1st Period:

Introduction: The Physics behind Pool: Momentum (5min)

Open Response Problems (35min). Work on groups of three on whiteboards. Problems from AP1 Workbook and AP Physics Practice Test. A couple sample response problems will be printed on a handout that will be given to each group of students. Students will be given time to work together and tackle the problem. Educator will circle around the class and provide assistance as needed while gaging student understanding by looking at their work. Listening to their discussions and asking questions. When time has been met or educator sees progress has stagnated and he has to make a remark. He brings the class together and work through the problem together. Explaining what he saw and where people went awry.

2nd Period:

Multiple choice question review with scanning app as formative assessment (35min) technique. Immediate feedback will be used to accommodate accordingly to student's needs. Spend more time of topics that students might be confused about and spend less time explaining topics already understood. Problems from AP1 Workbook and AP Physics Practice Test and will be added to the app beforehand so it is ready to go.

Students will each get a scan able card that they will use to answer the questions. Educator will display the question on the board. And students will have 2 to 3 minutes to answer the question and hold their card up. Instructor will go around the room scanning each student's response while looking at the screen to see how gets it right or wrong. Once everybody answered educator will display the bar graph results and talk about the trend. Later he will display the correct answer. He will then explain why according to student response. If most students got it right explain quickly why they were correct and explain why some other options were possible but not necessarily correct. If most people got it wrong explain thoroughly why it was incorrect and why the other option was the correct answer. Note specially what concept error that could have thrown students off. At the end. Educator will analyze the tabulated data for the class and for each individual student to gage their understanding on the subject matter.

Closure: (5min)

Exam taking tips but your truly instructor. How to tackle multiple choice questions. Different techniques and tips. Discard what you are sure is wrong. If there are two you are not sure about pick one. Statics are on your side.

Friday (12/16):

Test Day (80min):

Students will be tacking an AP like simulation of the test. They will be tested only in problems concerning Momentum but previous knowledge about kinematics and forces is expected to be able to solve the problems.

Educator will run the test taking and proctoring. He will hand out the tests and let students know that this should remain clear as they are going to be recycled to be used in later years. Students will answer on a separate piece of paper. Making an answer sheet for multiple choice and expanding on open response problems. Educator will make sure everybody has a calculator and an equation sheet.

Students will have the complete first period to work on the multiple choice section. They will be allowed to go on break before taking the next part. Students will be timed for the open response section accordingly (30 min) during the second period. Educator will collect the written tests, the test format, and the equation sheets and reclaim calculators. Tests should be corrected by next academic Monday.

Simple Harmonic Motion Shop Week work will be handed out.

B.2 Laboratory Practice Lesson Plan

Periodic Trends Lab Lesson Plan

Matias F. Campos A.

The day before Class educator will make sure the lab is ready for the laboratory assignment and will do all the preparation work and laboratory setup is done so as soon as the students come to the lab they can start working.

Before Class starts educator will organize paperwork and get everything ready for the laboratory practice. During Announcements and as students walk in educator will take attendance.

Do Now:

Element Quiz #3. As soon as the announcements end Educator will salute the class and hand back the graded element quiz so the students use the same sheet of paper for the third quiz. 10 element names or symbols will be projected on the board. 5 minutes after he will collect the quiz. Whole process should take around ten minutes.

Motivation:

This will be our first lab assignment of the year and we will see how all we have talked about during this week's actually takes place in the real life. As we will be mixing some chemicals and analyzing their reactions based on our knowledge about the periodic table and the elements. At the same time it will serve as an introduction to later topics to be discussed during the years. As it is molecules and bonding and acids and bases.

Objective:

Students will be able to employ different laboratory procedures in order to experiment and analyze the characteristics of different elements and find their similarities and differences based on their knowledge of periods, families and periodic trends.

Development of the Lesson:

At all-time instructor will be watching over and making sure safe and correct work and lab procedures are followed.

- 1. Do now: (10min)**
 - a. Daily Element Quiz #3. Students will take their third daily quiz on element names and symbols
- 2. Translation to the Chemistry Lab (2min)**
 - a. Instructor will prompt the students to gather their things and follow him to the chemistry lab.
- 3. Laboratory Guidelines and safety procedures(15min)**
 - a. Students are to be seated on the desks until getting further instructions to be allowed to approach the lab equipment.
 - b. Instructor will give a brief introduction to the lab and how it relates to the topics that have been covered since the start of the year.
 - c. Students will be warned that during the lab they will be handling dangerous substances. And that safety rules are to be followed at all moments to maintain everybody's safety. If every body works with proper care lab will be enjoyable and there will not be accidents.
 - d. Students will be separated in 6 groups. Four of three and two of four. Each student will be required to wear goggles and an apron before they go to their lab station.
 - e. Instructor will explain everything they have on their stations. Very quickly.
- 4. Part 1(15min)**
 - a. Instructor will give guidelines for part one. Students should listen first and then proceed to do the experiment.
 - b. Students will fill a beaker with tap water.
 - c. With the help of pipets they will fill to smaller beakers with 20ml of water each.
 - d. Students will add three drops of indicator to each small beaker.
 - e. Students will drop a strip of magnesium on the first one and a lump of calcium on the second one carefully.
 - f. Students should take note of their observations. Most importantly reaction time and outcome of the reaction. Fill the chart on their lab worksheets.
 - g. With the help of the instructor they will place the magnesium beaker on a hot plate and leave it there while the lab proceeds
 - h. Ask the students to place the calcium beaker on the second sink on their stations
- 5. Break.** Students can leave for the bathroom and be back in 4 minutes to keep working on parts 2 and 3.
- 6. Part 2 (15min)**
 - i. Instructor will give guidelines Instructor will give guidelines for part one. Students should listen first and then proceed to do the experiment. Specially mention that the products from this reactions can burn their skin like an acid would.

- a. Students will add 5ml of water onto each of the Hydroxide test tubes and the control water test tube that have been preset by the instructor. Using a pipet and water from the big beaker.
- b. Students will add 2 drops of indicator onto the solution.
- c. Student will cap the test tube with a rubber stopper and give it a slight shake. Being really careful not to spill the solution.
- d. Let the test tubes sit for two minutes and then take note of their observations. Specially color change on the solutions.

7. Part 3 (15min)

- a. Educator will give guidelines and prompt everybody to listen first and then experiment. Specially because acids and fire will be involved and you will need your instructors help to perform this part of the lab.
- b. Instructor will go group by group filling three test tubes with HCl. Really dangerous substance being an acid that can burn skin so it should not handle by the students just let the test tub sit on the test tube holder.
- c. Once you have your HCl samples drop a pellet of Al, a lump of Si and a strip of Mg onto each tube. Be quick to make observations.
- d. Instructor will then walk around lighting a toothpick for the students to see that the gas that is produces is Hydrogen.
- e. Take note of your observations. Reactivity of each metal.

8. Conclusion Questions(8min)

- a. Have students answer conclusion questions on their laboratory handout.
- b. If they do not finish due to lack of time. Conclusion questions will be Homework for the next day. Anyway students should have all the observation and started working on their conclusions.

9. Closure(3min)

- a. See summary below
- b. Remind them there is a short quiz on element trends the next day as well as the last element name quiz. Thank everyone and wish them a good day.
- c. As they leave they should return their safety equipment.

Material of Instructions

Test tubes, beakers, test tube holder, forceps, petri dish, HCl, Na(OH), Ca(OH)₂, Ba(OH)₂, Ca, Si, Al, Mg, H₂O, pipet, Indicator

Summary

Briefly talk about the findings we had during the lab and make sure they realize that what happened was strictly related to what we talk in class and how all we learn actually happens in real life, real chemistry. How we can see elements from the same families behaving the same and having similar characteristics while still following the periodic trends.

Homework

If students do not finish the laboratory assignment conclusion questions they will be homework due the next day. Periodic trend analysis of observations during the lab. Relationship between the different elements according to their periods and families. And its correspondence to periodic trends

B.3 Early Lesson Plan

Lesson Plan Title: Density

Mr. Campos & Ms. Kalisz

Subject/Course: Honors Chemistry

Unit: Properties of Matter

Grade Level: 10th Grade

Overview of and Motivation for Lesson:

Motivation Tell them About the Current Scientific Efforts to understand the subatomic Particles and how it correlates to the understanding of the atomic model in the past.

Stage 1-Desired Results	
Standard(s): PS1 Matter and Its Interactions <ul style="list-style-type: none"> HS-PS 2-1, 2-2 	
Understanding(s): <i>Students will understand that . . .</i> <ul style="list-style-type: none"> The Atom is the base unit of matter and in order to describe it several scientist contributed thought history to give us the current atomic model. 	Essential Question(s): What is the current Atomic Model? How did scientists get to this model? What were the experiments they conducted in order to find out this atomic structure?
Content Objectives: Knowledge: <i>Students will know . . .</i> <ul style="list-style-type: none"> Atom is the base unit of matter It is composed of protons, neutrons, and electrons. There are Ions and Isotopes The evolution the atomic model had through history. The most important scientists and their contribution to the atomic model. Skills/Performance: <i>Students will be able to . . .</i> <ul style="list-style-type: none"> Describe the Atomic Model 	Language Objectives: ELD Level 5 <i>Students will be able to . . . in English</i> <ul style="list-style-type: none"> Express their logical thinking using equations and technical terms. Explain technical concepts. Make different types of learning possible by varying teaching techniques Explain very complex experiments with lots of physics background in simpler terms, their own language even though they do not understand everything that is going on.

<ul style="list-style-type: none"> • Elaborate a timeline with the most important scientist and contributions to the atomic model. • Identify Ions and Isotopes • Find an element's atomic mass 	
Key Vocabulary Density, Intensive/Extensive Property,	
Stage 2-Assessment Evidence	
Performance Task(s) or Key Evidence <ul style="list-style-type: none"> • Project Scientist Timeline • Study Guide Packet Atomic Model • Isotopes and Ions Homework 	Other Evidence: <ul style="list-style-type: none"> • Ask questions to check for understanding
Key Criteria to measure Performance Task (s) or Key Evidence <ul style="list-style-type: none"> • I will oversee their timeline creation to determine if they are attaining the desired research skills and are understanding how the atomic model evolved through history. Check if they understand how science is based on what is believed correct but could change if a better description is found. 	
Stage 3- Learning Plan	
Learning Activities: Do Now/Bell Ringer/Opener: None Learning Activity 1: Scientist Contributions the Atomic Model Timeline Learning Activity 2: Atomic Structure Study Guide Closing	

'Eureka!' – The Story of Archimedes and the Golden Crown	
Multiple Intelligences Addressed:	
<input type="checkbox"/> Linguistic	<input checked="" type="checkbox"/> Logical-Mathematical
<input checked="" type="checkbox"/> Spatial	<input checked="" type="checkbox"/> Interpersonal
<input type="checkbox"/> Musical	<input checked="" type="checkbox"/> Bodily-kinesthetic
<input type="checkbox"/> Intrapersonal	<input type="checkbox"/> Naturalistic
Student Grouping	
<input checked="" type="checkbox"/> Whole Class	<input checked="" type="checkbox"/> Small Group
<input type="checkbox"/> Pairs	<input checked="" type="checkbox"/> Individual
Instructional Delivery Methods	
<input checked="" type="checkbox"/> Teacher Modeling/Demonstration	<input type="checkbox"/> Lecture
<input type="checkbox"/> Discussion	
<input checked="" type="checkbox"/> Cooperative Learning	<input type="checkbox"/> Centers
<input checked="" type="checkbox"/> Problem Solving	
<input checked="" type="checkbox"/> Independent Projects	
Accommodations	Modifications
Edison Slight Hearing Disability. Sit Near the front, Make sure he got the instructions	See how it goes first week and make note of all the shortcoming so they can be avoided or improved on week two.
Vincent Protein Assimilation problem. Might affect concentration. Allowed to have and drink especial shake.	
Homework/Extension Activities:	
Scientist and their contribution to the Atomic Model Timeline	
Materials and Equipment Needed:	
<ul style="list-style-type: none"> Paper, Crayons, pencil, computers (Library, computer lab), office supplies, etc. 	

Adapted from Grant Wiggins and Jay McTighe-*Understanding by Design*

Execution Plan:

Arrive Early to prepare lab material, take attendance, collect homework, etc.

Density (Lecture): What is density, definition, formula, units, How to determine Density, mass, volume, how to measure mass and volume? How to solve a math problem Sample Problems. Follow on Board. Normal object Rock and Ping Pong Ball followed by Planets Earth and Jupiter

Mini Lab: Divide the Class into 7 groups. Give each group objects of the same material. Have them calculate Density and report their found values to the class by writing it on the board. Analyze the data with the class when everybody has written their value.

Conclusion: Tell Archimedes and the Gold Crown story.

Density Worksheet: Handout density exercise worksheet to work on during class if they do not finish they will be taking it as homework.

C. Student Feedback Survey Analysis Example

The screenshot shows an Excel spreadsheet titled "CAP Student Feedback Survey Book - Excel". The spreadsheet contains a survey analysis for "AP Physics A-Week". The columns represent questions (I to XX) and the rows represent individual students (1 to 20). Each cell contains a numerical score, color-coded from red (low) to green (high). The right side of the spreadsheet shows summary statistics: "AVG" (Average) and "Result" (Question/Written). Below the survey data, there is a "Comments" section with 20 numbered entries, each corresponding to a student's feedback.

D. Student Survey Comment Section Transcript

Comments:

When a student does not understand the lesson, try rephrasing it or connecting it to something the student likes instead of repeating the lesson.

When you do notes, can you go a little slower please?

Go more into detail about the lesson, spend more time explaining slide on notes.

Sometimes note taking goes a little fast

I feel like you should slow down when teaching because when we are taking note of one of the slides you quickly move on and we do not get to finish writing. But overall I liked having you as a teacher.

It is really cold in the room like really cold.

Great teacher, but goes really quick

Most of the time I really do not understand, but I still ask question, and his answers are helpful

We should do more labs and more practice work on the topic in what we learn.

More hands on activities, maybe some more projects too. There is too much note taking and it is hard to retain a lot for the information. Also do more interactive stuff that will help us to learn. Maybe some more videos to help as well. Slow it down a bit on the power points too.

I think that Mr. Campos goes a little too fast and note taking and that if he went slower it would be good.

Sometimes the way you say things, makes it more confusing than it ends up being. You also have to speak up. Try to explain the lesson more just so sometimes it is not confusing.

Goes to fast sometimes

Most times when learning I grasp things quickly, but in this class specifically I have a really hard time understanding.

Great teaching skills, try and make it so that students feel more comfortable approaching you with problems.

Comments:

He is very nice, and he works hard to make sure the class understands the material

Please be clearer when explaining things. (Go into more detail) and give us more examples.

Good teacher, very helpful when answering questions or help to understand

Goes too fast when he discusses notes

He is a good teacher but he gets confusing sometimes. Also he is hard to understand when he talks.

Maybe be clearer and make sure we get what we are learning instead of just going to the next topic.

Good work so far!

Stop being so nervous

Mr. Campos is a great teacher. But I would like him to teach more thoroughly.

Grading classwork based on correct might be hard for students who need more time on the work and badly affect their grade.

Mr. Campos is a very nice teacher but can sometimes be difficult to understand and should attempt to teach in ways other than notetaking and power points.

When doing problems on board can you do them slower

He is very good at explaining things one may not understand, and will make sure that they understand

Possibly going over homework problems more often, or similar problems. Also seeing how to do more AP problems because the ones done on the board are not nearly as challenging

Doing really good, can control class easily, likes to have fun.

Mr. Campos is a great teacher, however sometimes he works a bit too fast and all over the place which can get confusing. Other than that though he does amazing.

On the more complex topics it would be best to slow down the lesson and use different words, if the students still do not understand.

Mr. Campos is a really good teacher but sometimes he goes a little too fast and I get confused

I like that when we ask you a question, you don't tell us the answer but instead guide us on the right path to the answer. It challenges me to go beyond my limits.

Mr. Campos know how to apply the theory to real life scenarios of occupations, making it more interesting. Also, he challenges us intellectually to think differently.

Be neater on the board, speak to the class rather than the board and stop skipping slides on PowerPoints that quickly.

Sometimes when you explain things you use different variables than we are taught which makes me confused sometimes.

A kind sort. Although he can be a bit more expressive, he is not afraid to leave unseen aspects

mentioned, and if there is something that does not produce expected results based on what we have learned, he says there is something else to see in it. Overall, I say he can really be a great teacher.

Makes small mistakes that can make the problem confusing, works a little fast, sometimes hard to understand

I understand more when you directly teach me

There is nothing wrong with his method of teaching he just needs to slow down a little when explaining.

E. Chemistry Lab Handout Example

Periodic Trends Lab

Name:

Date:

Week:

Please follow safety lab procedures and listen to your instructor at all time. This lab deals with potentially dangerous substances. Being careful is the best way to avoid accidents. Be safe and have fun.

Part I: Rates of Reaction Mg & Ca with Water

1. Take two beakers and put about 20mL of distilled water in each with 3 drops of universal indicator. Take a small piece of Mg ribbon and clean it with steel wool. Obtain a piece of calcium. At the same time, put the Mg and Ca into the separate beakers. Compare the rates of reaction and the color of the indicator after the reaction. Record your observation. Add heat (using a hot plate) to the beaker where the Mg and water are reacting. Leave for a couple minutes and record your observations.

Part II: Comparison of Ca, Na, and Ba Hydroxides

1. Put 5mL of distilled water and 2 drops of universal indicator in each of three prepared test tubes containing a hydroxide (Na(OH) , Ca(OH)_2 , Ba(OH)_2) and the control water test tube. Using clean corks, stopper the test tubes and gently shake all four test tubes.

2. Leave for 2 minutes and then compare the color of the indicators for the three hydroxide solutions. Record your results.

Part III: Rate of Reaction Mg, Al, Si with Acids

1. Obtain 3 clean test tubes of the same size and place in the test tube rack. Let your instructor fill each test tube about 3cm deep with 6.0M hydrochloric acid (HCl).

- Put a piece of Mg about 2cm long into the first test tube. Note the reaction rate and whether or not heat is produced. As this reaction is taking place.
- Let your instructor test for hydrogen gas by inserting a burning wood splint into the upper part of the inverted test tube. Record your observations.
- Repeat steps 2 and 3 using a pellet of aluminum. Note the reaction rate, and heat evolved, and if there is hydrogen gas. Record these results.
- Repeat steps 2 and 3 using a small piece of silicon. Note the reaction rate, and heat evolved, and if there is hydrogen gas. Record these results. Compare the reaction rates of the Mg, Al, and Si.

DATA: (10 pts)

1. Which reacted most rapidly with water: Ca or Mg? _____

Part I

	pH of pure water	pH after metal is added	pH after metal in heated water	pH change from pure water
Mg				
Ca			X	

2. Based on this lab, name two ways in which the elements Mg and Ca react in a similar way.

3. What difference did you note in the reaction of the Mg and Ca?

Part II.

	Original color	Color after adding hydroxide	Original pH	pH after adding hydroxide	Rank Basicity (1st, 2nd, 3rd)
Na(OH)					
Ca(OH)₂					
Ba(OH)₂					

Part III

	Fastest to slowest reaction	Hydrogen gas evolved?	Heat evolved?
Mg			
Al			

Si			
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ANALYSIS:

1																	18
1 H 1.008																	2 He 4.0026
3 Li 6.94	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.97	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.95	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 * #	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 #	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (266)	110 Ds (267)	111 Rg (268)	112 Cn (269)	113 Nh (270)	114 Fl (271)	115 Mc (272)	116 Lv (273)	117 Ts (274)	118 Og (276)
		* Lanthanide series															
		57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97	
		# Actinide series															
		89 Ac (227)	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)	

1. On the diagram to the left, draw two arrows (one for periods and one for groups) indicating increasing reaction rates of metals

2. Of Na, Mg, K, and Ca, which of these four elements would you **predict** will have the fastest rate of reaction? **Why?**

3. Name two properties that we associate with very active metals. Use examples from this lab

A)

B)

4. What general property of metals does the reaction of Mg, Al, and Si in part III illustrate?

5. The periodic table has often been called "the great organizer". Justify this statement with three experimental facts from this laboratory.

A)

B)

C)

6. Silicon has properties that are different from Mg and Al. Explain how the periodic table would help us predict this. (2 pts)

F. Project Example

Write a Chemical Reactions Rap/Song/Poem Project:

Goals:

- Students will be introduced to the topic of chemical reactions, recognizing and verbalizing its various types and importance on our daily life.
- Students will communicate their research in a clear and organized manner by "rapping", singing or reading their rap/song/poem to the class.
- Students will have the opportunity to develop their public performing skills.
- Students will clarify their new ideas about chemical reactions and previous knowledge of atomic and compound structure using music and art.

Assignment:

- Students will work together in groups of two.
- Students will be tasked to conduct research concerning chemical reactions.
- Topics to be included on your research
 - The 6 different types of chemical reactions. Synthesis, Decomposition, Single Replacement, Double Replacement, Combustion, and Acid-Base.
 - Chemical Equation Balancing and Conservation of Mass.
 - Use of chemical reactions in our daily life.
 - How chemical reactions shaped our world.
- Students will create a Rap/Song/Poem based on their research. Depending on which each group selects to create. Follow the specialized guidelines on the back of this paper.
- Students will also be required to create a cover album/book cover to go along with their record/writing. Cover will have a creative graphic representation that will advertise the rap/song/poem is about. It should include a Title, Artist name, slogan, and meaningful artwork.
- Students will present their project to the class further developing their public performance skills of Friday second period.

Timeline:

Tuesday: 1st Period: Guidelines will be discussed. Rubrics will be handed out. Partners will brainstorm, decide what they are going to create rap/song/poem and create and outline of what they are going to research and write about.

Wednesday: 2nd Period: We will go to computer lab to work on research. Take note of all the required topics and start thinking on how you are going to apply them to your rap/song/poem.

Thursday: 1st Period: Finish with research if you have not done so yet. Think and discuss with your partner about how you are going to use the information to write your project and develop your album cover/book cover. 2nd Period: Start working on creating your song/rap/poem and your album cover/book cover. You can use any tools or materials.

Friday: 1st Period: Finish your song/rap/poem and your album cover/ book cover. Go over last minute details and talk to you partner about how you are going to present. Practice your presentation. 2nd Period: Each group will present their rap/song/poem to the class. Groups will show and explain their cover album and sing/read their rap/song/poem.

Grading:

Your grade will be based upon 5 different categories, 10 points per category, totaling to 50 points.

1. Creativity: is the project creative, colorful and show signs of sincere effort?
2. Accuracy of Knowledge: are the descriptions of the terms, facts, concepts, etc. correct?
3. Depth of Knowledge: are the concepts explained clearly, in detail, and in your own words? I can't stress enough that you need to put things in your own words, not just rearrange the way your source presents the information.
4. Research: are a minimum of 3 valid sources included on the back of the project, all in proper MLA format*. If you use more than 3 sources, you MUST cite every source.
5. Presentation: if the project is being presented in front of the class, are all group members participating in the speech and is that speech organized and clear? If the project is not being presented, are the group members participating equally in all phases of creating the project and is the presentation logical and legible?

*MLA format: when you look up your sources, copy the web address, and paste it into the "cite it" box on the website www.easybib.com. This will automatically create a properly formatted MLA Works Cited page. You can copy the Works Cited that the website generates on a piece of paper and tape it to the back of your project or simply write it on the back of your project. If you end up with "n.p. n.d." you probably did something wrong. Please ask if you have questions on how to properly make a works cited page.

Finding valid sources:

- Google is not a source. It's a search engine which can provide you with valid and invalid sources – you can use google to look up scientists, images, etc., but then you have to click on the image or website and use that page instead.
- Wikipedia is not a valid source. It is a good place to start your research, however. If you look up the law and scroll to the bottom of that law's Wikipedia page, you will find a bibliography with links to a variety of potentially valid sources.
- Things you want to look for: any webpage that ends in .edu or .gov and some .org websites
- Pages you want to stay away from:
 - .com websites – this means it's a commercial page, trying to make money or sell something. These websites are usually very biased, but some exceptions are available
 - Any sort of blog or Q&A where random people are answering questions.

Project Specific Guidelines

Rap:

Rap/Song will follow the structure: Intro, Verse, Chorus, Verse, Chorus, Verse, Chorus, Verse, Middle 8, Chorus, and Outro. Each section in a rap is written in sets of couplets. Couplets are made up of two lines that rhyme with each other. A set is made out of two couplets. Your project should include no less than eight couplets. The chorus counts as one couplet. If you have any doubt ask Mr. Campos

Example:

I like basketball I think it's neat
It makes me walk to a different beat
Dribble the ball down the court
I think I am playing the right sport

Anonymous Basketball enthusiast

Poem:

For poem you will be required to write a sonnet. A sonnet follows the structure of two quatrains and one sestet. They are groups of lines that rhyme in pairs. Your project should be no less than two sonnets in length. No less than 4 quatrains and two Sestets. If you have any doubt ask Mr. Campos

Example:

When in the chronicle of wasted time
I see descriptions of the fairest wights,
And beauty making beautiful old rhyme
In praise of ladies dead, and lovely knights,

Shakespeare, Sonnet 106

Song:

For song you will be required to make an AABA verse form song. It should follow a similar structure to the rap. But you have more freedom in terms of number of lines per verse and rhyme. Also you have more building blocks available.

If you have any question refer to Mr. Campos or to: <http://www.songstuff.com/song-writing/article/aaba-song-form/>

Your song should be no less than 32 lines. Chorus and refrains will only count once.

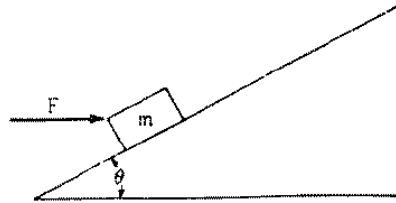
Example:

Blackbird singing in the dead of night
Take these broken wings and learn to fly
All your life
You were only waiting for this moment to arise.

Black Bird, The Beatles

G. Sample Practice Problems Worksheet

AP Physics Incline Plane Open Response Practice Problems

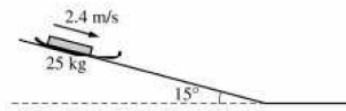


1981M1. A block of mass m , acted on by a force of magnitude F directed horizontally to the right as shown above, slides up an inclined plane that makes an angle θ with the horizontal. The coefficient of sliding friction between the block and the plane is μ .

- a. On the diagram of the block below, draw and label all the forces that act on the block as it slides up the plane.



- b. Develop an expression in terms of m , θ , F , μ , and g , for the block's acceleration up the plane.
 c. Develop an expression for the magnitude of the force F that will allow the block to slide up the plane with constant velocity. What relation must θ and μ satisfy in order for this solution to be physically meaningful?



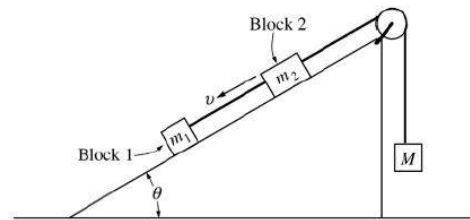
B2007B1. An empty sled of mass 25 kg slides down a muddy hill with a constant speed of 2.4 m/s. The slope of the hill is inclined at an angle of 15° with the horizontal as shown in the figure above.

- Calculate the time it takes the sled to go 21 m down the slope.
- On the dot below that represents the sled, draw/label a free-body diagram for the sled as it slides down the slope



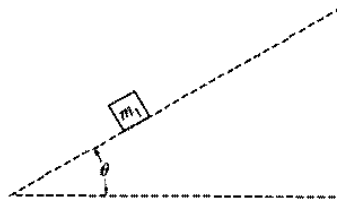
- Calculate the frictional force on the sled as it slides down the slope.
- Calculate the coefficient of friction between the sled and the muddy surface of the slope.
- The sled reaches the bottom of the slope and continues on the horizontal ground. Assume the same coefficient of friction.
 - In terms of velocity and acceleration, describe the motion of the sled as it travels on the horizontal ground.
 - On the axes below, sketch a graph of speed v versus time t for the sled. Include both the sled's travel down the slope and across the horizontal ground. Clearly indicate with the symbol t_f the time at which the sled leaves the slope.





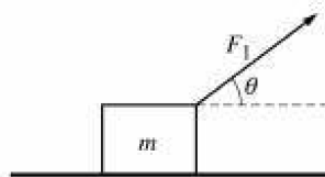
2000B2. Blocks 1 and 2 of masses m_1 and m_2 , respectively, are connected by a light string, as shown above. These blocks are further connected to a block of mass M by another light string that passes over a pulley of negligible mass and friction. Blocks 1 and 2 move with a constant velocity v down the inclined plane, which makes an angle θ with the horizontal. The kinetic frictional force on block 1 is f and that on block 2 is $2f$.

- a. On the figure below, draw and label all the forces on block m_1 .



Express your answers to each of the following in terms of m_1 , m_2 , g , θ , and f .

- b. Determine the coefficient of kinetic friction between the inclined plane and block 1.
 c. Determine the value of the suspended mass M that allows blocks 1 and 2 to move with constant velocity down the plane.
 d. The string between blocks 1 and 2 is now cut. Determine the acceleration of block 1 while it is on the inclined plane.

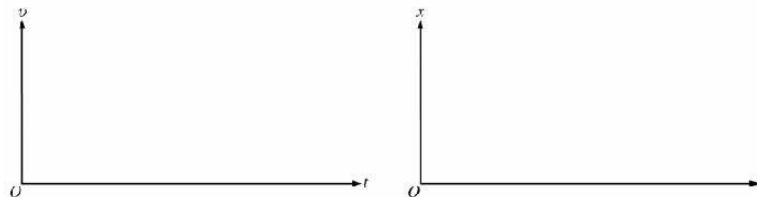


2007M1. A block of mass m is pulled along a rough horizontal surface by a constant applied force of magnitude F_1 that acts at an angle θ to the horizontal, as indicated above. The acceleration of the block is a_1 . Express all algebraic answers in terms of m , F_1 , θ , a_1 , and fundamental constants.

- a. On the figure below, draw and label a free-body diagram showing all the forces on the block.



- b. Derive an expression for the normal force exerted by the surface on the block.
 c. Derive an expression for the coefficient of kinetic friction μ between the block and the surface.
 d. On the axes below, sketch graphs of the speed v and displacement x of the block as functions of time t if the block started from rest at $x = 0$ and $t = 0$.



- e. If the applied force is large enough, the block will lose contact with the surface. Derive an expression for the magnitude of the greatest acceleration a_{\max} that the block can have and still maintain contact with the ground.

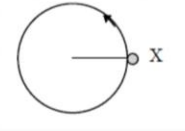
H. Plickers Examples (Multiple Choice Practice)

plickers Library Reports Classes Live View Cards Help J. KALISZ

[Back to Question History](#)

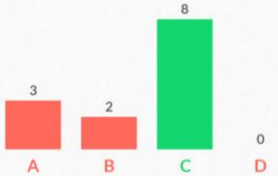
AP Physics Z Week 11/17/16 12:51 PM

A clay ball is travelling in a horizontal circle at the end of a string as shown below. If string is cut at point X, which arrow shows the direction the clay ball will go?



A. Right
B. Left
C. Up
D. North West

Correct: 62%
Total: 13/13



Answer	Card #	First name	Last name
A			
B			
C			
D			

plickers Library Reports Classes Live View Cards bill 0 of 0


[Back to Question History](#)

Honors Chemistry A Week 12/8/16 7:31 AM

Who tells the best chemistry jokes?

A. Bill Nye the Science Guy
B. Hank Green (Crash Course Chem)
C. Mr. Campos
D. Dmitri Mendeleev

Correct: 32%
Total: 19/20



Answer	Card #	First name	Last name
A			
B			
C			
D			

I. Sample Test

Name: _____ Date: _____

Molecular Geometry Test

Vocabulary: match the letter of each term to its appropriate definition. (2 pts each)

- a. Bond
- b. Lone pair
- c. Molecular Geometry
- d. Electron Domain/ Electron Group
- e. Bond Angle

1. _____ three-dimensional arrangement of the atoms that constitute a molecule.
2. _____ the energy holding two atoms together, formed by 2 electrons
3. _____ the region of high electron density where bonds or lone pairs exist
4. _____ the separation formed between three atoms across at least two bonds
5. _____ valence electrons that do not form bonds in covalent molecules

Short Answer: complete as thoroughly as possible, using COMPLETE SENTENCES. (5 pts each)

6. Why Molecular Shape study is called VSEPR theory? Explain.

7. When drawing Lewis Structures, why do double and sometimes triple bonds occur? Explain using the octet rule.

Lewis Structures & Molecular Geometry: for each molecule listed,

- a) Write the lewis structure (3 pts)*
- b) Determine the molecular geometry (2 pts)*

8. BeF_2

9. ICl_5

10. CO

11. PO_4^{-3}

J. Sample Physics Student Work

Name:

ek: Z

Date: 10/31/16

Friction Lab

Background:

Friction is a resistive force that works against the motion that produces it. You encounter friction every day. Without friction, cars wouldn't move, you couldn't write with a pencil, and you would have difficulty staying in your chair. In this investigation, you will study two types of friction: static friction and kinetic (sliding) friction. Static friction is present when you apply a force to an object, but the object does NOT move. Kinetic, or sliding, friction is when a force is applied to an object and it does move.

Purpose:

To measure and compare the forces of static and kinetic friction.

Equipment:

- Wood block
- 2 spring scales, one red, one brown
- Set of masses
- Piece of sandpaper

Procedure:

1. Using the brown spring scale, measure the mass of the block in kilograms and record this value in the first row of Table 1. Then calculate the weight of the block by multiplying by gravity, and record this value in Table 1.
2. Place the block on the desk and attach the brown spring scale to the hook so that the Newton side is facing upwards.
3. Gently pull on the scale until the block is on the verge of moving (but doesn't actually move). You need to keep the scale as horizontal as possible without letting the scale drag on the surface of the table. You want to find the greatest amount of force the block can resist *without* sliding. This is equal to the maximum static friction force. Record this value in Table 1.
4. Divide the friction force by the weight and record the resulting ratio as a decimal in Table 1 – round the ratio to ONE place after the decimal. Please notice that there are no units for this ratio (the Newtons cancel out).
5. Add mass to the block by setting one or multiple hooked masses on top of the block, then repeat steps 1-4 for 4 different masses. Be sure to add the mass of the block to the added mass to get the total mass in kg.

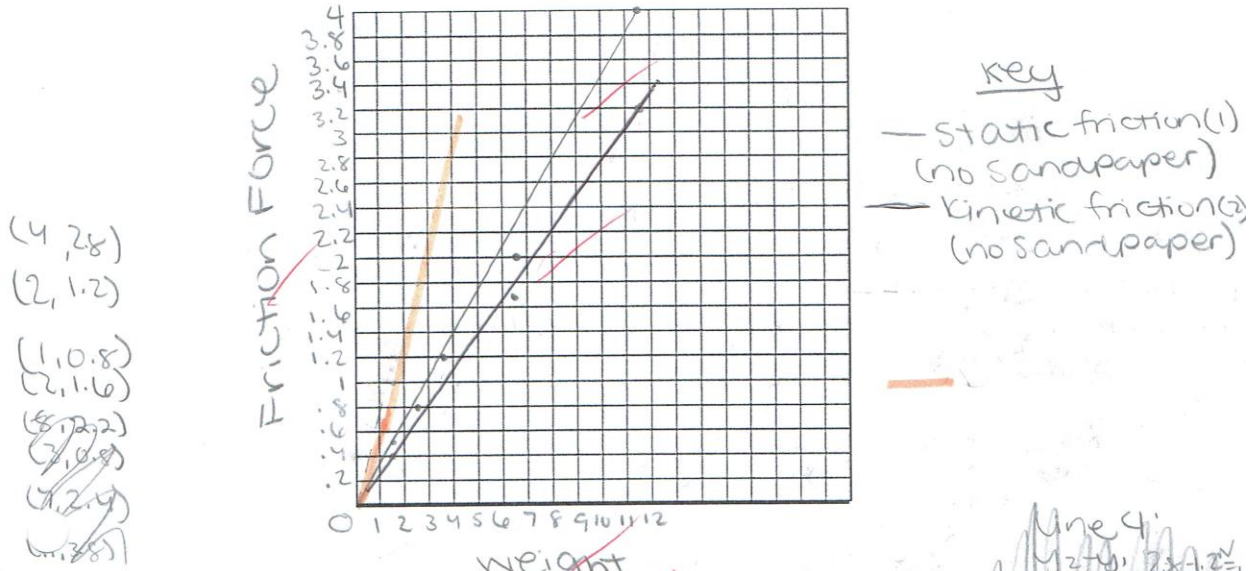
Table 1: Static Friction Data

Mass (kg)	Weight (N)	Friction Force (N)	Ratio
.15kg	1.5N	0.5N	0.3
.25kg	2.5N	0.8N	0.3
.35kg	3.5N	1.2N	0.3
.65kg	6.5N	2N	0.3
1.15kg	11.5N	4N	0.3

Analysis:

Create ONE graph of Friction Force vs. Weight. On that graph, you will graph TWO sets of data: 1st, static friction vs weight (no sandpaper), and 2nd, kinetic friction vs. weight (no sandpaper). Both sets of data must be graphed individually, be color coded & you must include a key for which set of data is which.

Friction Force vs. weight



1. Calculate the slope of EACH line. Make sure to write the formula, show your work & include units.

Line 1: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{3.8 - 2.4 \text{ N}}{11 - 7 \text{ N}} = \frac{1.4}{4} = \frac{1}{3}$

Line 2: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{2.2 - 0.8 \text{ N}}{8 - 3 \text{ N}} = \frac{1.4}{5} = \frac{1}{3.5}$

Line 3: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{0.8 - 0.8 \text{ N}}{2 - 1 \text{ N}} = \frac{0}{1} = 0$

Line 4: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{2.8 - 1.2 \text{ N}}{4 - 2 \text{ N}} = \frac{1.6}{2} = \frac{1}{3}$

2. What does the slope of a Friction vs Weight graph represent? (looking for the specific physics term)

The slope represents the coefficient of friction.

Conclusion Questions:

1. What happened to the static friction force as the weight of the pulled object increased?

The static friction force increases as the weight of the pulled object increases.

2. The ratio of the friction force to the weight of the pulled objects is called the coefficient of static friction. Was there a trend among these values? If so, what is the trend?

Yes there was a trend, they were all 0.3.

52/55

AP Physics-2
Forces Problems

10/25/16

$$1. F=MA \quad \frac{5 \text{ kg} \cdot \text{m/s}^2}{8 \text{ m/s}^2} = m_1 \quad (8 \text{ m/s}^2) \quad m_1 = 0.625 \text{ kg}$$

$$F=ma \quad \frac{5 \text{ kg} \cdot \text{m/s}^2}{24 \text{ m/s}^2} = m_2 \quad \frac{(24 \text{ m/s}^2)}{24 \text{ m/s}^2} \quad m_2 = 0.21 \text{ kg}$$

$$0.625 \text{ kg} + 0.21 \text{ kg} = 0.835 \text{ kg}$$

$$F=MA \quad \frac{5 \text{ kg} \cdot \text{m/s}^2}{0.835 \text{ kg}} = a = 5.99$$

$$(6 \text{ m/s}^2)$$

$$2. a = \frac{\Delta v}{\Delta t} = \frac{10 \text{ m/s} - 5 \text{ m/s}}{2 \text{ sec.}} = \frac{5 \text{ m/s}}{2 \text{ sec.}} = 2.5 \text{ m/s}^2$$

$$F=MA$$

$$F = 10 \text{ kg} \cdot 2.5 \text{ m/s}^2 = 25 \text{ kg} \cdot \text{m/s}^2 \quad (25 \text{ N})$$

$$3. F=MA$$

$$\frac{100 \text{ kg} \cdot \text{m/s}^2}{50 \text{ kg}} = 2 \text{ m/s}^2 = a$$

$$v = v_{0x} + at$$

$$v = 10 \text{ m/s} + 2 \text{ m/s}^2 (3 \text{ s}) \quad v = 10 \text{ m/s} + 6 \text{ m/s}$$

$$(16 \text{ m/s})$$

$$4. x = \frac{1}{2}(v_0 + v)t \rightarrow 1.5 \text{ m}^2 = \frac{1}{2}(770 \text{ m/s})t^2$$

$$\frac{3 \text{ m}}{770 \text{ m/s}} = \frac{770 \text{ m/s}}{770 \text{ m/s}} t$$

$$0.003896 \text{ s} = t$$

$$v = v_0 + at$$

$$770 \text{ m/s} = a(0.003896 \text{ s}) \quad F=MA$$

$$0.003896 \text{ s}$$

$$0.003896 \text{ s}$$

$$F = 55 \text{ kg}(197613.2427 \text{ m/s}^2)$$

$$F = 10868728.35 \text{ N}$$

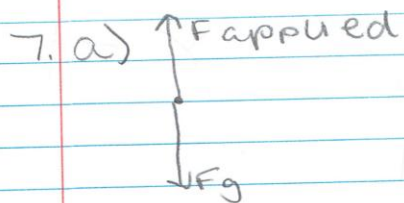
$$197613.2427 \text{ m/s}^2 = a$$

$$F = 1.09 \times 10^7 \text{ N}$$

$$d) F = MA$$

$$70\text{N} = (60\text{kg}) a$$

$$11.666\text{ m/s}^2$$



$$b) 10\text{ m/s}^2 \quad F = MA$$

$$\frac{+1\text{ m/s}^2}{11\text{ m/s}^2} \quad F = (60\text{kg})(11\text{ m/s}^2)$$

$$F = 660\text{N}$$

$$8. a) F_N = MA$$

$$F_N = (20\text{kg})(10\text{ m/s}^2) \quad F_F = (0.2)(200\text{N})$$

$$F_N = 200\text{N} \quad F_F = 40\text{N}$$

$$b) F = MA$$

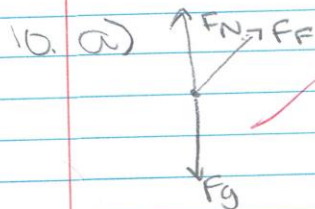
$$\frac{40\text{N}}{20\text{kg}} = \frac{20\text{kg}}{20\text{kg}} a$$

$$2\text{ m/s}^2 = a$$

$$9. F_N = MA$$

$$F_N = (2\text{kg})(10\text{ m/s}^2) \quad F_F = (0.47)(20\text{N})$$

$$F_N = 20\text{N} \quad F_F = 9.4\text{N}$$



$$b) F_N = (50\text{kg})(10\text{ m/s}^2)$$

$$F_N = 500\text{N} (\cos 35^\circ)$$

$$F_N = 409.6$$

Name: _____

Date: 10/18/16

27.5 / 30

Mass vs. Weight: Pre-Lab Questions

- Mass and weight are two different quantities. Define each and distinguish between the two.
Weight is the gravitational force exerted on an object by the Earth. Mass is the measure of an object's inertia.
- What is the smallest measurement that can be made by the red scale on the Newton side? By the brown scale?
(hint: the smallest measurement is between zero and the first mark)
Red Scale: 0.2 N
Brown Scale: 0.1 N
- What do you do if your force measurement exceeds 10 N on the brown scale?
Use the red scale instead of the brown because it goes up to 20 N.
- Graphing review: If the mass measurements range from 0.01 kg to 0.1 kg and there are 25 squares on the mass axis on the graph paper, find the proper scale to fit the spread (range) of the data. (hint: divide the range, starting from zero, by the number of squares, then round to the nearest easy counting number... something that ends in a 1, 2, 5, etc) Show your work.

$$0.1 / 25 = 0.004$$

Scale: 0.005

- If your data appears linear, you can represent this relationship with $y=mx+b$. In physics, instead of using y and x , we use what we graph on the y and x axes – independent axis (x) and dependent axis (y).
 - What does m stand for? What does b stand for?
 m stands for slope and b stands for the y -intercept which is where the line passes the y -axis.
 - How would you find m and b from a graph? Explain.

M: Take two points from the line of best fit and plug it into the $\frac{y_2 - y_1}{x_2 - x_1}$ formula and the answer is the m , which is slope.

B: plug in the slope for m and a point from the line of best fit for x and y into the formula $y = mx + b$, to find b , y -intercept.

Name _____

Date: 10/7/16

Newton's Laws & Forces

A crossword puzzle grid with the following words filled in:

- 1. FORCE
- 4. TENSION
- 6. INCLINED PLANE
- 12. WEIGHT
- 14. THIRD
- 16. COEFFICIENT
- 23. DIFFERENT
- 26. PERPENDICULAR
- 3. DYNAMICS
- 7. MASS
- 13. KINETIC
- 18. NET FORCE
- 21. OPPOSITE
- 24. ELECTROSTATIC

A green handwritten score of 130/30 is visible on the right side of the grid.

+22/30

AP-Physics-15/16-Z
Problems

10/13/16

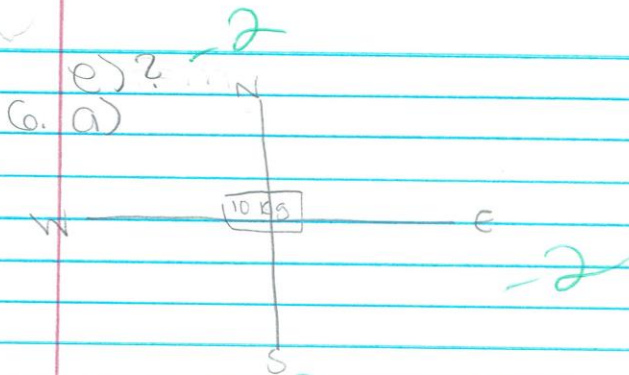
1. Newton's First Law states that objects at rest will remain at rest unless acted on by an outside unbalanced force. EX: A soccer ball will remain on the floor, unmoved, until someone kicks (unbalanced force) it, where then it would no longer be at rest.

- Newton's Second Law states that an object's acceleration depends directly on the force applied to the object and inversely to the object's mass. EX: If you use the same force to push a truck and push a car, the car will have more acceleration, because the car has less mass.

- Newton's Third Law states that for every action force, there is an equal and opposite reaction force. EX: When you sit down in a chair, your body acts on the chair with one force and the chair reacts on your body with a different force.

2. The difference between mass and weight is weight is the gravitational force exerted on the object by Earth, while mass is the measure of an object's inertia.

3. The gravitational force and gravity are not the same thing. Gravity describes an object attracted towards the Earth. Gravitational force describes the attraction between two masses.



b) ?

7. a) $F = mg$

$$F = 80 \cdot 3.66$$

$$292.8 \text{ N} \quad (109.28 \text{ kg})$$

b) $F = m g$

$$F = 80 \cdot 3.66 \quad 80.00$$

$$292.8 \text{ N} \quad -29.28$$

$$50.72$$

$$(50.72 \text{ kg})$$

20/45 + 2.5

4 Nov 2016

1. D ✗	6. C ✗	11. B ✓	16. A ✓	21. B ✗
2. B ✓	7. D ✗	12. A ✗	17. D ✓	22. BD ✓
3. D ✗	8. B ✗	13. A ✓	18. B ✗	23. BD ✗
4. A ✓	9. D ✓	14. D ✓	19. B ✓	24. BD ✗
5. C ✓	10. C ✗	15. B ✗	20. C ✗	25. BD ✗

9. Given

$$4m$$

$$m = 2g$$

$$3$$

$$q = \frac{1}{2} a t^2$$

$$q = \frac{1}{2} g q$$

$$1 = \frac{1}{2} a t^2$$

$$a = 2$$

$$T_1 - mg = ma$$

$$T_1 - 2g = 4$$

$$T_1 = 2g + 4$$

$$\uparrow F_r \quad F = b \cdot v$$

$$\downarrow F_g$$

$$b \cdot v - m \cdot g = m a$$

$$\frac{b \cdot v}{m} = \frac{m a + m g}{m}$$

A) Student 1's reasoning is correct, the first string will break first since it has to support the weight as well as the applied force.

C) Student 2's reasoning is incorrect because if the shorter string were to be on the bottom, if you were to pull it slowly, you would also be pulling the upper string, and because the upper string is supporting more weight it will snap first.

B) In this case, student 2's reasoning would be correct.

$$\sum F_x = ma$$

$$F_{\text{app}} - F_f = ma$$

$$10 \frac{\text{N}}{3} = a \text{ N} = \frac{3 \text{ kg}}{3} a$$

$$\frac{10 \text{ N}}{3 \text{ kg}} = a \text{ m/s}^2$$

$$a = 0.33 \text{ m/s}^2$$

-1

C. The Original Box would slide down first, we know $F_f = \mu F_N$ and $F_N = mg$, since the mass of the 2 box is bigger it has a much bigger normal force and because it has a much bigger normal force, the force of friction acting on the box increases. Also the coefficients of friction do not change because the blocks are identical meaning the surfaces sliding against each other are still the same, because the force of friction on the 2 box increases its acceleration would also decrease, it would take more force to move it initially as well.

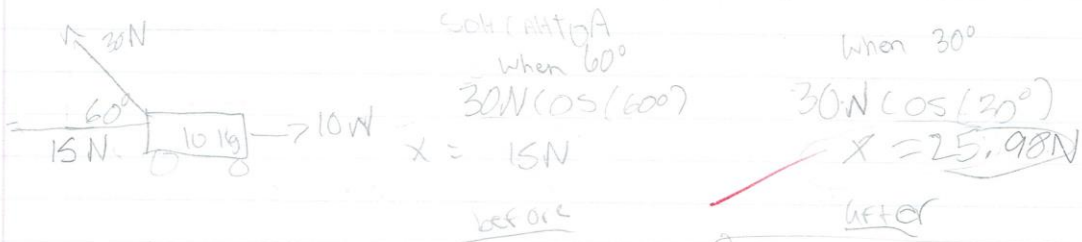
x -3

d? -3

+2

12. D If you look at the diagram, the system already had a tension force even before the performer stood on the string, thus when the performer stood on the rope, the tension would become the performer's weight in addition to the tension on the string, before he got on it.

15. A The acceleration of the cart increases.



Greater force means an increase in velocity, which means an increase in acceleration

18. A The force acting on the ball is gravity, gravity is pointing down, thus the acceleration on the ball is pointing down as well.

20. B

$$F = \frac{m \cdot a}{m}$$

$$F = 2\text{ s} = F = 4\text{ N}$$

$$\frac{F}{m} = a$$

$$\frac{4}{3} = \frac{4}{3} \text{ m/s}^2$$

K. Sample Chemistry Student Work

19/36 +7.25

Name: _____

Date: 11-18-16

Ionic & Covalent Compounds Quiz

Vocabulary: match the letter of each term with its appropriate definition. (2 pts each)

- ~~a.~~ Ionic
- ~~b.~~ Covalent
- ~~c.~~ Cation
- ~~d.~~ Anion
- ~~e.~~ Polyatomic

12. C an ion with a positive charge
13. A a compound that forms between a metal and a nonmetal
14. e an ion made up of more than one element
15. d an ion with a negative charge
16. b a compound that forms between two nonmetals

Short Answer: complete the following as thoroughly as possible. (5 pts each)

17. Explain how ionic bonds form and how covalent bonds form. Draw and label each type of bond.

Ionic bonds form when 1 or more

covalent bonds form when 1 or more

x5

18. In complete sentences, list 3 properties of ionic compounds and 3 properties of covalent compounds.

covalent compounds have a high melting point and a high boiling point, also they have the ability to be a good conductor for electricity.

Ionic compounds have a high melting point and boiling point and also can conduct electricity.

-2.5

+7.25

IONIC & COVALENT COMPOUNDS re-take

17. Ionic bonds form 2 ions
Covalent bonds form from 2 non-metals +1 *Draw and label?*

18. Covalent compounds have low melting and boiling points, soft forms and poor electrical conductivity. +1.25

19. Potassium Manganate (VII)
Ionic - +1

20. Iron (III) oxide
Ionic / +1

21. $Zn_3(PO_4)_2$
Ionic / +1

22. $CuCO_3$
Ionic / +1

A. $[AlF_6]^{3-}$ $3d^{10}$ $4s^2$ $4p^3$ ✓

B. Scandium / +1

Name _____ Per _____

Electron Configuration Practice Worksheet

In the space below, write the unabbreviated electron configurations of the following elements:

1. sodium $1s^2 2s^2 2p^6 3s^1$
2. magnesium $1s^2 2s^2 2p^6 3s^2$
3. iron $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$
4. potassium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
5. selenium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

In the space below, write the abbreviated electron configurations of the following elements:

6. cobalt $[Ar] 4s^2 3d^5$
7. silver $[Kr] 5s^2 4d^9$
8. tellurium $[Kr] 5s^2 4d^{10} 5p^4$
9. radium $[Rn] 7s^2$
10. lawrencium $[Rn] 7s^2 6f^{15}$

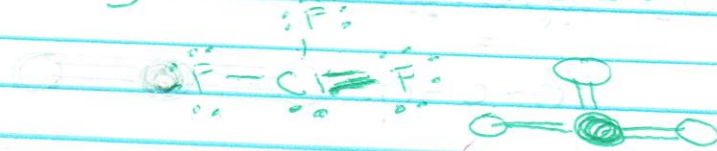
Determine what elements are denoted by the following electron configurations:

11. $1s^2 2s^2 2p^6 3s^2 3p^4$ sulfur
12. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ rubidium
13. $[Kr] 5s^2 4d^{10} 5p^3$ Antimony
14. $[Xe] 6s^2 4f^{14} 5d^6$ Iridium
15. $[Rn] 7s^2 5f^{11}$ Einsteinium

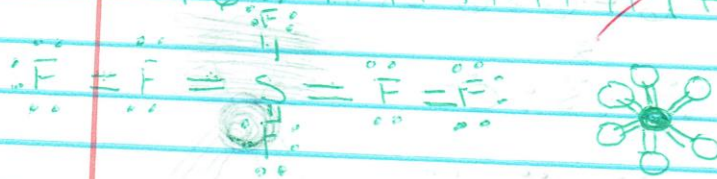
Explain what is wrong with the following electron configurations:

16. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^6$ it would have to be $3d^{10}$
17. $1s^2 2s^2 2p^6 3s^3 3d^5$ it would be $4s^2$

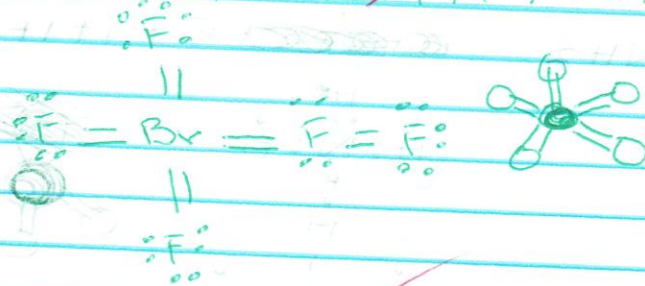
$$\text{ClF}_3 \quad 7+7+7+7=28$$



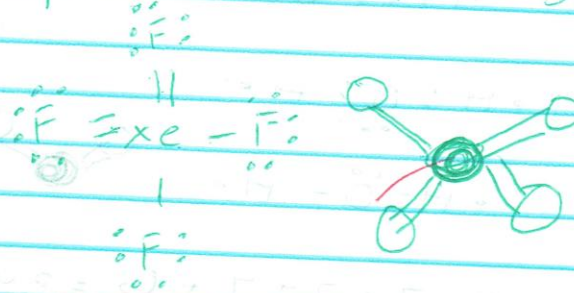
$$\text{SF}_6 \quad 7+7+7+7+7+7+6=48$$



$$\text{BrF}_5 \quad 7+7+7+7+7+7=42$$



$$\text{XeF}_4 \quad 8+7+7+7+7=36$$



$$\begin{aligned} \text{mass} &= \text{density} \cdot \text{volume} \\ \text{density} &= \text{mass} / \text{volume} \\ \text{volume} &= \text{mass} / \text{density} \end{aligned}$$

kimberly Garcia

1. mass = 33.0g
 volume = 30.0 cm³

$$\text{Density} = 1.1 \frac{\text{g}}{\text{cm}^3}$$

2. mass = 50.4g
 volume = 57.9 cm³

$$\text{Density} = .87 \frac{\text{g}}{\text{cm}^3}$$

3. mass = 6,200 g

volume = 2,296 cm³

$$\text{density} = 2.70 \frac{\text{g}}{\text{cm}^3}$$

4. Density = 0.9 g/cm³

mass = ? 900,000

volume = 1,000,000 cm³

$$v \cdot D = \frac{g}{\text{cm}^3} \quad \frac{m}{v} \cdot \frac{1}{v} =$$

$$m = v \cdot D$$

5. volume = 113 cm³

density = 21.4 g/cm³

mass = ? ~~2418.2g~~
2418.2g

a-20-16

element

The element oxygen.



compound

a water molecule



H₂O

Homogeneous

vinegar.



Heterogeneous

A bowl of different type of chips.



Physical change

cutting a paper in half



Chemical change

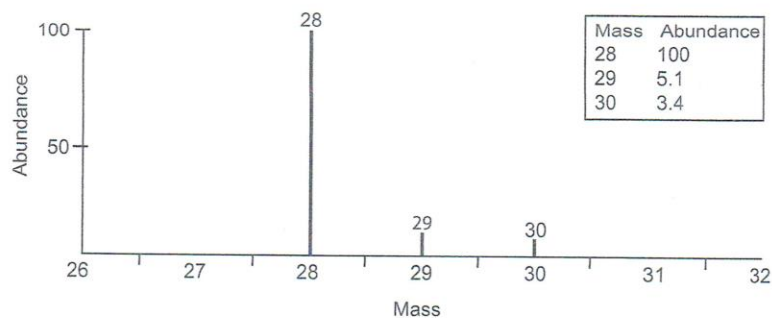
mixing one chemical substance with another



PRE-LAB EXERCISES (CONTINUED)

3. For the mass spectrum shown in Figure 5, calculate the percent abundances and the average atomic mass, and then identify the element.

Figure 5. Mass spectrum



$$\text{avg mass} = 108.5$$

$$\frac{100}{108.5} \cdot 100 = 92.2\%$$

$$\frac{5.1}{108.5} \cdot 100 = 4.7\%$$

$$\frac{3.4}{108.5} \cdot 100 = 3.1\%$$

$$\text{avg mass} = \left(28 \cdot \frac{92.2}{100}\right) + \left(29 + \frac{4.7}{100}\right) + \left(30 + \frac{3.1}{100}\right)$$

$$25.8 + 1.4 + 0.9 = 28.1 \text{ amu}$$

silicon

7. Now you will use some lone pairs to see how they affect the molecular shape. Build models with the number of bonds and lone pairs you see in the chart.

Number of Bonds	Number of Lone Pairs	Molecule Geometry	Electron Geometry	Bond Angles	Drawing
1	0	linear	linear	0°	
2	0	linear	linear	180°	
3	0	Trigonal Planar	Trigonal Planar	120°	
2	1	Bent	Trigonal Planar	120°	
4	0	Trigonal Planar	Trigonal Planar	120°	
3	1	Trigonal Pyramidal	Tetrahedral	109.5°	
2	2	Bent	Tetrahedral	109.5°	
1	3	linear	Tetrahedral	0°	